

Financial intermediaries, ownership structure and the provision of venture capital to SMEs: evidence from Japan

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Abstract This paper examines how the provision of venture capital to small- and medium-sized businesses (SMEs) is influenced by the ownership structure of the venture capital provider. We introduce a new and unique dataset from the Japanese venture capital market, comprising data on investment and venture capital activities of 127 Japanese venture capital funds. The data allow us to provide a

direct comparison of the behaviour of individual owner-manager venture capitalists versus financial intermediation (e.g., bank's venture capital divisions). The data indicate owner-manager venture capitalists (financial disintermediation) give rise to much smaller portfolios of SMEs and more advice to entrepreneurs. Across the scope of different financial intermediation structures, including banks, life insurance companies, securities firms, corporations and government bodies, there are further differences in the provision of governance and value-added advice provided to SMEs. Also, the data indicate US-affiliated funds in Japan are more likely to have smaller portfolios and tend to provide more advice to SMEs.

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1 Introduction

Financial intermediation involves banks and other institutional investors playing pivotal roles in transforming savings into investment, thereby facilitating liquidity, information, and consumption smoothing. Financial intermediaries also serve as a commitment mechanism and provide delegated monitoring to the

organization to which they provide capital. While there is a substantial body of research on these traditional functions of intermediaries, less is known on how financial intermediaries perform when they extend their boundaries to new business areas such as the provision of monitored finance in the form of venture capital to small- and medium-sized enterprises (SMEs). Indeed, a recent review of the financial intermediation literature by Gorton and Winton (2002) illustrates that our understanding of financial intermediation and its interplay with monitored financiers is incomplete (see also Allen 2001; Allen and Santomero 2001). Are there costs associated with banks and non-bank intermediaries in the venture capital market as compared with other, non-intermediated providers such as owner-manager investors? This paper provides quantifiable measures that allow us to examine effects of financial intermediation as it pertains to venture capital and monitored finance.

The involvement of financial intermediaries in monitored finance varies by country of domesticity. Banks in Japan have traditionally held equity in firms while maintaining debt relationships (Hamao et al. 2000; Kuroki et al. 2000; Phan and Yoshikawa 2000; Yoshikawa et al. 2004; Mayer et al. 2005). In the US, banks have been permitted to hold equity in cases where a firm is undergoing financial restructuring. The extension of financial intermediation into monitored finance is most stark, however, in cases where banks supplement their financial intermediation role with the provision of equity to private firms in the form of venture capital. Banks compete with venture capital and private equity funds (hereafter collectively referred to VC funds), which are typically organized as limited partnerships with the owner-manager (the general partner) receiving capital from institutional investors (including pension funds, banks, life insurance companies, etc.) (the limited partners). VC funds reinvest capital in non-publicly traded entrepreneurial firms under the conditions set out in a limited partnership agreement.¹ Relative to

banks, VC funds tend to have a more pronounced role in corporate governance and monitoring in the companies that they finance (Gompers and Lerner 1999) to solve more severe agency problems. Indeed, the need for active investors who manage and advise privately held high-growth companies, it is argued, primarily accounts for the existence of venture capitalists (although there are other explanations).²

In this paper we extend existing research on what it is that financial intermediaries do and the roles they play in the companies that they finance, with specific reference to SMEs. Our analyses are most similar in spirit to Mayer et al. (2005) and Lerner et al. (2004) (on the effect of sources of funds on VC activities) and Yoshikawa et al. (2004) (on how bank-affiliated VC fund managers behave). Mayer et al. (2005) show sources of funds affect investment decisions of VC funds, and find international differences across Japan, Europe and the US. Lerner et al. (2004) find endowments are much more likely to be invested in VC funds that yield higher project returns in the US. In short, these two seminal analyses identify the importance of the source of funds in the activity and success of VCs in their investee companies. Our paper investigates this concept to more closely explore how the extent of VC activities and governance differs by source of funds. Yoshikawa et al. (2004) argue that bank-affiliated VC funds are less likely to engage in active monitoring of their portfolio of investments. Rather, compensation and incentive structures within the bank-affiliated fund lead to larger portfolios to diversify investment risk and generate less volatile returns. We extend their

Footnote 1 continued

exits; Casamatta and Haritchabalet (2003), Lockett and Wright (1999, 2001) and Wright and Lockett (2003) on VC syndication; and Zacharakis and Shepherd (2001, 2005) on VC decision making. Almost all the VC funds in Japan (the focus of this paper) are generalists in the sense that they consider at least some traditional early stage venture investment as well as at least some later stage private equity investment; we control for different stages in our analyses, but do not (and cannot) exclude funds on the basis of considering certain stages in part of their portfolio investments.

² With the presence of severe moral hazard and adverse selection costs, we expect a group of specialized investors with enhanced ability to monitor and screen investments; see Sahlman (1990), Bascha and Walz (2001a, b), Kirilenko (2001), Gompers and Lerner (1999). Other explanations include risk-sharing (Gompers and Lerner 1999) and “skills learning” (Chan et al. 1990).

¹ See Gompers and Lerner (1999) for a collection of seminal articles on VC finance; see also Clarysse et al. (2005a, b), De Clercq and Sapienza (2005), De Clercq et al. (2005), Manigart et al. (2000, 2002a, b, c), Sapienza (1992) and Sapienza et al. (1996, 2005), Kaplan and Stromberg (2003) on VC monitoring and advising activities; Kanninen and Keuschnigg (2003, 2004), Fulghieri and Sevilir (2004) and Jääskeläinen et al. (2006) on VC portfolio size; Neus and Walz (2005) on VC

work by comparing the behaviour of VCs across a range of financial intermediation ownership structures, including owner-manager VC funds. We evaluate the differences between ownership structures through two aspects of the provision of venture capital: governance (portfolio size as measured by the number of entrepreneurial firms per investment professional) and value added (the explicit provision of different types of advice). As the sources of fund differences in our sample are directly attributable to the ownership structure of the funds, we are able to ascertain effects of financial intermediaries in their role as equity providers.

We focus on Japanese data, as opposed to European or US data, for the following reasons. First, the structure of the Japanese financial industry is heterogeneous in terms of the types of institutions that contribute capital to venture capital funds. This enables us to examine differences in the forms of financial intermediation in venture capital finance. Second, the available data are significantly richer in terms of ownership levels of different institutional investors in venture capital funds. Third, the venture capital industry in Japan is relatively nascent. As a result, there are many newly formed commitments between institutional investors and their investee venture capital funds, unlike the US and many European countries in which institutional investors and venture capital funds have longstanding relationships and terms that may have been established well before that for which current data are available. Finally, there is a comparative dearth of research on venture capital in Japan, and our new dataset sheds insights into the structure of the industry by examining, for the first time, ownership percentages held by institutional investors of venture capital funds (and not just for Japan, but for any country).

Our analysis highlights clear differences in the way banks and other financial intermediaries act as venture capitalists as compared with owner-manager VCs. We show that more financial intermediation (such as bank-affiliated funds) is associated with less governance of venture capital-backed SMEs. Individual owner-manager VCs give rise to smaller portfolios of entrepreneurial firms per manager, leading to more governance and monitoring of management in the company. Based on a nonlinear Box–Cox model, we show that a fund that is 100% owned by an individual/manager will finance

approximately 20 fewer companies per VC manager (a move from approximately the 75th percentile to the 25th percentile in the data), and thereby provide more monitoring, compared to a fund that does not comprise individual owner-managers. As a related matter, we find that owner-manager VCs behave differently in that they offer a greater scope of advice to their portfolio companies relative to bank VCs and VCs of other institutional ownership. These differences are directly related to the fact that individual owner-manager VCs are more likely to focus on earlier stage companies.

An added novel feature of our new dataset on financial intermediaries and venture capital is that it enables a consideration of the impact of US institutional affiliations in Japanese VC funds. The data indicate material impacts on the process of financial intermediation in Japan from an association with US investors, in terms of smaller portfolios per manager and more advice to entrepreneurial companies. The data indicate that the economic significance of US institutional affiliation within Japanese VC funds is in fact comparable in economic significance to financial disintermediation (owner-manager VC funds).³ Prior theoretical work (Kanniainen and Keuschnigg 2003, 2004; Bernile et al. 2007) suggests more experienced VCs are able to hold larger portfolios per manager and still provide greater advice and governance. All else being equal, smaller portfolios per manager do enable more advice and governance (Kanniainen and Keuschnigg 2003, 2004; Bernile et al. 2007). US funds are less likely to undertake larger portfolios per manager in order to bring about more governance and advice to investees, ostensibly to bring about a higher-quality reputation and become an established player in the market.

This paper is organized as follows. Section 2 discusses literature on monitored finance and provides a model of venture capital from which we derive propositions for empirical testing. Section 3 describes the institutional structure for providing venture capital finance in Japan. Section 4 introduces

³ By *disintermediation*, we refer to the case of owner-manager funds, where the manager holds a significant fraction of the fund. In contrast, funds that are not held by the manager (but by fund providers such as banks, corporations or governments) are intermediated funds.

the data and provides summary test statistics. Section 5 provides multivariate empirical analyses, and Sect. 6 examines differences in fund income. Concluding remarks follow.

2 Venture capital and monitored finance—a theoretical model

One of the primary roles of financial intermediaries is to facilitate the provision of liquidity. Financial intermediation involves banks borrowing from a large number of agents through deposit contracts, and providing a large number of consumers and firms (including SMEs) with liquidity. In general terms, financial intermediaries reduce the costs of search for borrowers and lenders, and facilitate the ability to trade at low transactions costs (Harris 2003; Kyle 1985). Given the position of intermediary, banks have a related function as information providers because their role provides access to detailed information not widely available. Seminal work on information by Leland and Pyle (1977) (see also Diamond 1984) shows that the information gathered by a financial intermediary can be protected (i.e., the intermediary can overcome an ‘appropriation problem’) and can be credibly ensured to be reliable (i.e., the intermediary can overcome a ‘reliability problem’) by issuing securities and using the proceeds to invest in companies in which the intermediary has favourable private information. To this end, financial intermediaries have incentives to invest in the acquisition of private information pertaining to investee companies, which in turn enhances the profitability of the financial intermediary.

The role of financial intermediaries as providers of liquidity and information collectors leads to banks being key monitors of firm behaviour and financial performance. Agents will lend a greater amount of funds to borrowers via a financial intermediary as a result of lower costs of monitoring. Perhaps the most important work on the theory of financial intermediaries as monitors is provided by Diamond (1984). Diamond explains the existence of banks as financial intermediaries in their role as delegated monitors. Lenders lend money to the intermediary, who in turn lends money to borrowers, and the intermediary monitors the borrowers on behalf of the lenders. Financial intermediaries exist

by virtue of their structure in that it is less costly for lenders to monitor the intermediary than it is for lenders to monitor the borrower. Further, the greater the size of the intermediary, the lower the cost of monitoring the intermediary, suggesting scale economies associated with the size of the intermediary (Williamson 1986). These core results in the development of the theory of financial intermediation indicate financial intermediaries play an important role in facilitating monitoring of the companies that they finance.

In addition to the key finance roles of liquidity provider, monitor and information collector banks have also moved into related intermediary functions by providing venture capital finance (or monitored finance) to entrepreneurial firms. Financial intermediaries as monitored financiers have several potential benefits for other financial claimants on firm value. First, Stiglitz (1985) argues that the dual role of debt and equity holder alters the banks’ approach to monitoring and governance. Traditional debt holders aim to avoid bad outcomes given the fixed income nature of the claim over cash flow and assets. When financial intermediaries hold equity as well as debt (e.g., through venture capital), goal alignment improves, as the intermediary is more concerned with maximizing firm value. Second, bank-monitored finance may decrease the probability of hold-up by equity holders who would otherwise strive to shift risks to debt holders post contracting/financing (see John et al. 1994). When banks also provide equity, other equity holders (typically founders/managers of the entrepreneurial firm) let the bank share in the firm’s upside potential. In contrast to these advantages, however, Gorton and Winton (2002) report empirical evidence that in countries where banks do hold equity and debt, debt dominates. If this is the case then banks may be willing to tradeoff active monitoring and equity claims for minimizing the probability of debt default.

2.1 A model of venture capital

In this section we develop a theoretical framework allowing us to derive empirical predictions for our analysis. Although the framework is quite simple and stylized, it enables understanding of the possible channels through which key determinants affect VC

investment behaviour and sets the conditions for our predictions.⁴

Consider a VC manager, denoted M , holding a fraction α of total funds managed by him, and facing a large number of entrepreneurs seeking venture capital finance.⁵ For simplicity, let us suppose that all individuals are risk-neutral. M has a limited amount of time available so that he can exert either high effort (e^H) in a single venture or low effort (e^L , where $e^L < e^H$) in two ventures. Any further investment would not be monitored by M and thus yields negative return. Exerting high effort increases present value of the venture from V to $(1 + \Delta) \cdot V$, where $V > 0$ and $\Delta > 0$. If M only exerts low effort, the venture is worth V . The investment in capital is normalized to zero for simplicity.

Once he has invested in a venture, M needs to gather additional information on the venture to be able to realize these value-added Δ through monitoring and advising at cost e^H . Acquiring information comes at private costs E^i to the manager but allows him to know for sure how to add value. Otherwise, we suppose that he can only add value Δ with probability λ , $0 \leq \lambda \leq 1$.

2.1.1 Monitoring and portfolio size

If informed, the VC manager will have incentive to advise and monitor his portfolio company iff

$$\alpha(1 + \Delta)V - e^H \geq \alpha 2V - 2e^L \quad (1)$$

since otherwise he will prefer to finance two SMEs when exerting e^L only. If uninformed, the VC manager will have incentive to advise and monitor his portfolio company iff

⁴ An alternative modelling approach to ours that may lead to qualitatively similar results is by Stein (2002) on the use of soft versus hard information. However, since we focus our attention of intermediation versus disintermediation and differences in stakeholding, our approach seems better suited for our specific purposes of modelling the Japanese VC market.

⁵ Here, we take the stake α as exogenously given. This is motivated by the observation that most VC managers are remunerated based on the 2–20 rule (i.e., 2% management fee plus 20% of fund profits; cf. Gompers and Lerner 1999). Moreover, it is important to note that owner-managers in Japan hold significant stakes as they also provide an important fraction of funds they manage (see empirical evidence provided later on in this article). Therefore, they will hold larger stakes compared to managers of intermediated funds.

$$\alpha\lambda(1 + \Delta)V + \alpha(1 - \lambda)V - e^H \geq \alpha 2V - 2e^L \quad (2)$$

For uninformed VC managers, this yields the following condition:

$$\alpha(\Delta - 1)V \geq e^H - 2e^L \quad (3)$$

Equation 3 simply states that the gains from monitoring (right-hand side) must be larger than the additional costs (left-hand side). Otherwise, an uninformed VC manager will not provide any valuable assistance. Combining results for informed and uninformed managers (Eqs. 1 and 3) allows us to derive the conditions for which only informed managers will provide monitoring services and advice, namely:

$$\alpha(\Delta - 1)V \geq e^H - 2e^L \geq \alpha(\lambda\Delta - 1)V \quad (\text{Condition 1})$$

If Condition 1 holds (as we will see), this then leads to a larger portfolio for each manager (or a larger number of SMEs financed per employee of the manager). In what follows, we impose Condition 1 to hold so that only an informed manager would provide significant monitoring and advising to portfolio companies. This allows us to focus the discussion on the most relevant cases and the conditions under which this indeed occurs.

2.1.2 Information acquisition

Note that if E^i is exerted so that M is informed, his ex ante payoff is: $\alpha(1 + \Delta)V - e^H - E^i$. If it is not exerted, his payoff is: $\alpha 2V - 2e^L$ (given that Condition 1 holds), since then M can invest in two projects. The manager will therefore prefer to invest in gathering information at private cost E^i iff

$$\alpha(1 + \Delta)V - e^H - E^i \geq \alpha 2V - 2e^L, \quad (4)$$

i.e.,

$$\alpha(\Delta - 1)V \geq E^i + (e^H - 2e^L) \quad (5)$$

This condition simply says that additional monetary gains must be greater than additional effort costs for the VC manager.

2.2 Propositions

Since owner-manager VC funds hold larger stakes than VC managers of intermediated funds (where α is

lower), they are more willing to gather information and thereby also provide valuable assistance and monitoring.⁶ This is summarized below in Propositions 1 and 2:

Proposition 1 (amount of advice): *Owner-manager VCs are more likely to provide a greater amount of advice to portfolio companies than intermediated VC funds.*

Proposition 2 (portfolio size): *Owner-manager VCs are more likely to make a smaller number of investments (as measured by the number of portfolio companies per fund manager) than intermediated VC funds.*

We will test these propositions in this paper both in terms of amount of advice provided and the number of portfolio companies financed (or portfolio size). It is important at this stage to note, however, that when advising and monitoring are multidimensional (e.g., when the quantity and quality of advice differ), M will prefer to provide the types of advice that gives the highest ratio to return over costs. This will depend on the personal prior experience and skills of each manager (see Sect. 2.3 for a more extensive discussion). In Sect. 3 below, we formulate specific hypotheses for different ownership structures.

2.3 Robustness and limitations of the theoretical framework

In this section, we discuss robustness and limitations of the theoretical model presented. While the tradeoff is fairly generalizable (in particular with respect to functional forms), it includes a few key assumptions that make the tradeoff to happen.

Our framework uses the costly information collection hypothesis. However, a qualitatively similar tradeoff can be achieved under other hypotheses such as heterogeneity in venture capitalist's propensity to provide valuable effort. If VC managers differ in the quality of their advice (or in their private costs per unit of effort), those managers who can add value most easily will be more inclined to support their

investees with advice. They will in turn also manage fewer companies. Therefore, the costly information collection hypothesis is not the only framework where such a tradeoff can arise. In the empirical analysis, we are not able to determine which framework is most appropriate.

A valid limitation is that the framework neglects syndication, which may at times alleviate the problem. Indeed, VC managers may achieve larger portfolios through syndication with other VC funds. However, to obtain enough incentives to exert the required effort, the manager will still need to hold large stakes in any investee he aims at monitoring and advising. As such, syndication only offers diversification benefits (and thus a larger portfolio size) when value-adding and information-gathering activities by the VC manager require little effort and when effort is divisible among the different syndicate members.⁷

The most critical assumptions is embedded in Condition 1. It provides lower and upper boundaries for the difference between e^H and $2e^L$. Intuitively, it gives the condition so that informed managers will provide advice (the first inequality) while uninformed ones do not (the second inequality). Condition 1 is most likely to hold when the parameter λ is small (i.e., the probability that uninformed VC managers are nevertheless able to add value). In practical terms, this assumes that information gathering is a critical element for the provision of value-adding advice and monitoring and that it does not go without costs. However, this cost should not be too high; otherwise even informed managers will refrain from advising. We consider these conditions as fairly realistic.

Finally, an important simplification dies is with respect to a single effort type. In Sect. 3, we consider a framework where the VC manager offers various types of advice, rather than only one. Our framework is generalizable towards multiple dimensions of effort and advice. The approach taken here merely allows limiting the mathematical complexity to a minimum and is primarily intended to derive the basic mechanism driving the tradeoff. Under the assumption that each type of advice has its own effort cost function and that they are independent of each other, similar

⁶ This is consistent with other theoretical work such as Kannianen and Keuschnigg (2003, 2004) and Bernile et al. (2007), Cumming and Johan (2007).

⁷ This last point goes against common practice, since typically one VC manager acts as a lead investor for the syndicate, while the others only bring in their capital. Therefore, effort is rarely provided jointly among the different syndicate members.

results can be easily obtained. A condition similar to Condition 1 would be needed but with more than one case distinction (since now informed managers can decide to provide one or two types of advice, as opposed to only one in our simplified model). To avoid making the discussion too technical, the presentation of the tradeoff between advice and portfolio size is easiest with a single type of advice. In essence, a VC manager will be most inclined to provide the kind of advice that is least costly to him (or which has the highest benefits over costs ratio), followed by the type of advice that then is the second least costly compared to benefits. All types of advice where his personal gains are greater than his personal effort costs will be provided to the investee, the other(s) not.

3 The provision of venture capital in Japan

The Japanese financial system provides a natural experiment to examine the impact of financial intermediation on venture capital. Banks have traditionally played an important role in providing monitored finance such as venture capital given the “bank-oriented” financial system. There is now a comprehensive literature on the theory and operations of the main bank system in Japan. Early research maintained that main banks (usually the largest lender with the longest relationship) operated as Diamond (1984) delegated monitors, reducing the agency costs associated hidden action and imperfect information (Sheard 1989; Aoki 1990; Prowse 1990; Lichtenberg and Pushner 1994; Phan and Yoshikawa 2000). This work was complemented by evidence that main banks mitigated asymmetric information problems between lenders and borrowers given embedded, long-term credit relationships (see, for example, Shin and Kolari 2004). Main bank relationships lead to less liquidity constraints for growth firms such as SMEs, although there is little evidence that investment levels differ between funds with and without a main bank relationship. Recent empirical evidence has emerged that the main bank system in Japan also contains fundamental flaws associated with banks extracting economic rent (through hold-up) from their clients (Weinstein and Yafeh 1998) and favouring creditors over other stakeholders in the governance process (Morck and Nakamura 1999).

Hanazaki and Horiuchi (2000) show that main-bank-supported firms have excelled in spite of their long-term relationships due to robust competition in product markets.

The operation of the main bank system includes provision of monitored finance in the form of venture capital to entrepreneurial firms. Bank-affiliated VC funds (usually divisions) extended equity capital as part of the banking relationship. Over time banks were joined in the venture capital market by other affiliated VC funds supported by securities firms, corporations and life insurance companies. By 2000 the Japanese-monitored finance system comprised firms of diverse ownership structures, allowing a direct comparison of the behaviour of banks, non-bank financial intermediaries and specialist owner-manager VC funds (Hamao et al. 2000; Kuroki et al. 2000; Yoshikawa et al. 2004). In the remainder of this section we review different types of monitored financiers in the Japanese market and relate these different ownership structures to the propositions offered in Sect. 2.

3.1 Banks and venture capital

The earliest participants in the Japanese venture capital market were financial intermediaries. Several authors have found that financial intermediaries behave differently than other providers of venture capital. Kuroki et al. (2000) report that financial intermediaries in Japan often invest in venture capital funds with a view to secure services for their own bank, offer debt and equity to their investee private companies, and invest with a view to maximizing the operating income from portfolio companies (for example, through cross-selling services) as opposed to adding value and realizing investments over a finite time for maximum capital gain. Hamao et al. (2000) find that companies backed by venture capital from financial intermediaries demonstrate lower initial public offering under-pricing as compared with other types of venture capital. Lower under-pricing suggests that banks play a stronger certification role than non-bank venture capital given the benefits of an information-rich lending relationship with portfolio companies. Finally, Yoshikawa et al. (2004) argue that bank-affiliated VC funds are less likely to engage in active monitoring of their portfolio of investments. Rather, compensation and

incentive structures within the bank-affiliated fund lead to larger portfolios to diversify investment risk and generate lower (but less volatile) returns. They find a negative association between lower powered incentive structures (such as salary bonuses or promotion via seniority) and active monitoring.

Our study provides empirical analysis of observations made by Kuroki et al. (2000) and extends analysis of how banks act as venture capitalists provided by Hamao et al. (2000) and Yoshikawa et al. (2004). Financial intermediaries source capital (predominately) from a diversified pool of depositors, implying a lower opportunity cost of capital than a small group of third-party providers (such as those investing with an owner manager VC fund). Proposition 1 suggests that bank VC funds will have larger portfolios of investments. This is also consistent with the arguments of Kuroki et al. (2000) and Yoshikawa et al. (2004), where a bank VC will have a larger portfolio of companies (per investment professional), to maximize the pool of potential customers and minimize volatility of returns. Proposition 2 suggests that bank VC funds will provide less advice to portfolio companies relative to owner-manager VC funds as the bank's investment professionals adopt more passive portfolio management techniques.

Banks provided monitored finance through establishing divisions within the organization or establishing affiliates/subsidiaries as part of the wider business group. Banks have been major providers of expansion and late stage capital to privately owned SMEs that were in pre-IPO funding rounds. The division or affiliate is typically organized along functional lines, with organizational divisions such as industry analysis, consultation, investment planning. The primary goal of this type of monitored financier is to undertake investments or value-adding activities consistent with the objectives of the affiliation group (Yoshikawa et al. 2004; Kuroki et al. 2000). Venture capital to SMEs becomes one of the ways in which the corporate parent achieves its financial and strategic goals. Therefore, in regard to specific types of advice provided by bank-owned venture capital funds to their investee companies, we may expect that the access to a banks' other clients would enable a bank to provide personal referral (setting up links with other business partners) and client intermediary services (finding clients for the investee firms). Since their core operations is

financial services, we may also expect bank-owned venture capital funds to provide management consulting (financial and strategic advice). These factors give rise to our first testable hypothesis:

Hypothesis 1: Bank-owned VC funds are more likely to provide personal referral (setting up links with other business partners), management consulting (financial and strategic advice) and client intermediary services (finding clients for the firm) than other types of VC funds due to their access to other bank clients and because financial services are their core area of expertise.

3.2 Non-bank financial intermediary providers of venture capital

The Japanese financial system is characterized by various ownership structures for VC funds. We focus on two key non-bank financial intermediary providers of monitored finance: securities-company-affiliated VC funds and corporate VC funds. Securities companies fill a finance services gap in the system given that banks have long been excluded from securities finance activities important in the growth of entrepreneurial firms (although banks have traditionally held equity positions in larger corporations). Corporate investment has been important within the supply chain and as a strategic option to capture/negate competitive threats of new technology. In addition to these two intermediaries, we also briefly discuss life insurance companies and governments as owners of VC funds in this section.

Securities-company-affiliated VCs provide portfolio companies with capital, value-adding activities and specialist skills in underwriting securities in the event of an initial public offering. As Hamao et al. (2000) argue, VC funds affiliated with securities companies face a potential conflict of interest during the exit process, between the opportunity to generate short-term gains and the longer-term interests of other (non-exiting) equity holders.⁸ Securities-company-affiliated VCs generate income from both the realization process (maximizing the return multiple on the investment) and the underwriting of the offering. In cases of market power, the underwriter can influence

⁸ See also Gompers and Lerner (1999) and Li and Masulis (2004).

the offer price and the short term market price to the detriment of longer term equity holders. Hamao et al. (2000) find that all securities-company-affiliated VCs in their sample used their parent/owner as the underwriter when listing portfolio companies. Further, investors in IPOs of securities company VC-backed funds received higher first-day returns as compensation for conflicts of interest. In contrast, owner-manager VC funds cultivate a reputation in the market by listing only the highest quality portfolio companies (Gompers and Lerner 1999).

Hypothesis 2: Securities-firm-owned VC funds are more likely to provide management consulting (financial and strategic advice), business broker services (facilitating the sale of the firm) and personal referral services (setting up links with other business partners) since these activities are consistent with the core business of the securities firm and the VC fund can refer the investee firm to its security firm owner.

Corporate VC funds provide liquidity and technical expertise to entrepreneurial funds operating in similar industries or economic sectors. Gompers and Lerner (1999) argue that corporate VC funds provide venture finance to secure real options consistent with broader corporate goals and strategic objectives. Gompers and Lerner's (1999) evidence indicates that a new venture is more likely to be financed by a strategic investor the more complementarities exist with the corporate sponsor. Corporate VC funds allow the corporate headquarters to concentrate on core activities and purchase (fund) a set of real options that may give the firm a window on research and development and/or increase the speed of response to competitive threats.

Hypothesis 3: Corporation-owned VC funds are more likely to provide technology broker services (setting up links for technological advancement) to the investee firm in conjunction with their industry expertise and strategic reasons for investment.

Life insurance companies have (typically) been minority owners of VC funds. To the extent that these owners have influence we would expect insurance-company-affiliated VC funds to have less risk tolerance than other financial institutions that invest in venture capital. In negotiating a limited partnership agreement, life insurance companies with greater ownership in the fund may require covenants that give rise to the VC fund investing in a greater number

of portfolio companies (a greater span of control) to spread the risk (examples of such covenants are provided and studied in Gompers and Lerner 1999). Risk-adverse life insurance companies would find this to be more valuable than a strategy of diversifying their capital across a greater number of VC funds, in view of the costly contracting and negotiation process associated with setting up a fund.

Hypothesis 4: Life insurance-owned VC funds do not necessarily influence the type of advice in any particular direction. Generally, life insurance-owned VC funds will provide less advice since life insurance companies have more pronounced incentives to invest in VC funds with large portfolios per manager, thereby lowering the advice provided by maximizing the diversification benefit.

Finally, government VC funds are designed to promote investment and business development in their local economy, and will often look to syndicate investments with other market participants to achieve this end. Funds with government backing may have political pressures to spread their capital across a greater number of (and possibly more geographically disparate) portfolio companies (Lerner 1999). Government funds, however, provide little advice but rather rely on private VCs with which they may syndicate.

Hypothesis 5: Government-owned VC funds do not necessarily influence the type of advice in any particular direction. While they typically provide a significant amount of capital to fund R&D activities, little advice is given to complement capital supply.

3.3 Owner-manager VC funds: specialist providers of venture capital

The Japanese VC market is further characterized by the existence of owner-manager funds, where the owner is also the investment manager. Unlike the financial intermediaries examined so far, owner-manager VC funds have investment decision-making control of the fund, and position themselves in the market according to their fund competencies and competitive advantages. Independent funds are the more recent providers of venture capital in Japan, often specializing by sector(s), and raising capital from third-party providers. In contrast to banks and

other financial intermediaries, owner-manager VC funds enter partnership agreements which contain covenants on investment strategy and behaviour, and provide longer-term interest alignment through profit sharing on realized investments (carried interest) (Gompers and Lerner 1999). The success and longevity of the owner-manager fund depends on the investment managers' ability to maximize returns to investors.

The arms length relationship with investors and focus on return has the following implications for governance and interest alignment. Proposition 1 states that owner-manager funds will provide greater corporate governance and more value-adding advice than financial intermediary providers of venture capital by allocating human resources to maximize effort per investment. Proposition 2 states that the optimal resource allocation will be associated with lower portfolio sizes (a lower span of control). Such behaviour reflects the higher risk tolerance of owner-manager VC managers given their specialist expertise and skills, and the need for them to produce capital gains on investments (as remuneration is back-end structured through profit share—carried interest) (Gompers and Lerner 1999).⁹

Hypothesis 6: Individual-owned VC funds are more likely to provide more advice in all dimensions, but the specific types of advice provided will vary depending on the idiosyncrasies and expertise of the individual.

4 Data

4.1 Institutional background

We draw on data from the Japanese venture capital market to examine the influence of ownership structure on the provision of venture capital. Venture capital in Japan was established in the early 1970s with financial intermediaries extending equity finance

to entrepreneurial firms (Kuroki et al. 2000). During the next 20 years approximately 100 private equity funds raised capital, with 75–80% of these being owned by financial institutions. Two structural changes influenced growth in the late 1990s. First, policy change in 1996 removed the prohibition against investing in private equity by pension and corporate funds. It has been estimated that more than 45 new private equity funds were established as a result of the legislative changes (Kuroki et al. 2000; Ministry of Economy, Trade and Industry 2001). Second, major structure change took place in the financial system with the establishment of the MOTHERS board on the Tokyo Stock Exchange. The new market provided a (potentially) viable new exit venture for venture-capital-backed firms and combined with the rise in information technology investing (especially in the US) spurred new firms to enter the venture capital industry.

The structural changes in the mid- and late-1990s in Japan altered the demand-and-supply features of the market by permitting a wider range of private equity funds to raise capital and new capital providers (pension and corporations) to enter the market. Figure 1 provides a time series of capital raised (i.e., committed) to Japanese private equity funds between 1990 and 2002. The capital-raising cycle in Japan was traditionally out-of-alignment with developed private equity markets in the US and Europe, with little capital raised in 1997 and 1998 (see Gompers and Lerner 1998, on fundraising in US, and Jeng and Wells 2000, on fund raising in other countries). Since 1999, however, Japanese funds have enjoyed increased capital inflows. From 1999 to 2000, 47 fund managers raised 79 funds totalling \$3.2 billion (¥333 billion), representing 45% of all capital raisings. The number of funds raised decreased substantially in 2001 and 2002, again more in line with international market trends.

While fund-raising cycles have become more interdependent since 1999, the Japanese market differs from established private equity markets in two key institutional characteristics. First, the supply of private equity capital in Japan is still provided largely by corporations, banks and insurance companies. Indeed, in 2000 corporations (48%), banks (25%) and insurance companies (13%) accounted for 86% of committed capital. Pension plans, the traditional private equity investor in the US, have been the

⁹ Recent theoretical work on the differences between banks and specialist VCs in supporting growth companies shows that specialist VCs favour higher returns, higher growth companies and have a higher risk tolerance (Landier 2001; Black and Gilson 1998).

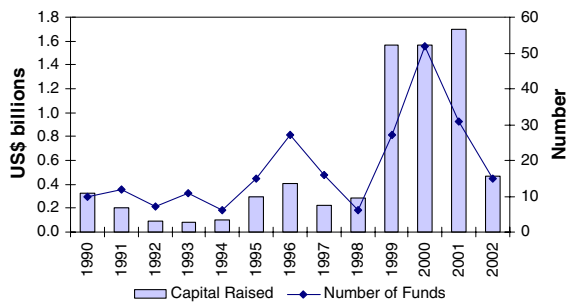


Fig. 1 Japanese private equity capital raisings and number of funds, 1990–2002. Source: venture economics

more recent entrants in the Japanese market but only provided 9% of committed capital in that year (see Mayer et al. 2005 for similar data for 1999). Furthermore, the domesticity of capital remains high with Japanese providers making up 76% of capital committed in 2000 (Asian countries providing 4% and non-Asian countries provided 20%).

4.2 Sample and variable measurement

Our data are drawn from the 2000 annual survey of Japanese venture capital undertaken by the Venture Enterprise Center (VEC), under instruction from the Japanese Government's Ministry of Economy, Trade and Industry. In 2000 the VEC was asked to perform a comprehensive survey of the industry. A population of 185 VC funds of all ownership types was identified by the VEC using the following criteria: (1) the VC fund has a major office in Japan; and (2) the VC fund invests in portfolio companies as a VC investor (whether through equity or debt instruments). Financial institutions that made investments in inter-related firms (e.g., a parent into a subsidiary) were excluded because such transactions "could not be considered as an investment aiming at capital gain" (p. 1). The survey questionnaire comprised eight sections covering organization and personnel, VC fund finances, capital funding, investment stages, portfolio composition, exit data, investment by region, and investment by sector. Comprehensive data were received from 127 VC funds (a 69% response rate) and reflect self-reported information as at 2000. Our conversations with the VEC indicate that the Ministry's involvement in the sponsoring the survey led to the high response rate and depth of information from participants. Unfortunately there are no other publicly

available data sources to provide cross verification of responses, although we have no reason to expect responses to be unrepresentative.¹⁰

Table 1 reports the definitions of variables used in this study. The VEC survey provides quantitative and qualitative information on the responding VC funds. Therefore we have adopted the majority of our definitions from the VEC to maintain data integrity, and coded qualitative data to allow statistical analysis.

We standardized portfolio size by the number of investment professionals to measure span of control. Returns to scale are captured in Box–Cox regressions. Firm age is measured as the number of years between the vintage year of the firm's first raising and the reporting date (year 2000). US affiliation is defined as a VC firm with a US equity holder as reflected in the listing of top five owners. Finally stage and industry focus of the fund are measured using indicator variables. Given that the data are cross-sectional for year 2000 we do not control for market conditions at the time of the survey.¹¹

4.3 Sample characteristics and summary statistics

Figure 2 provides a three-dimensional bar graph for fund ownership, type of owner and number of funds. Single-owner VC funds (100% equity held by one group) are more common for owner-managers and corporate VC funds. Banks typically hold minority ownership (up to 20%) positions, while corporate VC funds and other financial institutions take "controlling" minority equity positions up to 50%. Government VC funds are most likely to be syndicated with other parties given their tendency to hold equity below 20%.

Table 2, Panel A, presents the complete sample (row 1) as well as univariate difference tests for fund ownership levels of at least 10% (rows 2–9), and for US-affiliated funds (row 10). We use the 10% cutoff purely for graphical reasons (and the data do comprise all details for less than 10% ownership),

¹⁰ Mayer et al. (2005) use self-reported data on 62 VC funds in their cross-country analysis. Other studies on Japanese VC exhibit smaller samples.

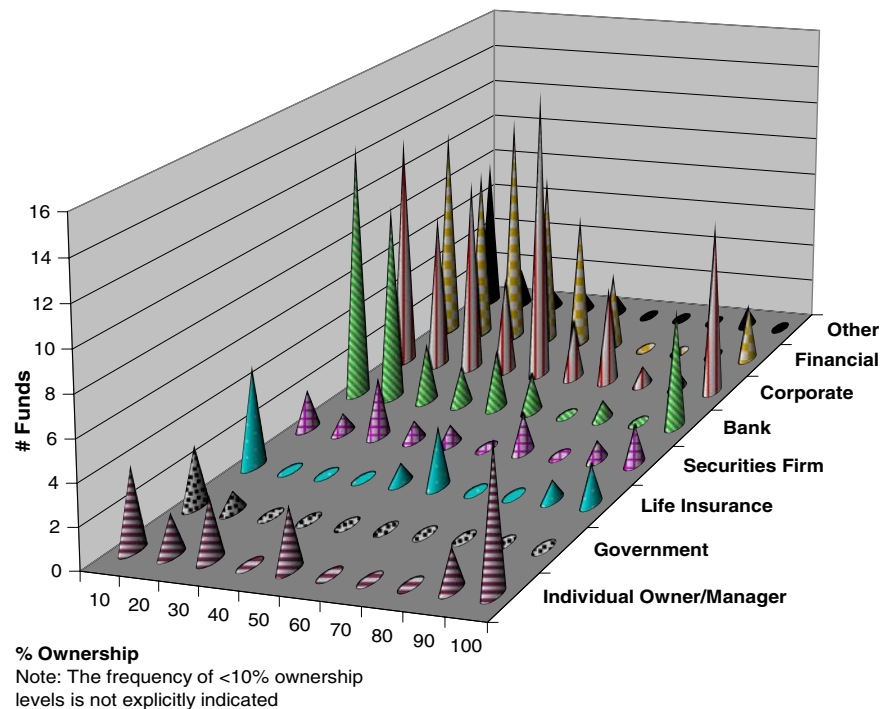
¹¹ We do control for firm age. The period leading up to 2000 is associated with increasing market returns (as well as money-chasing deals, at least in the US; Gompers and Lerner 1999), and hence is strongly positively correlated with age in our sample.

Table 1 Variable definitions

<i>Dependent variables</i>	
Portfolio size/VC manager	The number of entrepreneurial firms in which the fund invested divided by the number of fund managers
Personal referral	A dummy variable equals one if the fund provides advice to entrepreneurs in the form of personal referral (setting up links with other business partners)
Management consulting	A dummy variable equals one if the fund provides advice to entrepreneurs in the form of management consulting (financial and strategic advice)
Client intermediary	A dummy variable equals one if the fund provides advice to entrepreneurs in the form of client intermediation (finding clients for the firm)
Technology broker	A dummy variable equals one if the fund provides advice to entrepreneurs in the form of technology brokering (setting up links for technological advancement)
Business broker	A dummy variable equals one if the fund provides advice to entrepreneurs in the form of business brokering (facilitating the sale of the firm)
Sum of advice measures	The sum of the 5 advice measures (personal referral, management consulting, client intermediary, technology broker, and business broker)
<i>Ownership variables</i>	
Individual (owner-manager)	The ownership percentage of the individual fund managers that carry out the operations of the fund (top 5 individual ownership % only)
Life insurance	The ownership percentage of life insurance companies in the fund (top 5 life insurance ownership % only)
Bank	The ownership percentage of banks in the fund (top 5 bank ownership % only)
Corporate	The ownership percentage of corporations in the fund (top 5 corporate ownership % only)
Securities firm	The ownership percentage of securities companies in the fund (top 5 securities firm ownership % only)
Other financial institution	The ownership percentage of other financial institutions in the fund (top 5 other financial institutions ownership % only)
Government	The ownership percentage of the government in the fund (top 5 other government ownership % only)
Herfindahl index	The sum of squares of the ownership percentages of the top 5 owners in the VC fund
<i>Fund characteristics</i>	
US affiliation	Funds that are affiliated with a US private equity fund
Funds raised	The amount of capital raised by the venture capital fund in millions of 2000 Yen
Fund age	The age of the fund in years up to the period 2000
Number of funds	The number of funds raised by the private equity firm
Average experience of VC managers	The total number of years of experience of the managers divided by the number of managers
Proportion of investments exited	The proportion of investments exited (either by IPO, acquisition and/or write-off)
Lead investments	The percentage of investments taken as the lead investor
<i>Stage controls</i>	
Seed stage	The percentage of investments at the seed stage. Seed stage financing is provided for research, and to assess and develop an initial concept; seed stage companies may be in the process of being set up or may have been in business for a short time, but have not sold their product commercially
Early stage	The percentage of investments at the early stage. Early stage financing is provided for the growth of a company, which may or may not break even or trade profitably. Capital may be used to: finance increased production capacity, market or product development, provide additional working capital
Mezzanine stage	The percentage of investments at the mezzanine stage, whereby the company has reached profitable operating levels
Buyout stage	The percentage of investments at the buyout stage, for the acquisition of another company
<i>Industry controls</i>	
Health	Percentage of the fund's focus in the health sector
Computers	Percentage of the fund's focus in the computer sector

Table 1 continued

Semiconductors	Percentage of the fund's focus in the semiconductor sector
Biotechnology	Percentage of the fund's focus in the biotechnology sector
Energy	Percentage of the fund's focus in the energy sector
Retail	Percentage of the fund's focus in the retail sector
<i>Returns to scale</i>	
λ	The degree of curvature of the output function, based on the Box–Cox transformation ($\lambda < 1$ implies concavity; $\lambda = 0$ implies logarithmic; $\lambda = 1$ implies linear; $\lambda > 1$ implies convexity)

Fig. 2 Ownership % of Japanese venture funds in 2000. Source: VEC survey, Japan

as the histogram graph with ownership levels lower than 10% makes it more difficult to distinguish between differences across funds for ownership with more than 10%. As well, 10% is a common industry convention for distinguishing significant ownership levels. We focus on differences by fund capital per VC manager, portfolio size per VC manager and scope of advice (the number of types of advice). Panel B presents the data for different types of value-added advice (personal referral, management consulting, client intermediary, technology broker and business broker).

Table 2 indicates a number of significant differences associated with the 21 funds with owner-managers of at least 10% ownership. Importantly,

note that the cutoff point of 10% is not provided as a restriction in the data, as discussed immediately above; rather, 10% is a common industry convention for distinguishing significant ownership levels and is used to provide a benchmark for comparing means and medians in Table 2. In Panel A of Table 2, one must first note that owner-manager funds take on much smaller portfolios per VC (average of 2.1 and median of 1.5) relative to the other funds (average of 8.5 and median of 6.0). This indicates that individual owner-manager funds are much more interested in taking a greater amount of time to add value to each of their investee companies (Kanninen and Keuschnigg 2003, 2004), which is consistent with Propositions 1 and 2 in Sect. 2 and Hypothesis 6

Table 2 Summary statistics and univariate results

Panel A														
	Characteristic	# Funds	Average fund capital/VC manager	<i>t</i> -Test (means)	Median fund capital/VC manager	Z-test (medians)	Average portfolio size/VC manager	<i>t</i> -Test (means)	Median portfolio size/VC manager	Z-Test (medians)	Average # types of advice	<i>t</i> -Test (means)	Median # types of advice	Z-Test (medians)
1	All funds	127	39.325		16.667		7.500		4.250		2.559		3.000	
2	Individual ownership >10%	21	25.434	−1.356	9.286	$P \leq 0.788$	2.104	−5.904***	1.528	$p \leq 0.000$ ***	3.190	1.746*	3.000	$p \leq 0.184$
	Individual ownership <10%	106	41.838		16.667		8.502		6.000		2.434		3.000	
3	Bank ownership >10%	40	57.360	1.177	18.333	$p \leq 0.858$	9.110	1.505	6.750	$p \leq 0.092$ *	2.125	−1.965**	2.000	$p \leq 0.109$
	Bank ownership <10%	87	30.737		16.667		6.642		3.648		2.759		3.000	
4	Corporate ownership >10%	69	25.696	−1.790*	16.667	$p \leq 0.401$	6.409	−1.449	4.000	$p \leq 0.919$	2.101	−3.384***	2.000	$p \leq 0.018$ **
	Corporate ownership <10%	58	56.422		22.727		8.822		4.717		3.103		3.000	
5	Life insurance ownership >10%	12	39.202	−0.006	15.833	$p \leq 0.807$	15.409	1.764*	8.893	$p \leq 0.218$	3.000	1.329	3.000	$p \leq 0.301$
	Life insurance ownership <10%	115	39.338		16.667		6.664		3.931		2.513		3.000	

Table 2 continued

Panel A														
	Characteristic	# Funds	Average fund capital/VC manager	t-Test (means)	Median fund capital/VC manager	Z-test (medians)	Average portfolio size/VC manager	t-Test (means)	Median portfolio size/VC manager	Z-Test (medians)	Average # types of advice	t-Test (means)	Median # types of advice	Z-Test (medians)
6	Securities firm ownership >10%	13	35.267	−0.410	26.667	$p \leq 0.176$	7.152	−0.216	7.391	$p \leq 0.379$	2.538	−0.047	3.000	$p \leq 0.609$
	Securities firm ownership <10%	114	39.800		16.667		7.541		4.000		2.561		3.000	
	Other financial ownership >10%	55	39.308	−0.002	16.667	$p \leq \mathbf{0.092^*}$	6.787	−0.819	4.500	$p \leq 0.502$	2.218	$\mathbf{-1.967^{**}}$	2.000	$p \leq 0.185$
7	Other financial ownership <10%	72	39.338		25.000		8.030		3.212		2.819		3.000	
	Government ownership >10%	4	72.793	1.503	78.351	$p \leq 0.545$	9.748	0.599	8.101	$p \leq 0.625$	3.250	0.931	3.000	$p \leq 0.433$
	Government ownership <10%	123	38.209		16.667		7.419		4.000		2.537		3.000	
9	Other ownership >10%	14	20.291	$\mathbf{-2.236^{**}}$	15.000	$p \leq 0.927$	7.771	0.118	4.500	$p \leq 0.58$	2.714	0.382	3.000	$p \leq 0.748$
	Other ownership <10%	113	41.747		16.667		7.466		4.000		2.540		3.000	
	US affiliation	12	37.889	−0.105	32.333	$p \leq 0.425$	3.973	$\mathbf{-2.905^{***}}$	3.276	$p \leq 0.309$	3.750	$\mathbf{2.774^{***}}$	4.000	$p \leq \mathbf{0.100^*}$
10	No US affiliation	115	39.465		16.667		7.836		4.500		2.435		3.000	

Table 2 continued

Panel B									
Characteristic	# Funds	Proportion of funds providing personal referral advice	t-Test	Proportion of funds providing management consulting advice	t-Test	Proportion of funds providing client intermediary advice	t-Test	Proportion of funds providing technology broker advice	t-Test
1 All funds	127	0.509		0.620		0.593		0.241	
2 Individual ownership >10%	21	0.667	1.238	0.762	1.087	0.714	0.925	0.333	0.737
Individual ownership <10%	106	0.519		0.632		0.604		0.245	
3 Bank ownership >10%	40	0.525	-0.280	0.550	-1.583	0.575	-0.719	0.150	-1.691*
Bank ownership <10%	87	0.552		0.701		0.644		0.310	
4 Corporate ownership >10%	69	0.449	-2.313**	0.565	-2.172**	0.507	-2.824***	0.203	-1.402
Corporate ownership <10%	58	0.655		0.759		0.759		0.328	
5 Life insurance ownership >10%	12	0.583	0.291	0.750	0.702	0.917	2.147**	0.250	-0.072
Life insurance ownership <10%	115	0.539		0.643		0.591		0.261	
								0.500	0.143
								0.478	

Table 2 continued

Panel B										
Characteristic	# Funds	Proportion of funds providing personal referral advice	t-Test	Proportion of funds providing management consulting advice	t-Test	Proportion of funds providing client intermediary advice	t-Test	Proportion of funds providing technology broker advice	t-Test	Proportion of funds providing business broker advice
6 Securities firm ownership >10%	13	0.692	1.134	0.615	-0.290	0.538	-0.636	0.231	-0.221	0.462
Securities firm ownership <10%	114	0.526		0.658		0.632		0.263		0.482
7 Other financial ownership >10%	55	0.455	-1.749*	0.655	0.020	0.564	-1.151	0.182	-1.541	0.364
Other financial ownership <10%	72	0.611		0.653		0.667		0.319		0.569
8 Government ownership >10%	4	0.750	0.840	1.000	1.410	0.750	0.520	0.500	0.982	0.250
Government ownership <10%	123	0.537		0.642		0.618		0.252		0.488
9 Other ownership >10%	14	0.643	0.790	0.857	1.616	0.571	-0.402	0.214	-0.361	0.429
Other ownership <10%	113	0.531		0.628		0.628		0.265		0.487
10 US affiliation	12	0.667	0.898	0.833	1.309	0.833	1.539	0.500	1.764*	0.917
No US affiliation	115	0.530		0.635		0.600		0.235		0.435

This table presents summary statistics and sample tests for different fund ownership structures. Statistically significant t-tests are shown in bold. ***, **, * Significant at the 1%, 5%, and 10% levels, respectively

developed in Sect. 3 above. Second, although there are no statistically significant differences in the scope of advice provided at the univariate level (Panel A), there is evidence that owner-manager funds are much more likely to provide more business broker advice (Panel B) (the owner-manager funds are also more likely to provide each of the other types of advice indicated in Table 2, Panel B, but the univariate differences are not statistically significant).

Bank VC funds, in contrast to owner-managed funds, have much larger portfolios per manager (Table 2, Panel A, indicates an average of 9.1 investee firms per VC for bank-owned funds and a median of 6.8 compared to an average of 6.6 and median of 3.6 for non-bank funds), which is consistent with Propositions 1 and 2 and Hypothesis 1 developed above. On average, bank-owned funds also provide a smaller scope of advice (an average of 2.1 types of advice for bank funds relative to an average of 2.8 types for non-bank funds). Table 2, Panel B, indicates bank-owned funds are statistically less likely to provide technology broker and business broker advice than the non-bank-owned funds.

In contrast to the prediction in Hypothesis 2, we do not observe any statistically significant differences in the univariate comparison tests for securities-company-affiliated VC funds. Corporate-owned funds provide a significantly smaller scope of advice (mean of 2.1 and median of 2.0) relative to non-corporate-owned funds (mean of 3.1 and median of 3.0). Corporate VC funds are also statistically much less likely to provide each of the specific types of advice indicated in Table 2, Panel B (each comparison of proportion test is statistically significant with the exception of the dimension for technology broker which is marginally insignificant). Hence the data are for the most part inconsistent with Hypothesis 3 although there is some sign that corporate funds are slightly more likely to provide technology broker advice than other types of advice. Corporate funds also tend to be smaller on average in Japan (Table 2, Panel A). VC funds owned by life insurance companies in Japan have the largest portfolios per VC manager (an average of 15.4 companies per manager and a median of 8.9). Life insurance-owned funds are more likely to provide client intermediary advice than any other type of funds (92% of funds with more than 10% life insurance company ownership provide client

intermediary advice), which is consistent with Hypothesis 4.

Funds with ownership from other financial institutions (such as pension funds) tend to raise less capital (in terms of the median, at ¥16 million). Such funds also provide a smaller scope of advice (2.2 types on average), and in particular are less likely to provide personal referral advice and business broker advice (Panel B).

We do not observe statistically significant differences in regard to government-owned funds in the univariate comparison tests (largely because there are only four such funds in the data), and hence the data tend to not support Hypothesis 5. Nevertheless, it is noteworthy that such funds tend to have the most capital per manager (average of ¥72 million and median of ¥78 million).

It is noteworthy that funds with a US affiliation exhibit characteristics that are similar to owner-manager funds in that they finance fewer companies per VC manager (4 on average, compared to 7.8 for non-US-affiliated funds) and offer a greater scope of advice (3.8 on average, relative to 2.4 for non-US-affiliated funds) (both the mean and median tests indicate significant differences for both). US-affiliated funds are also more likely to provide business broker advice (see Table 2, Panel B).

Table 3 provides a correlation matrix across a number of variables in the dataset. The comparison tests in Table 2 are consistent with the correlations indicated in Table 3; for instance, owner-manager funds are more likely to provide a greater scope of advice (correlation is 0.29 and significant at the 5% level) and more likely to finance fewer companies (correlation is -0.23 and significant at the 5% level), which is consistent with Propositions 1 and 2 and Hypothesis 6. As well, there are extra items in Table 3 of importance. First, note that owner-manager funds are much more likely to finance early stage companies (correlation is 0.45 and significant at the 1% level). Second, funds with more capital raised include US-affiliated funds, older firms (in terms of age and number of funds raised), and funds that provide more advice to their investee companies. Finally, it is noteworthy that some of the variables of interest for explanatory purposes in our multivariate tests are correlated; as such, we are careful to consider robustness of the results to included

variables in the multivariate analyses presented in next section.¹²

5 The effects of ownership structure on the provision of venture capital: multivariate analysis

As presented in Sect. 4, our central research proposition has been that the ownership of financial intermediaries providing monitored finance influences governance and monitoring (portfolio size/manager), and value-adding behaviour (types of advice provided). The univariate tests presented in the prior section offered some confirmation of these hypotheses. This section provides more formal multivariate tests. Section 6.1 outlines the methodologies considered. Sections 6.2 and 6.3 present results pertaining to governance (portfolio size/manager) and value-adding behaviour (scope of advice).

5.1 Empirical methods

We make use of Box–Cox regressions in our analysis of governance in Sect. 5.2. As for our analysis of scope of advice in Sect. 5.3, we use ordered Logit regressions. The Box–Cox transformations to independent variables (other than the dummy variables) are used to capture nonlinearities in the factors that account for these dependent variables. An alternative, simpler, approach would be to use logs. The Box–Cox model accounts for the possibility of a logarithmic specification; however, it is much more general in that the transformation that maximized the log-likelihood function might not be exactly a log specification.

Following the conventional notation, λ is used to denote the transformation variable for the right-hand side variables. The transformation yields a convex relation when $\lambda > 1$, and a concave relation when $\lambda < 1$. Maximum likelihood optimization and grid searches were used to optimize the value of the log-likelihood function to ascertain the appropriate value

for λ given the data. The Box–Cox grid search was sufficiently broad (-2 to $+2$) to allow for the possibility of concavity and convexity. The Box–Cox transformation is as follows:

$$B(x, \lambda) = \begin{cases} \frac{x^\lambda - 1}{\lambda} & \text{when } \lambda \neq 0; \\ \log(x) & \text{when } \lambda = 0. \end{cases}$$

where x represents the independent variables and $\log(x)$ is the limit of $(x^\lambda - 1)/\lambda$ as $\lambda \rightarrow 0$. Note that the transformation is applied to variables that are *not* dummy variables (see, e.g., Greene 1997).

The linear OLS model is presented for comparison (Model 2); Models 1 and 3–5 involve Box–Cox estimations, with consideration to heteroscedasticity. Significant correlations are observed among some of the variables, particularly the entrepreneurial firm and transaction-specific variables; as such, regressions are provided with alternative right-hand side variables to show robustness. The heteroscedastic specification is as follows: $\text{Var}(\varepsilon) = (\sigma^2)[w^2]^{(\lambda)}$, where w = fund duration. This heteroscedastic specification was employed to account for non-normality of the error terms. The weighting variable in each of the different regressions was selected on an intuitive basis. There is a possibility of unobserved investments (that is, after 2000 in our dataset) that have not yet been carried out, and hence, it seems natural to control for heteroscedasticity due to unobserved investments based on how many years the fund has been making investments (consistent with Cumming 2006).

Our right-hand side variables include four main categories of variables: venture capital fund characteristics, including ownership (a category of ‘other types of owners’ indicated in Table 2 is suppressed to avoid collinearity), age, the number of prior funds raised, average years of experience of venture fund managers, the stage focus of the fund (tendency to originate deals as a lead investor, seed, early, mezzanine and buyout stage; a variable for balanced stage is suppressed to avoid collinearity), and various variables for the industry focus of the fund. The variables are as defined in Table 1. Note that our right-hand side variables do not include a variable for market conditions because all our data are measured for the funds as at 2000, and we include a variable for fund age which is highly correlated with market conditions. That is, a recently established fund relative to the year 2000 will

¹² For example, to deal with correlation between ownership variables we use Box–Cox regressions for nonlinearities on the effect of changing ownership percentages on our dependent variables of interest. We also consider measures of ownership concentration (and in particular, we report the results with a Herfindahl index). Other specifications not explicitly presented are available upon request.

Table 3 Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 Fund capital	1.00																				
2 Portfolio size/ fund managers	-0.03	1.00																			
3 Individual ownership	<u>0.21</u>	-0.23	1.00																		
4 Life Insurance ownership	-0.02	<u>0.38</u>	-0.10	1.00																	
5 Bank ownership	-0.07	<u>0.18</u>	-0.19	-0.12	1.00																
6 Corporate ownership	-0.15	-0.17	-0.27	-0.18	-0.25	1.00															
7 Securities firm ownership	<u>0.06</u>	0.00	-0.10	-0.06	-0.12	-0.15	1.00														
8 Other financial institution ownership	-0.16	-0.01	-0.23	-0.10	-0.14	-0.13	-0.09	1.00													
9 Government ownership	<u>0.14</u>	<u>0.05</u>	-0.07	-0.05	-0.05	-0.03	-0.05	-0.01	1.00												
10 Herfindahl index	-0.05	<u>0.03</u>	<u>0.31</u>	<u>0.14</u>	<u>0.16</u>	<u>0.18</u>	<u>0.15</u>	-0.11	-0.15	1.00											
11 US affiliation	<u>0.55</u>	-0.13	<u>0.18</u>	-0.01	-0.17	-0.12	0.05	-0.03	-0.06	0.01	1.00										
12 Firm age	<u>0.34</u>	<u>0.26</u>	-0.23	-0.06	<u>0.14</u>	<u>0.02</u>	<u>0.01</u>	-0.10	<u>0.18</u>	-0.23	<u>0.03</u>	1.00									
13 Number of funds	<u>0.80</u>	-0.03	<u>0.08</u>	<u>0.01</u>	-0.06	-0.14	<u>0.27</u>	-0.07	-0.05	<u>0.05</u>	<u>0.53</u>	<u>0.17</u>	1.00								
14 Average experience of VC managers	-0.01	<u>0.24</u>	<u>0.04</u>	<u>0.08</u>	-0.02	-0.03	-0.22	<u>0.31</u>	<u>0.03</u>	-0.06	-0.03	<u>0.12</u>	-0.10	1.00							
15 Lead investments	<u>0.12</u>	<u>0.04</u>	-0.04	-0.01	<u>0.02</u>	-0.05	-0.04	-0.04	<u>0.36</u>	-0.12	-0.02	<u>0.25</u>	-0.03	<u>0.14</u>	1.00						
16 Seed stage	-0.05	-0.11	<u>0.45</u>	-0.10	-0.17	-0.03	-0.11	-0.17	-0.03	<u>0.21</u>	-0.06	-0.31	-0.04	<u>0.07</u>	-0.04	1.00					
17 Sum of advice measures	<u>0.26</u>	<u>0.12</u>	<u>0.29</u>	<u>0.13</u>	-0.18	-0.19	<u>0.03</u>	-0.09	<u>0.06</u>	<u>0.10</u>	<u>0.22</u>	-0.07	<u>0.28</u>	<u>0.01</u>	<u>0.16</u>	<u>0.29</u>	1.00				
18 Personal referral	<u>0.25</u>	0.00	<u>0.14</u>	-0.02	-0.02	-0.10	<u>0.16</u>	-0.12	<u>0.05</u>	<u>0.08</u>	<u>0.08</u>	<u>0.01</u>	<u>0.24</u>	<u>0.04</u>	<u>0.12</u>	<u>0.24</u>	<u>0.72</u>	1.00			
19 Management consulting	<u>0.15</u>	<u>0.02</u>	<u>0.18</u>	<u>0.10</u>	-0.22	-0.21	-0.03	<u>0.04</u>	<u>0.13</u>	-0.10	<u>0.12</u>	-0.13	<u>0.14</u>	-0.03	<u>0.09</u>	<u>0.17</u>	<u>0.71</u>	<u>0.40</u>	1.00		

Table 3 continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
20 Client intermediary	0.15	0.16	0.23	0.19	-0.06	-0.15	-0.06	-0.05	0.05	0.16	0.14	-0.07	0.20	0.08	0.09	0.26	0.76	0.46	0.42	1.00	
21 Technology broker	0.18	0.16	0.19	0.02	-0.22	-0.05	0.04	-0.11	0.08	0.07	0.18	0.02	0.18	0.04	0.16	0.21	0.66	0.33	0.24	0.42	1.00
22 Business broker	0.23	0.11	0.32	0.16	-0.14	-0.17	0.01	-0.10	-0.10	0.14	0.28	-0.08	0.25	-0.10	0.12	0.19	0.78	0.41	0.50	0.46	0.44

This table presents correlation coefficients across selected variables in the dataset. The correlations are presented for the full sample of 127 funds. For certain variables there was no complete information for all the funds, and hence the correlations are presented for the subset of funds for which the data are available; these variables are fund capital (125 funds), portfolio size/fund manager (125 funds) and average experience of VC managers (126 funds). Correlations that are statistically significant at the 5% level are highlighted in underline font

have a young age in the data and will have started when market conditions were very strong, whereas an older fund will have been initiated when market conditions were less robust. Some of the regressions have slightly different numbers of observations, as observations were skipped where data for all included variables were incomplete (various alternative approaches to account for incomplete data did not materially affect the results; alternative specifications are available upon request).

In regard to fund characteristics, note that we also include a Herfindahl index of the ownership concentration of the fund, which is directly correlated with the extent the ownership of the fund is tied to a single institution. A similar alternative variable that we considered was a dummy variable for ‘captive funds’; however, that variable was very highly positively correlated with the Herfindahl index, so that it would not be possible to consider both variables simultaneously, and little new information was gleaned from considering that variable in the regressions. We also considered variables for captive funds that were not owner-managers (e.g., 100% bank owned), but again, that variable was very highly correlated with the Herfindahl index, and there was little new information derived from such variables over and above the other variables explicitly reported. We further explored other types of nonlinearities in the data (to account for the possibility of changes in the sign of the relations, as in Morck et al.’s (1988) study of entrenchment and alignment of managers in public companies), but found no significant sign changes (and likewise, plots of these variables did not reveal the presence of sign-reversal nonlinearities of that type). Other specifications with other variables not explicitly reported are of course available upon request from the authors.

Various model selection criteria supported the heteroscedastic Box–Cox models presented in the tables, relative to the linear specification and other specifications considered but not reported. Because the data generally support the first model in Tables 4 and 5 with the complete set of right-hand side variable considered, we focus our discussion of the results on Model 1. The other models are presented to explicitly illustrate robustness to other included/excluded variables. Note that the ownership levels for the included variables are correlated, but do not sum to one such that there is not a perfect collinearity

Table 4 Analysis of portfolio size/fund manager

Independent variables	1. Box-Cox			2. Linear			3. Box-Cox			4. Box-Cox			5. Box-Cox		
	Coefficient	t-Statistic	Slope	Elasticity	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	t-Statistic
Constant	-11.360	-15.129***	-11.360	-0.999	-18.535	-1.910*	-10.382	-11.043***	-0.626	-0.856	-11.920	-3.410***			
<i>Ownership variables</i>															
Individual	-0.766	-10.500***	-0.204	-0.124	-0.016	-0.285	-0.950	-8.206***	-0.277	-5.747***	-4.109	-4.059***			
Life insurance	1.034	13.971***	0.286	0.165	0.211	2.305**	1.450	8.836***	1.596	10.027***	-	-			
Bank	-0.159	-4.897***	-0.021	-0.035	0.076	1.468	-	-	-	-	-1.137	-2.570**			
Corporate	-0.547	-10.800***	-0.057	-0.136	-0.029	-0.656	-0.639	-7.922***	-	-	-2.447	-3.836***			
Securities firm	-0.636	-10.617***	-0.149	-0.110	0.025	0.504	-0.592	-7.052***	-	-	-	-			
Other financial institution	0.016	0.790	0.003	0.004	0.040	0.892	-	-	-	-	-	-			
Government	-0.330	-4.146***	-0.157	-0.041	0.358	1.960**	-0.329	-2.562**	-0.001	-0.013	-	-			
Herfindahl index	0.118	5.356***	0.0004	0.145	0.0003	0.653	-	-	-	-	-	-			
US affiliation	-1.216	-3.759***	-1.216	-0.008	-3.321	-0.886	-0.799	-2.542**	-2.101	-5.248***	-	-			
<i>Fund characteristics</i>															
VC fund duration	2.170	14.123***	0.2915	0.4827	0.1857	1.964**	2.286	8.642***	2.145	9.783***	6.960	3.579***			
VC funds raised (million Yen)	0.116	5.606***	0.008	0.035	-0.004	-0.724	0.257	4.666***	0.115	3.925***	2.581	2.679***			
Number of funds	0.237	3.468***	0.066	0.038	0.026	0.308	-	-	0.639	6.184***	-0.677	-0.877			
Average experience of VC managers	1.482	14.801***	0.479	0.220	0.343	2.687***	2.032	9.813***	1.773	10.654***	5.257	4.283***			

Table 4 continued

Independent variables	1. Box-Cox			2. Linear			3. Box-Cox			4. Box-Cox			5. Box-Cox		
	Coefficient	t-Statistic	Elasticity	Coefficient	t-Statistic	Elasticity	Coefficient	t-Statistic	Elasticity	Coefficient	t-Statistic	Elasticity	Coefficient	t-Statistic	Elasticity
Lead investments	-0.078	-5.069***	-0.006	-0.007	-2.765***	-0.022	-0.043	-1.251	-	-	-	-	-	-	-
<i>Stage controls</i>															
Seed stage	0.164	4.879***	0.039	0.009	0.178	0.028	0.504	7.377***	-	-	-	-	2.138	3.909***	-
Early stage	0.201	8.847***	0.022	0.075	2.538**	0.050	-	-	-	-	-	-	-	-	-
Mezzanine stage	0.663	11.421***	0.244	0.194	1.456	0.093	-	-	-	-	-	-	-	-	-
Buyout stage	-0.924	-14.582***	-0.288	-0.127	-1.551	-0.139	-	-	-	-0.879	-10.605***	-	-	-	-
<i>Industry controls</i>															
Health	4.444	25.362***	2.467	2.005	2.283**	0.513	4.575	14.848***	-	-	-	-	-	-	-
Computers	1.374	14.652***	0.637	1.201	2.622***	0.172	2.379	12.535***	-	-	-	-	2.058	2.569**	-
Semiconductors	0.498	2.617***	0.275	2.083	1.562	0.058	-	-	-	1.061	4.259***	-	-	-	-
Biotechnology	2.918	19.531***	1.515	2.572	2.570**	0.347	3.566	13.590***	-	-	-	-	4.398	3.648***	-
Energy	-2.162	-9.855***	-1.285	-1.415	-2.123**	-0.242	-	-	-	-4.022	-12.399***	-	-	-	-
Retail	0.040	0.227	0.023	0.295	0.257	0.005	-	-	-	-	-	-	-	-	-
<i>Returns to scale</i>															
λ	0.316	11.743***	-	-	-	-	0.197	4.616***	-	0.264	6.944***	-	-0.244	-2.167**	-
# Observations	113			113			113			113			113		
Adjusted R^2	0.960			0.300			0.934			0.939			0.787		
F-statistic	88.05***			3.00***			98.81***			140.14***			37.37***		
Loglikelihood	-225.098			-386.264			-253.554			-249.422			-319.992		
Akaike information statistic	4.427			7.279			4.753			4.627			5.858		

This table presents OLS and Box-Cox regressions of the determinants of VC portfolio size. The dependent variable is the number of entrepreneurial firms in the VC fund's portfolio/the number of VC fund managers. The independent variables are as defined in Table 1. Box-Cox specification: $B(x, \lambda) = (x^\lambda - 1)/\lambda$ when λ not equal to 0; $\log(x)$ when $\lambda = 0$; $x =$ independent variables. Grid searches for λ from -2 to +2 to maximize the loglikelihood. Heteroscedastic specification: $\text{Var}(\varepsilon) = (\sigma^2)[w^2]^{1/\lambda}$, where $w =$ fund duration. The marginal effects are computed ignoring the residuals. Various assumptions about the distribution of the residuals did not materially affect the marginal effects, as the high R^2 values indicate relatively small residuals. Fourteen observations were lost due to missing data for certain variables. ***, **, * Significant at the 1%, 5% and 10% levels, respectively. Two-sided tests. "-" = Not applicable, or variable excluded for robustness checks

Table 5 Analysis of scope of advice

Independent variables	1. Ordered logit			2. Ordered logit			3. Ordered logit		
	Coefficient	<i>t</i> -Statistic	Marginal effect Advice = 0	Marginal effect Advice = 1	Marginal effect Advice = 2	Marginal effect Advice = 3	Marginal effect Advice = 4	Marginal effect Advice = 5	Coefficient <i>t</i> -Statistic
Constant	-0.120	-0.099	0.025	0.013	0.007	0.000	-0.018	-0.027	-0.805 -0.563 -0.809 -0.530
<i>Ownership variables</i>									
Individual	0.010	2.176**	-0.002	-0.001	-0.001	0.000	0.002	0.002	0.007 1.294 0.010 1.447
Life insurance	0.006	0.515	-0.001	-0.001	0.000	0.000	0.001	0.001	0.007 0.604 0.006 0.497
Bank	-0.008	-1.270	0.002	0.001	0.001	0.000	-0.001	-0.002	-0.004 -0.686 -0.006 -0.874
Corporate	-0.005	-1.284	0.001	0.001	0.000	0.000	-0.001	-0.001	-0.005 -0.996 -0.004 -0.773
Securities firm	-0.004	-0.778	0.001	0.000	0.000	0.000	-0.001	-0.001	-0.002 -0.354 -0.002 -0.387
Other financial institution	0.016	0.115	-0.003	-0.002	-0.001	0.000	0.002	0.004	0.026 0.468 0.025 0.470
Government	0.002	0.326	0.000	0.000	0.000	0.000	0.000	0.001	0.007 0.957 0.003 0.293
US affiliation	-	-	-	-	-	-	-	-	0.716 1.592 0.616 1.303
<i>Fund characteristics</i>									
Number of fund managers	0.005	1.928*	-0.001	-0.001	0.000	0.000	0.001	0.001	0.003 1.375 -0.006 -0.820
VC fund duration	-	-	-	-	-	-	-	-	- 0.004 0.312
VC funds raised (million Yen)	-	-	-	-	-	-	-	-	- 0.001 0.554
Number of funds	-	-	-	-	-	-	-	-	- 0.063 1.372
Average experience of VC managers	0.014	0.523	-0.003	-0.002	-0.001	0.000	0.002	0.003	0.004 0.150 0.001 0.030
Lead investments	0.016	2.266**	-0.003	-0.002	-0.001	0.000	0.002	0.004	0.012 1.876* 0.013 1.990
<i>Stage controls</i>									
Seed stage	-	-	-	-	-	-	-	-	0.012 1.375 0.011 1.258
Early stage	-	-	-	-	-	-	-	-	0.014 2.713*** 0.013 2.234**
Mezzanine stage	-	-	-	-	-	-	-	-	-0.002 -0.198 -0.003 -0.223
Buyout stage	-	-	-	-	-	-	-	-	0.006 0.395 0.003 0.186
<i>Industry controls</i>									
Health	0.000	-0.003	0.000	0.000	0.000	0.000	0.000	0.000	-0.065 -0.431 -0.070 -0.452
Computers	0.055	0.693	-0.011	-0.006	-0.003	0.000	0.008	0.012	0.052 0.605 0.037 0.423

Table 5 continued

Independent variables	1. Ordered logit					2. Ordered logit			3. Ordered logit		
	Coefficient	t-Statistic	Marginal effect Advice = 0	Marginal effect Advice = 1	Marginal effect Advice = 2	Marginal effect Advice = 3	Marginal effect Advice = 4	Marginal effect Advice = 5	Coefficient	t-statistic	Coefficient t-Statistic
Semiconductors	0.297	1.878*	-0.062	-0.032	-0.018	-0.001	0.045	0.068	0.373	2.042**	0.357 1.874*
Biotechnology	-0.001	-0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.036	0.000 -0.002
Energy	-0.029	-0.143	0.006	0.003	0.002	0.000	-0.004	-0.007	0.011	0.047	0.010 0.043
Retail	0.077	0.467	-0.016	-0.008	-0.005	0.000	0.012	0.018	0.059	0.278	0.057 0.249
μ_1	0.452	4.013**	-	-	-	-	-	-	0.503	3.843***	0.506 3.822***
μ_2	0.784	5.730***	-	-	-	-	-	-	0.861	5.625***	0.869 5.593***
μ_3	1.463	8.162***	-	-	-	-	-	-	1.578	7.890***	1.591 7.684***
μ_4	2.196	9.783***	-	-	-	-	-	-	2.353	9.282***	2.397 9.264***
# Observations	126								126		124
Chi-squared	38.026***								54.216***		59.943***
Loglikelihood	-203.246								-195.151		-189.058
Pseudo R^2	0.086								0.122		0.137

This table presents ordered logit regressions of the determinants of the scope of VC advice. The dependent variable is the number of different types of advice provided by the VC fund to the entrepreneurial firm (among the 5 commonly advertised types of advice advertised in Japan: Personal Referral, Management Consulting, Client Intermediary, Technology Broker, Business Broker). One observation was lost due to missing data for a variable in Models 1 and 2, and 3 observations were lost in Model 3. The independent variables are as defined in Table 1. ***, **, * Significant at the 1%, 5% and 10% levels, respectively. Two-sided tests. “-” = Not applicable, or variable excluded for robustness checks

problem. We report different specifications by including/excluding ownership of various institutions. The reported results are quite robust. Alternative specifications are available upon request.

Finally, note that one may wonder about endogeneity concerns with respect to institutional ownership. For instance, could it be that entrepreneurial firms in need of more governance self-select towards venture capital funds that have more individual ownership? This is unlikely in the data for a variety of reasons. Most importantly, prior to the availability of our data, institutional ownership of VC funds in Japan was largely unknown. Only with the exception of wholly owned banks and corporations, it is difficult for an entrepreneurial firm to find out the identity of the group of institutional investors of the VC fund and the percentage ownership of each institutional investor. As such, self-selection (endogeneity) is unlikely to be problematic (e.g., the ownership identity and percentages of US funds, even well-known funds like Kleiner Perkins, is generally unknown). Nevertheless, as a robustness check, we excluded the wholly owned VC funds, and this did not affect the generality of our results (details are available upon request). As well, we also considered excluding second-time funds in case institutional investors provided capital on the basis of first-fund efforts, and the results did not change (again, available upon request). We discuss some of the alternative specifications in the notes accompanying the tables below. Overall, we have no reason to believe there is a significant concern with endogeneity.

5.2 Governance: portfolio size

Table 4 indicates financial intermediation has a pronounced impact on span of control (portfolio size). One can recall that our multivariate estimates of governance focus on the portfolio size per fund manager as different advices are provided to investees, consistent with the theoretical work of Kanninen and Keuschnigg (2003, 2004) (see also Keuschnigg and Nielsen 2001, 2003a, b, 2004a, b for related theoretical work, and Cumming 2006, for related empirical evidence). We focus our discussion on Model 1 in Table 4; the others are provided to show robustness. Note that the nonlinear specification is important (the linear Model 2 is rejected by the likelihood dominance criterion, among other model selection criterion, relative to all the nonlinear models).

Table 4, Model 1, indicates that a fund that is 100% owned by an individual/manager will finance approximately 20 fewer companies per VC manager (a move from approximately the 75th percentile to the 25th percentile in the data), and thereby provide more advice and monitoring, compared to an average fund that does not comprise individual owner-managers.¹³ The data therefore indicate that all else equal, the delegation of governance to financial intermediaries, as opposed to governance by a non-intermediary that is an owner-manager, involves less governance. Put another way, owner-managers have personal vested interests in providing more governance to their investees relative to those financial intermediaries that do not have a direct financial stake with the direct investment of their own wealth. The data therefore support Propositions 1 and 2 and Hypothesis 6.

Other forms of intermediation give rise to less governance than owner-manager VC funds. For example, an increase in bank ownership, corporate ownership and government ownership gives rise to smaller portfolios per fund manager. However, the economic significance of those effects (the size of the coefficients and marginal effects reported in Table 4) is smaller relative to that for individual owner-managers, consistent with Propositions 1 and 2 and Hypotheses 1, 3, 5 and 6. The effect of intermediation via other financial institutions has no statistically significant effect on portfolio size per manager.

The data indicate that US-affiliated funds have smaller portfolios per manager (1–2 fewer investee companies per VC fund manager, depending on the model specification in Table 4), which indicates US-affiliated VCs provide more governance provided to their investees. This likely indicates the importance of focusing on generating a fewer number of more companies, to gain reputation in the foreign market, thereby improving deal flow and networks with other domestic VCs.

Life insurance companies, by contrast, have much larger portfolio sizes per manager, consistent with Hypothesis 4. One interpretation of this result is that

¹³ When we exclude all 100% owned funds as described immediately above in Sect. 5.1, the economic significance for the individual owner funds tends to increase slightly and the effect remains statistically significant. Likewise, more parsimonious specifications with fewer right-hand side variables tends to increase the economic significance of this effect while maintaining the statistical significance.

life insurance companies are more risk adverse and seek diversification through larger portfolios. This is perhaps a more valuable strategy relative to diversifying across a greater number of venture funds given the costs to setting up a fund in terms of contracting and negotiating limited partnership agreements (as studied by Gompers and Lerner 1999).

The Herfindahl index of ownership concentration is positively associated with fund size. There are a few natural explanations for this result. First, ownership concentration is associated with an absence of diversification, and if there are costs associated with providing capital to a fund (as discussed immediately above) then there is value to diversification in terms of investment in a greater number of entrepreneurial firms. Second, captive fund managers that tend to be less will be compensated than those in funds set up as limited partnerships (Gompers and Lerner 1999), and therefore have less incentive (and perhaps fewer skills) to add value to a smaller number of investees per manager. As such, those funds finance less and advise more. Third, captive funds (for example) tend to invest with a dual purpose of maximizing the revenue for the fund itself as well as maximizing the revenue for the companion organization. Investing in a greater number of entrepreneurs may have side benefits of fostering relations with the companion organization that provided the capital to the VC fund. We may conjecture that this tendency to over-invest (from the viewpoint of the VC funds but not the institutional source of capital) would be mitigated by greater discipline brought by diversity in ownership.

The data indicate a positive association between portfolio size per manager and various other fund characteristics, including fund duration, funds raised, the number of prior funds raised by the VC organization, and the average experience of the fund managers. In regard to fund duration, this is expected due to the incidental truncation associated with not observing investments among funds that are not fully invested (i.e., a fund in our data may still invest in new companies in 2001 or 2002, etc.). It is for this reason that we employed the heteroscedastic specification discussed above in Sect. 6.1. In regard to funds raised, we observe greater portfolios per fund managers that have more capital, perhaps as expected if there are limits to a the capital required by any given investee. The average experience of the fund managers is also positively related to the number of

different investees, indicating efficiencies with skill acquisition in the process of VC investment (see Kannianen and Keuschnigg 2004, for a supportive theory). The estimates pertaining to the number of fund previously raised by the VC fund are also supportive of this latter prediction.¹⁴

Several of the control variables for stage and industry focus are significant. First, funds that focus more on deal origination (in respect of the variable for lead investor) tend to invest in fewer investees. This result is intuitive, as deal screening is much more time intensive for lead investments (Lerner 1994; Lockett and Wright 1999, 2001; Wright and Lockett 2003). Second, note that seed, early and mezzanine-focused funds have larger portfolios (relative to balanced stage funds, which is suppressed for reasons of collinearity as discussed above). Cumming (2006) finds similar evidence in respect of early stage investees and interprets this as evidence of the benefits of specialization through stage focus. Buyout funds tend to have smaller portfolios, which might be attributable to the greater capital required for any given buyout transaction. There is also evidence that funds with a focus on the health, computers, semi-conductors and biotech sectors have larger portfolios per manager, while energy-focused funds have smaller portfolios. There are various possible explanations for these latter results; we have included those variables largely for control purposes. Finally, note that as with the fund-raising evidence, there are diminishing returns to scale in respect of the concavity of the output function. The data indicate $\lambda < 1$, and significantly different from 0 and 1 (suggesting both log and linear specifications are inferior for the data).¹⁵

¹⁴ However, an alternative interpretation of the number of funds previously raised by the VC organization is that there are inefficiencies associated with the process of fundraising, setting up a new fund and the allocation of attention to new investees. Gompers and Lerner (1999) show institutional investors are quite concerned with this problem and covenants that inhibit a VCs' tendency to misallocate time.

¹⁵ Supportive theory and consistent evidence of diminishing returns to scale in VC portfolio size expansion are provided by Kannianen and Keuschnigg (2003, 2004), Keuschnigg (2003a) and Cumming (2006). As discussed, our innovation to this literature on portfolio size is provided by showing the effect of financial (dis)intermediation, which is not considered in these other papers.

5.3 Value-adding behaviour

So far, we have found that ownership influences the level of governance provided the entrepreneurial firm. In this section we explore how value-adding behaviour varies according to the different types of financial intermediaries operating in monitored finance. We first explore the scope of advice in Table 5 with the use of ordered logit regressions where the dependent variable is measured as the sum of personal referral, management consulting, client intermediary, technology broker and business broker (and therefore ranges from 0 to 5). We then analyse each type of advice separately in Table 6.

Model 1 in Table 5 indicates owner-manager VC funds provide a greater scope of advice, in support of Propositions 1 and 2 and Hypothesis 6.¹⁶ This finding is consistent with the univariate analysis in Sect. 4 (Tables 2 and 3) indicated that owner-manager VC funds provided a greater number of types of advice (on average) than other VC funds (Table 2, Panel A), and this was especially the case for business brokering advice (Table 2, Panel B). Model 1 in Table 5 also indicates bank VC funds and corporate VC funds provide less advice than the other providers of monitored finance.

Models 2 and 3 in Table 5, however, show that the relationship between owner-manager VC funds and advice is not robust once we add control variables for the stage of investment. The primary reason is that owner-manager funds are more focused on early stage (the correlation between these variables is 0.45; see Table 3). An extensive amount of prior work shows seed and early stage entrepreneurial funds to require greater levels of advice given the need to help entrepreneurs establish the firm, validate technology, develop product and marketing strategies and generate revenue and profits (see, e.g., the collection of papers in Gompers and Lerner 1999). By contrast, established firms receiving buyout or mezzanine finance would require less advice on issues such as technology and business brokering, or contacts through personal referrals. Both Models 2 and 3 show that early stage firms do require greater scope

of advice, with positive coefficients conditional on industry, VC fund characteristics and ownership. In short, the data do indicate owner manager VCs behave differently in that they offer a greater scope of advice to their portfolio companies relative to bank VCs and VCs of other institutional ownership. Again, the differences appear to be more directly related to the fact that individual owner manager VCs are focusing on earlier stage investee companies.

In Table 6 we consider logit regressions for each specific type of advice as a complement to Table 5 (where the dependent variable was the sum of the advice measures) and to directly test Hypotheses 1–6. The reported regressions include a complete set of control variables and include variables for ownership, fund characteristics, stage of development and industry. Table 6, Model 5, indicates that a 100% individual owner-managed fund is 80% more likely to provide business broker advice than a fund that does not have an individual owner-manager. The other types of advice, however, are not statistically related to individual owner management.¹⁷ As indicated in Hypothesis 6 and accompanying text, specific types of advice provided by individual-owner VC funds are related to the idiosyncrasies of the owner-manager. This is however consistent with the view (similar to business angels) that owner-managers invest in industries in which they acquired significant industry expertise prior to becoming VC manager.

Table 6 indicates 100% bank-owned funds are 60% less likely to provide management consulting advice, which is inconsistent with our expectations (Hypothesis 1). Generally, however, we do see that bank-owned VCs provide less advice than other types of VC funds overall (Tables 2, 4 and 5), as we had expected (Sects. 2 and 3). Bank-owned VCs are 80% less likely to provide technology broker advice (Table 6).

In Sect. 3, Hypothesis 2, we had expected corporate-owned VCs would provide more technology broker advice. The regressions in Table 6 do not support this prediction; however, Table 6 does

¹⁶ When we exclude all 100%-owned funds the economic significance of the owner-manager funds tend to increase to approximately 0.018 in Table 5 and the effect remains statistically significant at the 5% level.

¹⁷ Similarly, when we exclude all 100% owned funds this relation between owner management and business broker only remains statistically significant in more parsimonious specifications (which is most likely attributable to the reduction in sample size).

Table 6 Regression analysis of specific types of advice

Independent variables	1. Personal referral		2. Management consulting		3. Client intermediary		4. Technology broker		5. Business broker	
	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic
Constant	-0.505	-2.045**	0.025	0.046	-0.988	-3.217***	0.186	0.349	-0.634	-1.001
<i>Ownership variables</i>										
Individual	2.482E-05	0.025	-0.002	-0.609	0.003	1.591	2.975E-05	0.015	0.008	1.725*
Life insurance	-0.003	-2.008**	-0.002	-0.457	0.010	1.557	0.001	0.231	0.004	1.307
Bank	-0.001	-1.450	-0.006	-2.429**	0.001	1.339	-0.008	-1.764*	-0.002	-0.619
Corporate	-0.001	-0.683	-0.004	-2.271**	0.001	0.751	-0.001	-0.735	2.324E-04	0.120
Securities firm	0.003	1.805*	-0.003	-1.098	-1.881E-04	-0.130	-0.001	-0.221	-0.001	-0.228
Other financial institution	-0.002	-1.729*	-0.002	-0.748	0.002	1.922*	-0.002	-0.695	-5.984E-05	-0.024
Government	0.005	0.929	-	-	0.009	1.602	0.005	0.376	-	-
US affiliation	-0.055	-0.420	-0.065	-0.257	0.068	0.972	0.092	0.515	0.233	1.485
<i>Fund characteristics</i>										
Number of fund managers	-3.831E-04	-0.326	0.004	1.047	0.002	1.518	-0.002	-0.913	0.009	2.143**
VC fund duration	0.002	0.850	-0.005	-0.967	0.001	0.492	0.004	0.901	-0.007	-1.200
VC funds raised (million Yen)	0.001	2.146**	1.805E-04	0.423	2.740E-05	0.152	-1.625E-04	-0.220	0.001	0.995
Number of funds	0.072	3.826***	0.012	0.655	0.045	2.284**	0.012	1.080	0.047	1.589
Average experience of VC managers	3.832E-05	0.008	0.005	0.463	0.008	1.375	-0.002	-0.147	-0.001	-0.088
Lead investments	0.004	1.963**	0.004	0.953	0.001	0.602	0.002	1.284	0.008	1.684*
<i>Stage controls</i>										
Seed stage	0.002	1.728*	0.001	0.269	0.004	2.161**	0.003	1.089	0.001	0.234
Early stage	0.003	3.087***	0.005	2.458**	0.002	1.740*	0.002	0.929	0.002	0.904
Mezzanine stage	-0.005	-2.075**	-0.003	-0.743	0.002	1.050	0.004	1.127	0.002	0.519
Buyout stage	0.004	1.715*	0.003	0.692	-0.001	-0.428	-0.005	-0.999	-0.002	-0.401
<i>Industry controls</i>										
Health	-0.031	-1.252	-0.074	-1.329	-0.011	-0.425	-0.064	-1.079	0.048	0.788
Computers	0.006	0.421	-0.019	-0.594	0.023	1.524	-0.004	-0.112	0.032	0.883
Semiconductors	0.034	1.197	0.045	0.653	0.083	2.422**	0.040	0.597	0.043	0.604
Biotechnology	0.028	1.232	-0.008	-0.155	0.012	0.477	-0.059	-1.025	0.026	0.435
Energy	0.014	0.510	-0.012	-0.188	0.069	2.123**	0.004	0.059	-0.136	-1.167

Table 6 continued

Independent variables	1. Personal referral		2. Management consulting		3. Client intermediary		4. Technology broker		5. Business broker	
	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic	Marginal effect	t-Statistic
Retail	0.007	0.281	0.148	1.518	0.038	1.214	-0.103	-1.571	0.016	0.237
# Observations	124		124		124		124		124	
Chi-squared	74.238***		41.497**		61.436***		30.733*		62.345***	
Loglikelihood	-48.428		-59.900		-52.044		-54.363		-54.633	
Pseudo R ²	0.434		0.257		0.371		0.220		0.363	

This table presents logit regressions of the determinants of specific types of VC advice. The dependent variable is a binary variable for the different types of advice provided by the VC fund to the entrepreneurial firm (each of the 5 commonly advertised types of advice advertised in Japan: Personal Referral, Management Consulting, Client Intermediary, Technology Broker, Business Broker). Three observations were lost due to missing data for certain variables. The variables are as defined in Table 1. ***, **, * Significant at the 1%, 5% and 10% levels, respectively. Two-sided tests. “-” = Not applicable since the variable was excluded as it was invariant for the given dependent variable (there were no government-affiliated funds that provided such advice)

indicate 100% corporate funds are 40% less likely to provide management consulting, which is consistent with the idea that corporate funds are at least more inclined towards technology brokering than management consulting.

Table 6 indicates 100% securities-owned VC funds are 30% more likely to provide personal referral, but not statistically more likely than other types of advice. This provides partial support for Hypothesis 3. We had also expected securities-owned VC funds to provide business brokering and management consulting, but the data do not support those latter predictions.

Table 6 further indicates 100% life insurance-owned VC funds are 30% less likely to provide personal referral. In Hypothesis 4 and accompanying text we had predicted that life insurance company-owned VC funds would provide less advice, although there was no reason to expect any particular type of advice to be less prevalent.¹⁸

Government funds are neither more nor less likely to provide any of the different types of advice enumerated in Table 6, which is consistent with the prediction in Hypothesis 6. We had expected government funds to provide no particular type of advice. Nevertheless, our results should be taken with caution since as indicated, there are only 4 government-owned VC funds in the sample and therefore this result may in part be related to the comparative dearth of government VC funds in the sample.

In regard to the control variables, note that we find that scope of advice in Table 5 is higher for funds with more fund managers and for VC funds that lead the investment. As well, Table 6 indicates that a fund that carries out 10% more lead investments are 4% more likely to provide personal referral and 8% more likely to provide business broker advice.

The relationship between fund managers and advice indicates that there are positive spillovers within the VC fund, with the greater the number of investment professionals leading to wider networks of contacts and ability to provide value to the

¹⁸ Also, Table 6 shows VC funds owned 100% by other financial institutions (such as by pension funds, for example) are 20% less likely to provide personal referral and 20% more likely to provide client intermediary, but the lack of details of the owner in the data does not enable us to control for the specific type of owner (and hence this is included as a control variable and not a testable hypothesis).

portfolio company. In Table 6, more fund managers are more likely to provide business broker advice (10 more fund managers are 9% more likely to provide business broker advice). Relatedly, large funds are more likely to provide personal referral (an additional 100 million Yen gives rise to 10% more personal referral advice in Table 6). Further, VC organizations that operate one extra fund are 7.2% more likely to provide personal referral and 4.5% more likely to provide client intermediary.

The multivariate regressions reported in Table 5 indicate the US-affiliation dummy variable is positive but marginally insignificant when the other control variables for investment stages and industries, among other things, are included. There was evidence in Table 2, Panel B, indicated US-affiliated funds were more likely to provide technology and business broker advice. As well, Table 3 indicated a positive and significant (at the 5% level) correlation of 0.22 between the variable for the sum of advice measures and US affiliation (and the correlations for each of the specific advice measures are positive and significant in Table 3). Table 5 regression evidence indicates that the control variables which are correlated with the US affiliation more directly explain the influence on the scope of advice (or at least the available data do not give rise to an independently significant influence of the US affiliation on the scope of advice). As well, in Table 6 US-affiliated funds are neither more nor less likely to provide any of the different types of advice. Nevertheless, recall from Table 4 that the US affiliation gave rise to significantly smaller portfolios per manager in the multivariate context.

In Models 1 and 2 of Table 5, the data indicate lead investors are more likely to add value through advice, given their primacy in the monitored finance relationship, presumably reflected in the level of capital extended to the entrepreneurial firm. Also, lead investors choose to lead an investment given their *ex ante* expectation of the marginal benefits of the investment. Thus, we would expect lead investors to add more value to maximize return and efficiently exploit their comparative advantages.

Finally, note that many of the stage control variables are significant in Table 6, but the industry variables are generally insignificant. Table 6 indicates that a fund that carries out 10% more seed stage investments is 2% more likely to provide personal referral and 4% more likely to provide client

intermediary advice. A fund that carries out 10% more early stage investments is 3% more likely to provide personal referral, 5% more likely to provide management consulting and 2% more likely to provide client intermediary advice. A fund that carries out 10% more buyout investment is 4% more likely to provide personal referral advice. A fund that carries out 10% more mezzanine investment is 5% less likely to provide personal referral advice. Lastly, firms in semiconductors and energy are 8.3% more likely to receive client intermediary advice, but the other industry variables are statistically insignificant.

6 Concluding remarks

Franklin Allen's (2001) Presidential Address to the American Finance Association lamented the "narrowness" of asset pricing and corporate finance research in ignoring the role of financial intermediaries in the economy. A growing body of literature has attempted to address these earlier deficiencies by examining how modern financial intermediaries participate in finance markets. In this paper we contribute to the financial intermediation literature by considering the effect of intermediation on governance and value-adding advice when monitored finance is provided to entrepreneurial firms. We examine a unique dataset enabling a direct comparison of owner-manager VC funds with different types of financial intermediation using data from 127 Japanese private equity funds. Our data enable a first empirical analysis of how different types of financial intermediaries behave when they extend their business operations into related markets such as venture capital financing, with direct comparison to owner-managers.

We present evidence in this paper in support of Allen's (2001, p. 1172) conjecture that the "role of financial institutions in ensuring good corporate governance is not entirely convincing." The theory of delegated monitoring suggests that financial intermediaries should have stronger incentives to oversee management behaviour in firms they finance. Our data show that bank and non-bank financial intermediaries have larger portfolios than owner-manager VC funds, implying lower governance and oversight. Furthermore, we find significant differences between forms of affiliated intermediation, with life insurance company-affiliated VC funds having much larger portfolios per manager. By contrast, individual

owner-manager funds tend to have much smaller portfolios per manager and focus on the earliest stage investee companies. There is also some evidence that individual owner-manager funds provide a greater scope of advice, but the level of advice is more directly related to the fact that individual owner-manager funds focus on earlier stage investee companies. Given that owner manager funds invest in different types of ventures than affiliated VC funds, one cannot conclude that there are costs of financial intermediation associated to the lower level of governance.

A novel feature of our new dataset on financial intermediaries and monitored finance is that it enables a consideration of the impact of US institutional affiliations in Japanese VC funds. The data indicate material impacts on the process of financial intermediation in Japan from an association with US investors, in terms of smaller portfolios per manager and more advice to entrepreneurial companies. The data indicate that the economic significance of US institutional affiliation within Japanese VC funds is in fact comparable in economic significance to financial disintermediation (owner-manager VC funds). US-affiliated funds in Japan are manage less entrepreneurial firms, ostensibly to become an established player in the market, and possibly due to a greater skill set in providing advice to facilitate the development of small entrepreneurial firms. This evidence suggests that further research on international differences in the form of financial intermediation along these lines might prove fruitful for understanding the comparative success of the US private equity market relative to that in other countries.

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References

- Allen, F. (2001) Presidential address: Do financial institutions matter? *Journal of Finance*, 56, 1165–1175.
- Allen, F., & Santomero, A. (2001) What do financial intermediaries do? *Journal of Banking and Finance*, 25, 271–294.
- Aoki, M. (1990). Toward an economic model of the Japanese firm. *Journal of Economic Literature*, 28, 1–27.
- Bascha, A., & Walz, U. (2001a). Convertible securities and optimal exit decisions in venture capital finance. *Journal of Corporate Finance*, 7, 285–306.
- Bascha, A., & Walz, U. (2001b). *Financing practices in the German venture capital industry: An empirical assessment*. Working Paper, University of Tübingen.
- Bernile, G., Cumming, D., & Lyandres, E. (2007). The structure of venture capital and private equity fund portfolios. *Journal of Corporate Finance*, 13(4), 564–590.
- Black, B. S., & Gilson, R. J. (1998). Venture capital and the structure of capital markets: Banks versus stock markets. *Journal of Financial Economics*, 47, 243–277.
- Casamatta, C., & Haritchabalet, C. (2003). *Learning and syndication in venture capital investments*. Working paper 3876, CEPR.
- Chan, Y.-S., Siegel, D. R., & Thakor, A. V. (1990). Learning, corporate control and performance requirements in venture capital contracts. *International Economic Review*, 31, 365–382.
- Clarysse, B., Knockaert, M., & Lockett, A. (2005a). *How do early stage high technology investors select their investments?* Vlerick Leuven Gent Working Paper Series 2005/21.
- Clarysse, B., Wright, M., Lockett, A., Van de Velde, E., Vohora, A. (2005b). Spinning out new ventures: A typology of incubation strategies from European research institutions. *Journal of Business Venturing*, 20, 183–216.
- Cumming, D. J., (2006). The determinants of venture capital portfolio size: Empirical evidence. *Journal of Business*, 79, 1083–1126.
- Cumming, D. J., & Johan, S. A. (2007). Advice and monitoring in venture finance. *Financial Markets and Portfolio Management*, 21, 3–43.
- De Clercq, D., & Sapienza, H. J. (2005). When do venture capital firms learn from their investments? *Entrepreneurship Theory & Practice*, 29(4), 517–535.
- De Clercq, D., Sapienza, H. J., & Crijns, H. (2005). The internationalization of small and medium-sized firms: The role of organizational learning effort and entrepreneurial orientation. *Small Business Economics*, 24(4), 409–419.
- Diamond, D., (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies*, 51, 393–414.
- Fulghieri, P., & Sevilir, M. (2004). *Size and focus of a venture capitalist's portfolio*. Working Paper, University of North Carolina.
- Gompers, P. A., & Lerner, J. (1998). What drives venture fundraising? In *Brookings Proceedings on Economic Activity—Microeconomics* (pp. 149–192). National Bureau of Research Working Paper 6906 (January 1999).
- Gompers, P. A., & Lerner, J. (1999). *The venture capital cycle*. Cambridge: MIT Press.
- Gorton, G., & Winton, A. (2002). Financial intermediation. In G. Constantinides, M. Harris, & R. Stulz (Eds.), *The handbook of economics and finance*. Amsterdam: North Holland.
- Greene, W. H. (1997). *Econometric analysis*. New Jersey: Prentice Hall.
- Hamao, Y., Packer, F., & Ritter, J. (2000). Institutional affiliation and the role of venture capital: Evidence from initial

- public offerings in Japan. *Pacific-Basin Finance Journal*, 8, 529–558.
- Hanazaki, M., & Horiuchi, A. (2000). Is Japan's financial system efficient? *Oxford Review of Economic Policy*, 16, 61–73.
- Harris, L. (2003). *Trading & exchanges: Market microstructure for practitioners*. New York: Oxford University Press.
- Jääskeläinen, M., Maula, M., & Seppä, T. (2006). Allocation of attention to portfolio companies and the performance of venture capital firms. *Entrepreneurship Theory & Practice*, 30, 185–206.
- Jeng, L. A., & Wells, P. C. (2000). The determinants of venture capital fundraising: Evidence across countries. *Journal of Corporate Finance*, 6, 241–289.
- John, K., John, T., & Saunders, A. (1994). Universal banking and firm risk-taking. *Journal of Banking and Finance*, 18, 307–323.
- Kannianen, V., & Keuschnigg, C. (2003). The optimal portfolio of start-up firms in venture capital finance. *Journal of Corporate Finance*, 9, 521–534.
- Kannianen, V., & Keuschnigg, C. (2004). Start-up investment with scarce venture capital support. *Journal of Banking and Finance*, 28, 1935–1959.
- Kaplan, S., & Stromberg, P. (2003). Financial contracting theory meets the real world: An empirical analysis of venture capital contracts. *Review of Economic Studies*, 70, 281–315.
- Keuschnigg, C. (2003a). Taxation of a venture capitalist with a portfolio of firms. *Oxford Economic Papers*, 56, 285–306.
- Keuschnigg, C., & Nielsen, S. B. (2001). Public policy for venture capital. *International Tax and Public Finance*, 8, 557–572.
- Keuschnigg, C., & Nielsen, S. B. (2003a). Tax policy, venture capital and entrepreneurship. *Journal of Public Economics*, 87, 175–203.
- Keuschnigg, C., & Nielsen, S. B. (2003b). Taxes and venture capital support. *Review of Finance*, 7, 515–539.
- Keuschnigg, C., & Nielsen, S. B. (2004a). Progressive taxation, moral hazard, and entrepreneurship. *Journal of Public Economic Theory*, 6, 471–490.
- Keuschnigg, C., & Nielsen, S. B. (2004b). Start-ups, venture capitalists, and the capital gains tax. *Journal of Public Economics*, 88, 1011–1042.
- Kirilenko, A. A. (2001). Valuation and control in venture finance. *Journal of Finance*, 56, 565–587.
- Kyle, A. (1985). Continuous auctions and insider trading. *Econometrica*, 53, 1315–1335.
- Kuroki, M., Rice, M., & Abetti, P. (2000). Emerging trends in the Japanese venture capital industry. *Journal of Private Equity Winter*, 4, 39–49.
- Landier, A. (2001). *Start-up financing: From banks to venture capital*. Working paper, University of Chicago Graduate School of Business.
- Leland, H. E., & Pyle, D. H. (1977). Information asymmetries, financial structure and financial intermediation. *Journal of Finance*, 32, 371–387.
- Lerner, J. (1994). The syndication of venture capital investments. *Financial Management*, 23, 16–27.
- Lerner, J. (1999). The government as a venture capitalist: The long-run effects of the SBIR program. *Journal of Business*, 72, 285–318.
- Lerner, J., Schoar, A., & Wong, W. (2007). Smart institutions, foolish choices? The limited partner performance puzzle. *Journal of Finance*, 62(2), 731–764.
- Li, X., & Masulis, R. (2004). *Venture capital investments by IPO underwriters: Certification, alignment of interest or moral hazard?* Working Paper, Owen Graduate School of Management.
- Lichtenberg, F., & Pushner, G. (1994). Ownership structure and corporate performance in Japan. *Japan and the World Economy*, 6, 239–261.
- Lockett, A., & Wright, M. (1999). The syndication of private equity: Evidence from the U.K. *Venture Capital: International Journal of Entrepreneurial Finance*, 1, 303–324.
- Lockett, A., & Wright, M. (2001). The syndication of venture capital investments. *Omega: The International Journal of Management Science*, 29, 375–390.
- Manigart, S., De Waele, K., Wright, M., Robbie, K., Desbrières, P., Sapienza, H., & Beekman, A. (2000). Venture capital, investment appraisal, and accounting information: A comparative study of the US, UK, France, Belgium and Holland. *European Financial Management*, 6, 380–404.
- Manigart, S., De Waele, K., Wright, M., Robbie, K., Desbrières, P., Sapienza, H. J., & Beekman, A. (2002c). The determinants of the required returns in venture capital investments: A five-country study. *Journal of Business Venturing*, 17, 291–312.
- Manigart, S., Korsgaard, M. A., Folger, R., Sapienza, H., & Baeyens, K. (2002a). *The impact of trust on private equity contracts*. Working Paper, Vlerick Leuven Gent Management School.
- Manigart, S., Lockett, A., Meuleman, M., Wright, M., Landstrom, H., Bruining, H., Desbrières, P., & Hommel, U. (2002b). *Why do European venture capital companies syndicate?* Working Paper, Vlerick Leuven Gent Management School.
- Mayer, C., Schoors, K., & Yafeh, Y. (2005). Sources of funds and investment strategies of VC funds: Evidence from Germany, Israel, Japan and the UK. *Journal of Corporate Finance*, 11, 586–608.
- Ministry of Economy, Trade and Industry. (2001). *Annual Survey of Japanese Venture Capital Investments 2000*. Venture Enterprise Center.
- Morck, R., & Nakamura, M. (1999). Banks and corporate control in Japan. *Journal of Finance*, 54, 319–339.
- Morck, R., Shleifer, A., & Vishny, R. (1988). Management ownership and corporate performance: An empirical analysis. *Journal of Financial Economics*, 20, 293–315.
- Neus, W., & Walz, U. (2005). Exit timing of venture capitalists in the course of an initial public offering. *Journal of Financial Intermediation*, 14, 253–277.
- Phan, Ph. H., & Yoshikawa, T. (2000). Agency theory and Japanese corporate governance: A test of the convergence hypothesis. *Asia Pacific Journal of Management*, 17, 1–38.
- Prowse, S. (1990). Institutional investment patterns and corporate financial behavior in the United States and Japan. *Journal of Financial Economics*, 27, 43–66.

- Sahlman, W. A. (1990). The structure and governance of venture capital organizations. *Journal of Financial Economics*, 27, 473–521.
- Sapienza, H. (1992). When do venture capitalists add value? *Journal of Business Venturing*, 7, 9–27.
- Sapienza, H. J., De Clercq, D., & Sandberg, W. R. (2005). Antecedents of international and domestic learning effort. *Journal of Business Venturing*, 20(4), 437–457.
- Sapienza, H., Manigart, S., & Vermeir, W. (1996). Venture capital governance and value-added in four countries. *Journal of Business Venturing*, 11, 439–469.
- Sheard, P. (1989). The main bank system of corporate monitoring and control in Japan. *Journal of Economic Behavior and Organisation*, 11, 399–422.
- Shin, G., & Kolari, J. (2004). Do some lenders have information advantages? Evidence from Japanese credit market data. *Journal of Banking and Finance*, 28, 2331–2351.
- Stein, J. C. (2002). Information production and capital allocation: Decentralized versus hierarchical firms. *Journal of Finance*, 57(5), 1891–1921.
- Stiglitz, J. (1985). Credit markets and control of capital. *Journal of Money, Credit and Banking*, 17, 133–152.
- Weinstein, D., & Yafeh, Y. (1998). On the costs of a bank-centered financial system: Evidence from the changing main bank relations in Japan. *Journal of Finance*, 53, 635–672.
- Williamson, S. (1986). Costly monitoring, financial intermediation, and equilibrium credit rationing. *Journal of Monetary Economics*, 18, 159–179.
- Wright, M., & Lockett, A. (2003). The structure and management of alliances: Syndication in the venture capital industry. *Journal of Management Studies*, 40, 2073–2104.
- Yoshikawa, Y., Phan, P., & Linton, J. (2004). The relationship between governance structure and risk management approaches in Japanese venture capital firms. *Journal of Business Venturing*, 19, 831–849.
- Zacharakis, A. L., & Shepherd, D. A. (2001). The nature of information and venture capitalists' overconfidence. *Journal of Business Venturing*, 16, 311–332.
- Zacharakis, A. L., & Shepherd, D. A. (2005). A non-additive decision-aid for venture capitalists' investment decisions. *European Journal of Operational Research*, 162(3), 673–689.

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