

TAKING CARE: HOW MECHANISMS TO CONTROL MISTAKES AFFECT INVESTMENT  
DECISIONS

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Standard screening models focus on the problem of providing optimal incentives to agents to reveal their "type". This article examines the problems that arise when individuals honestly but incorrectly believe they are qualified to form accurate estimates. Mechanisms to control the mistakes of unqualified agents help organizations pool the resources of many providers but they also create a bias against projects where no one has complete information about the true distribution of returns. I also analyze the match between mechanisms used by different types of organizations and the capital requirements, complexity and completeness of information of the projects they undertake. My analyses provide new insights about the differences in projects undertaken by self-financed entrepreneurs, individual "angel" investors, professionally managed venture capital firms and large public companies.

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## TAKING CARE: HOW MECHANISMS TO CONTROL MISTAKES AFFECT INVESTMENT DECISIONS

### **1. Introduction**

Investors worry about both knaves and fools. Venture capitalists (VCs) try to uncover facts that entrepreneurs have an incentive to conceal, such as a history of substance abuse or a criminal record. They also try to verify assumptions (for instance, about the size and segmentation of markets) that entrepreneurs make in good faith. Furthermore, investors' concerns about folly can outweigh their concerns about knavery. For instance, entrepreneurs who commit all their wealth to a venture may dispel concerns about adverse private information (Leland and Pyle 1977) but not about their judgment. Therefore, inexperienced entrepreneurs like Sandy Lerner and Len Bosack, the founders of Cisco, cannot secure outside financing, in spite of committing all their savings and taking out large personal loans. In contrast 'repeat' entrepreneurs like Jim Clark who commit a small portion of their wealth to start-ups like WebMD and Healtheon can raise VC financing.

Knavery has received more attention than folly however. The control of opportunistic or dishonest behavior has been the focus of research on topics such as agency theory, institutional economics, corporate governance and incomplete contracts. The problem of controlling honest mistakes is not as well explored. Erroneous judgment plays a central role in Knight's (1921) theory, but in the modern literature papers by Sah and Stiglitz (1986, 1988) on alternative forms of error control and by Sah (1991) on fallibility represent notable exceptions to the general neglect of the topic. Studies of cognitive biases (such as "overconfidence") focus on their "anomalous" consequences; but besides Heath, Larrick and Klayman (1998) few papers examine how organizations try to control cognitive mistakes.

*Contribution.* I focus on the problem of controlling the mistakes of agents who have sound cognitive faculties but who may lack the knowledge required to form accurate estimates of project returns. To illustrate, consider an entrepreneur who wants to open an espresso-bar in Seattle in 1985. No one has information about the demand for such bars in Seattle (where few then exist), so the entrepreneur relies on his prior observations of espresso-bars in Italy. If consumers in Seattle don't have the same innate craving for espresso as Italians do, the entrepreneur will misestimate the revenues and profits of his venture.

Investors will obviously favor entrepreneurs who have the knowledge to form accurate estimates because inaccurate estimates lead entrepreneurs to propose bad projects and reject good

projects. But investors face adverse selection problems – entrepreneurs who misestimate the returns of projects (and their own ability to form accurate estimates) are more likely to seek financing. For instance, entrepreneurs who overestimate the demand for espresso are more likely to solicit funds to start an espresso-bar in a location that cannot support a profitable establishment than entrepreneurs who form accurate estimates of demand.

Incentives to encourage agents to reveal their ‘type’ cannot solve these selection problems. Incomplete information that leads to errors in estimating the returns of a project also makes it difficult for agents to assess whether they have the right prior knowledge required to form accurate estimates of returns. An entrepreneur who relies on his knowledge of Italy to estimate the demand for espresso-bars in Seattle cannot accurately assess the error implicit in this extrapolation. Nor can investors rely on diversification across many agents to compensate for selection mistakes; investors who finance an unprofitable espresso-bar and an unprofitable pizzeria receive a poor composite return.

I analyze three types of mechanisms commonly used to control the inadvertent mistakes of unqualified agents: **direct approval** – investors finance espresso-bars after forming their own estimate of their returns; **routines** – investors finance entrepreneurs who follow procedures that have been used to open profitable espresso-bars in the past; and, **expert teams** – investors finance groups of individuals who jointly decide where they will open espresso-bars. The analysis explains why many inexperienced entrepreneurs, like the founders of Cisco, cannot raise outside capital even though they commit all their personal wealth to their start-ups. I argue that mechanisms to control mistakes create a bias against symmetrically incomplete information. Investors therefore reject projects offered by entrepreneurs who have little evidence, private or otherwise, about their ability to start a business.

My framework also helps explain why wealthy individuals (the so-called venture “angels”) are more willing than VCs to invest in early stage businesses. To the extent that early stage investments have more risk, VCs who pool the capital of many investors ought to have advantages over angels in making early stage investments. But, VCs also have to allay the concerns of their investors about the VCs’ ability to evaluate projects. The use of standardized due-diligence routines helps VCs allay these concerns but it also discourages VCs from making early stage investments where the entrepreneur (and everyone else) lacks the information required to satisfy the due-diligence standards. Wealthy individuals who invest their own capital have lower informational requirements. Entrepreneurs like Howard Schultz (the founder of Starbucks) who have little direct evidence about the profitability of espresso-bars in Seattle therefore tend to finance their ventures from “angels” rather than from VCs. But, after such entrepreneurs have

generated some evidence, they can use VCs, who have access to more capital than individual investors, to finance growth.

My propositions about the ‘match’ between mechanisms and projects do not however explain why organizations choose certain mechanisms. My goal is to explain why different nets catch different fish not how fishermen choose nets.

*Organization of the paper.* The next section contains my definitions and assumptions. Sections 3, 4 and 5 offer propositions about the control of errors through direct approval by investors, routines and joint decision-making by teams of experts. Sections 5, 6 and 7 provide applications. They show how my propositions provide new insights about the differences in the investments made by self-financed entrepreneurs, angel investors, VCs and large public corporations. The last section concludes, and an appendix offers extensions.

## 2. Definitions and Assumptions

**Errors** refer to the deviation of estimated probabilities from true probabilities. **True probabilities** refer to the distribution of outcomes that would result if there were repeated trials of the same event. **Judgment** refers to the distribution of a person's estimation errors and the parameters of such a distribution represent measures of the person's judgment. For instance, if a person's errors have a normal distribution, the mean and standard deviation of the distribution represent measures of that person's judgment. And if such measures have low values we say that the person has “good” judgment.

To focus on mistakes, I restrict attention to situations where complete honesty naturally exists or can be secured through incentives and monitoring mechanisms. Individuals therefore do not break promises, lie or refuse to share information. I also exclude situations where conflicts arise because individuals have different utility functions or wealth. Moreover, all decision-makers maximize expected utilities subject to identical resource constraints.

### *Main Assumptions*

I. **Individuals form subjective estimates when they lack complete information about true probabilities\* by using their knowledge of similar past events to fill information gaps.** Therefore, when individuals don't have the “right” prior knowledge they can make estimation errors. Such errors can have multiple dimensions -- if the true returns of a project have a normal

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\* Although the spirit of my argument is Knightian, in contrast to some neo-Knightian models (e.g. Gilboa and Schmeidler (1995) and Bewley (1986)), I do not question the ability of individuals to form sharp subjective estimates even when information is highly incomplete.

distribution, decision-makers may misestimate both the mean and the variance of the distribution. For my analysis, we can assume decision-makers only make errors in estimating means. The possibility of errors in estimates of other parameters (or in the shape of the distribution) does not affect any of my results, but it does complicate the exposition of the analysis.

**II. Individuals have finite capacities for acquiring knowledge.** Therefore, even rational individuals cannot learn everything about everything.

**III. Individuals revise their estimates in the right direction as they receive more information** (Selten and Buchta 1994). This assumption implies that holding decision-makers' prior knowledge constant, more information about a project reduces errors in their estimate of its returns. For instance, imagine that the "true" profits of a proposed espresso-bar depend on the median incomes and rents in the neighborhood. Under my assumption, decision-makers will make smaller errors in estimating profits when they have accurate data about incomes and rents than when they have accurate data just about incomes.\*

**IV. Individuals incur costs to share their information.**

### **3. Direct approval.**

*Benefits and Costs.* Investors can protect themselves against the overestimates of a promoter of a project by forming their own estimates of its return; however approvals by investors increase decision-making costs because they entail duplicate evaluations.

**Proposition 1: Organizations whose investors approve individual projects undertake projects with larger capital requirements and more complete information than do self-financed individuals.**

*Capital requirements.* If the investors' assessments of attractiveness coincide with the promoter's assessments, the promoter can raise more capital than can a wealth-constrained individual. Moreover, the higher decision-making costs encourage promoters to favor large projects where economies of scale provide offsetting benefits.

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\* Information about projects can also indirectly reduce errors by helping agents use their prior knowledge more effectively. For instance, suppose a New Yorker guesses the median income of a location in Denver by averaging the incomes of three apparently similar locations in his native city. If the New Yorker receives further information (e.g. about the demographics, car ownership or house prices) that helps him associate the Denver location with just one New York location, his estimate of local income, and by extension of the profitability of the espresso-bar, will improve.

*Completeness of information.* Finite capacities for acquiring knowledge (Assumption II) encourage individuals to develop different kinds of knowledge. This leads (from Assumption I) to pervasive differences subjective estimates.

As in the Sah and Stiglitz (1986) hierarchy, differences in promoters' and investors' estimates will lead investors to reject two kinds of projects that promoters propose. First, investors will mistakenly reject some good projects because they underestimate their returns. Second, investors will also correctly reject bad projects proposed by promoters who had overestimated their returns. According to Assumption III, the incidence of both kinds of errors -- the investors' underestimates of good projects and the promoters' overestimates of bad projects -- increases with the incompleteness of information. Therefore the incompleteness of information increases the likelihood that investors will reject projects that promoters would be willing to undertake on their own.

*Sensitivity to assumptions.* Relaxing the assumption that individuals incur costs to share information weakens the tendency of investors to reject projects with incomplete information. Promoters would secure approval for all their good projects if they could persuade investors to accept their estimates by fully sharing their prior knowledge (Harsanyi 1968) without incurring any costs. The absence of information sharing costs will not however increase the acceptance rates of bad proposals.

The incompleteness of information would not affect acceptance rates of good or bad projects if: a) investors and promoters had identical prior knowledge and therefore formed the same estimates of project returns (or, as is implicit in the Sah and Stiglitz 1986 model, differences in estimates arose only because of random noise). b) Investors were concerned about promoters' honesty but not about their judgment. Investors' reviews would then create a bias against projects with moral hazard problems (e.g. against acquiring property from the promoters' relatives) but not against incomplete information.

Incompleteness of information would *increase* acceptance rates if Assumption III did not hold (i.e. if estimation errors increased with information).\*

*Tolerance for "known risks".* Direct approval by investors does not lead to a bias against good projects whose "true" distribution of returns has a large variance if (risk-neutral) decision-

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\* This might occur if decision-makers use an incorrect estimation model. For instance, suppose the profits of an espresso-bar increase linearly with the median neighborhood incomes, such that  $\text{profits} = A \cdot \text{income} + e$ . If decision-makers know the value of A, but overestimate neighborhood incomes they will overestimate profits. And better information about incomes will make their estimates of profits more accurate. If however, decision-makers use a low value for A and overestimate incomes then accurate information about incomes will increase the error in their estimate of profits.

makers have complete information about the distribution. As discussed in the appendix, direct investor approval may however favor projects whose returns have low variance if decision-makers have “moderate” information about the “true” distribution.

#### 4. Routines

Routines can eliminate the exercise of judgment in performing repetitive tasks (e.g. making an espresso). Alternatively, routines may limit the exercise of judgment to certain domains (“open espresso-bars just in large cities”) and specify the procedures that decision-makers must follow (e.g. “interview local merchants when selecting a site”) to form estimates. Below I analyze the second kind of routines i.e. routines that circumscribe rather than dispense with the exercise of judgment.

*Benefits and costs.* Routines help investors select qualified promoters by increasing the predictive value of their performance records. Finite capacities for acquiring knowledge (Assumption II) imply that the accuracy of promoters’ estimates vary across projects and estimation procedures. This limits extrapolations from promoters’ performance records to the types of projects promoters have previously undertaken and the procedures they have used. For instance, a promoter’s success in opening espresso-bars may not persuade investors that the promoter can also pick good locations for pizzerias. Similarly, the accuracy of a promoter’s forecasts of espresso consumption formed by analyzing demographic information may not convince investors that the promoter can also form accurate forecasts by conducting focus group research.

Therefore, performance records that derive from one domain and evaluation procedure provide more information about future performance than track records based on many domains and procedures. Commitments to domains and procedures also increase the predictive value of track records by controlling promoters’ misestimates of the scope of their expertise. For instance, the CEOs of banks may mistakenly believe that they have the capacity to start insurance subsidiaries. Routines that limit new projects to the banking industry help control such overreaching.

Specializing in a domain and using standardized procedures can also provide decision-making advantages (March and Simon 1958, Nelson and Winter 1982). Therefore even self-financed individuals who do not have to win the confidence of investors may also use routines. But individuals who use routines just to improve decision-making will deviate more readily from their normal domains and procedures. For instance, self-financed individuals can choose to undertake out-of-the-ordinary projects -- Joey Crugnale, who owned ice-cream parlors in the

Boston area seized an unusual real-estate opportunity to open a pizzeria (and go on to build the chain, *Bertucci's*). And, the more rigid adherence to routines to attract investors entails direct and indirect costs: promoters may forgo attractive projects and incur information-gathering expenditures that do not provide commensurate benefits in estimating returns.

**Proposition 2: Organizations whose investors rely on routines to control errors undertake projects with larger capital requirements and more complete information than organizations whose investors rely on the direct approval of projects.**

*Capital requirements.* Organizations whose investors rely on routines enjoy two advantages in undertaking projects with large capital requirements over organizations whose investors rely on the direct approval of projects. Organizations that use routines can secure funds from individuals who lack the knowledge to evaluate the projects undertaken by the organization.\* Routines also provide cost advantages in raising funds for large projects. The costs of direct approval (arising from duplicate evaluations) increase in proportion to the number of investors -- ten investors will collectively incur twice the costs as five investors.

In contrast, the costs of using routines do not increase significantly with the number of investors because the information they provide to one investor does not reduce its value to another. Therefore even if the number of knowledgeable investors does not represent a binding constraint, the scale economies of using routines gives professionally managed organizations an advantage in undertaking large projects. Conversely, the higher fixed costs of using routines create disadvantages in undertaking projects with low capital requirements.†

*Completeness of information.* Like direct investor approvals, routines also create a bias against projects with incomplete information. Commitments to stick to a domain discourage organizations from undertaking projects that incomplete information make hard to categorize. For instance, suppose an organization specializes in operating espresso-bars for a young professional clientele. This policy will discourage the organization from considering locations in neighborhoods where decision-makers don't have data about the ages and occupations of the

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\* The comfort provided by routines also does not require that investors have the knowledge to evaluate the manager's investment "model": the consistent use of a routine need only reassure investors that a manager's track record represents a sample drawn from the use of one rather than many models.

† The fixed costs of controlling principal-agent conflicts also encourage organizations to undertake large projects (Fama and Jensen 1985). Indeed we can think of the "over-standardization" of routines as a form of 'agency cost' that arises from concerns about judgment rather than honesty. But, to the extent organizations use different procedures to control errors and conflicts of interests, they have independent rather than overlapping effects. For instance, the costs of researching assumptions that entrepreneurs make in good faith encourages VCs to favor larger projects than if they just made inquiries about the entrepreneurs' honesty and truthfulness.



residents. Organizations that use routines will also tend to reject projects where the incompleteness of information precludes the use of standardized evaluation procedures. For instance, instead of just opening its own stores, Starbucks sometimes acquires regional competitors. To avoid bad acquisitions, the company may adopt a routine that requires analysis of three years of audited financial statements for any acquisition it makes. The policy will discourage Starbucks from considering regional chains that are less than three years old or whose owners have not maintained audited financial records. Self-financed individuals who adhere to routines less rigidly can more easily deviate from their normal informational standards.

Moreover, the bias against incomplete information due to routines is stronger than the bias due to direct investor approvals. The extent of the bias against incomplete information that arises because of investor approval is a function of the differences in the prior knowledge of promoters and investors. When both parties have similar backgrounds, the differences in their estimates and their bias against incomplete information will tend to be low. And, even if differences in estimates are significant, promoters may be able to eliminate them, albeit at some cost, by sharing their prior knowledge. For instance, after approaching 242 potential investors, Howard Schultz raised \$1.7 million to finance espresso-bars in Seattle by providing videotapes and other data about such bars in Italy. In contrast, the bias against incomplete information due to routines isn't an accidental by-product of differences in backgrounds that can be eliminated by sharing prior knowledge. Routines reassure individuals (such as the proverbial doctors and dentists) who cannot second-guess the decisions of promoters that the promoters will follow a proven approach. Undertaking out-of-the ordinary projects or deviating from standard procedures eliminates this reassurance and jeopardizes the promoters' access to capital.\*

*Sensitivity to assumptions.* Organizations would not have an incentive to use routines to attract investors if (contrary to Assumption II) investors formed all-purpose rather than domain and procedure specific estimates of judgment. And, routines would not have a significant effect on tolerances for incomplete information if investors were concerned about promoters' honesty but not about their judgment. The routines organizations would use to protect investors from dishonesty would focus on different issues e.g. whether the promoter of an espresso-bar happens to own the property where the bar is to be located rather than on the demographics of the neighborhood.

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\* The lower tolerance for incomplete information induced by routines does not imply a correspondingly stronger aversion for "known" risks. In fact, routines that help organizations secure capital from "passive" investors, should according to Fama and Jensen's (1983) analysis, increase tolerances for such risks.

*Projects with large capital requirements and highly incomplete information.* The discussion above suggests that organizations and self-financed individuals will avoid such projects; as discussed in the appendix, they may however partition such projects into sub-projects with lower capital requirements or more complete information.

## 5. Expert teams

*Benefits and Costs.* Pooling the prior knowledge of multiple experts helps control errors. To illustrate, consider the problem of forecasting the revenues of a new espresso-bar that will also serve prepared sandwiches. The joint forecast of an espresso expert and a sandwich expert will tend to be more accurate than their individual forecasts. Using teams of experts also involves additional costs, namely the costs of duplicate evaluations and the costs of sharing information to form joint estimates.\*

The benefits and costs increase with team size. Adding members allows teams to expand the scope of its collective expertise; large teams are therefore more likely to have the prior knowledge required to form accurate estimates than small teams. Large teams also face higher costs in making joint decisions. As mentioned, the costs of duplicate evaluations increase in proportion to the number of decision-makers. The costs of sharing prior knowledge to form joint estimates can increase more than proportionately. For instance, if each member shares information with every other member, the number of such pairs and the total amount of information that has to be exchanged will grow at least proportionately to the square of the number of members in the group (Simon 1960).†

**Proposition 3: Organizations that use large teams undertake projects with more complexity and have a stronger bias against incomplete information than organizations that use small teams.**

*Complexity.* The **complexity** of a project refers to the degree to which decision-making involves the joint optimization of many interdependent variables rather than choices about a few or unrelated variables. Thus the bet made by George Soros's Quantum fund that the U.K.

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\* Organizations can avoid information-sharing costs by selecting individuals with similar prior knowledge and averaging their independent estimates. This can help eliminate "random" individual errors; but it also limits the scope of an organization's collective knowledge. Using teams to control problems involving the blind spots of individual agents requires joint-decision making by experts with diverse prior knowledge.

† Hierarchical or "tree" organizational structures provide efficiencies in the sharing and processing of information across many decision-makers (Simon 1960 and Radner 1992). Hierarchical organizational designs do not however eliminate differences between large and small teams. In the limit, when team size equals one, the costs of duplicate evaluations and information sharing disappear.

government would withdraw from the European Exchange Rate Mechanism involved little complexity because the decision involved the forecast of a single variable. In contrast, Starbucks's foray into selling sandwiches and coffee-making equipment exemplifies a complex project because it requires the joint optimization of many interdependent variables.\*

The benefits of using more decision-makers increase with complexity. Thus the estimates of two experts produce more accurate forecasts of revenues when an espresso-bar also plans to serve sandwiches. And their consensus forecast of the bar's total revenues will be more accurate than the sum of their independent forecasts for espresso and sandwiches if demand for the two items is interdependent (e.g. if people who enter the store to buy sandwiches order espresso).

*Completeness of information.* As mentioned in Proposition 1, investors reject more projects that promoters would undertake on their own as information becomes less complete. A similar logic applies to large and small teams. Imagine a team that has approved a set of projects. New members added to the team may not favor all these projects. In particular, new members will oppose some good projects because they underestimate their returns. New members may also appropriately reject some bad projects whose returns had been overestimated by the old members. According to Assumption III the incidence of both kinds of errors -- the new members' underestimates of good projects and the old members' overestimates of bad projects-- increases with the incompleteness of information. Therefore the likelihood that the 'expanded' group will reject projects that smaller group had accepted increases with the incompleteness of information about the projects.

The broader range of expertise of large teams also creates stronger incentives to favor projects where information is more complete. Consider two teams formed to select locations for espresso-bars where the larger team includes an expert who can improve site selections (i.e. reject more bad sites and accept more good sites) by analyzing data on mail order sales of coffee beans. To take advantage of this expertise, the team will favor sites where data on mail order sales is available. The smaller team that cannot use the data will be indifferent to its availability.

*Sensitivity to assumptions.* Incompleteness of information would not affect approval rates of good projects by large teams if the "advocates" could win over dissenting members without incurring information sharing costs. (See discussion of direct approval in Section 3). The use of large teams would also not have a significant effect on tolerances for incomplete

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\* Per this usage, complexity is not correlated with the completeness of information available to decision-makers or to capital requirements. The Quantum Fund's "simple" currency bet involved an unprecedented situation with highly incomplete information and a multi-billion dollar amount.

information if investors were concerned about honesty but not about the judgment of decision-makers. Joint decision-making would then create a bias mainly against projects with moral hazard problems.

*Correlation with capital requirements.* Complexity represents a necessary but not sufficient condition for favoring large teams. Projects undertaken by large teams must also offer commensurate economies of scale to offset the higher decision-making costs -- an organization that plans to open a single espresso-bar cannot justify the costs of a large decision-making team. And because scale economies are usually correlated with capital requirements, projects that can support large teams also have large capital requirements.

This does not however imply that large teams are always optimal for projects with large capital requirements. Small teams have cost advantages in undertaking simple projects regardless of their capital requirements. The right number of decision-makers in a hedge fund that makes multi-billion dollar currency bets may be small. In other words, large teams are optimal for projects that offer significant economies of scale *and* "scope."

*Interactions between team sizes and routines.* As discussed (proposition 2), routines that circumscribe judgment mitigate the problem of using performance records to select good agents. The difficulty of drawing inferences from past results tends to be greater in projects involving the joint effort of many individuals. And, the selection of a few bad team members can lead to significant negative spillovers. The more severe selection problems in large teams encourage organizations to use more rigid routines. And, (also proposition 2), more rigid routines lead to lower tolerances for incomplete information. Conversely, when organizations (such as hedge funds) undertake projects managed by individuals or small teams they can use less rigid routines with higher tolerances for incomplete information because investors can place greater reliance on the past records of the decision-makers.\*

*Incentives to specialize.* Organizations that use teams and routines optimized for complex projects sometimes try to form sub-units with smaller teams and less rigid routines to undertake simpler projects. Such commingling can however impair the actual or perceived quality of the

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\* Routines optimized for complex projects have obvious similarities to the bureaucratic model discussed by Weber (1947). The idealized bureaucracy comprises experts who have duties and rights within a "specified sphere of competence" and make decisions "according to *calculable rules*" (Kalberg 1980). Although its procedures can impede "the discharge of business in a manner best adapted to the individuality of each case," Weber argued that bureaucratization offers "the optimum possibility for carrying through the principle of specializing administrative functions according to purely objective considerations." In its perfectly developed form, bureaucracy eliminates "love, hatred, and all purely personal, irrational and emotional elements which escape calculation" (Weber 1947). In other words, bureaucracies reject options where incomplete information makes estimates of outcomes highly dependent on the prior knowledge and experience of the decision-makers.

judgment of the top executives of multi-unit firms. To the extent that top executives have to make different kinds of subjective estimates to manage the two kinds of sub-units they require different kinds of specialized knowledge. Commingling hinders the development of such knowledge. Differences between sub-units also make it difficult for top executives to win the confidence of investors -- as previously discussed, individuals who repeatedly make the same kinds of estimates face less skepticism. The benefits of the specialization of top management in turn limit the range of projects organizations undertake and the control mechanisms they use.\*

## **6. Application 1: Self-financed start-ups**

The “stealing theories” reviewed by Kaplan and Stromberg (forthcoming) suggest that the availability of capital for a start-up depends on the observability and verifiability of an entrepreneur’s effort. Entrepreneurs who start businesses where they can secure “private benefits” at the expense of their investors in a manner that investors cannot easily detect or prove in a court of law face more significant capital constraints. This does not offer a plausible explanation for why the founders of companies like Compaq, Lotus and Juniper Networks financed their start-ups with outside equity when the founders of its competitors, Dell, Microsoft and Cisco, did not.

Nor do moral hazard issues explain why self-financed businesses like Dell, Microsoft and Cisco subsequently raise outside equity. It seems unlikely that Cisco that was self-financed by its founders in 1984 could raise capital from VCs in 1987 and from the public markets in 1991, because problems of lying, inadequate effort, or the pursuit of private benefits declined. If anything, we should expect such problems to increase in the later stages of a business where entrepreneurs have greater opportunities and incentives to misrepresent the value of company assets and to slack off.

My propositions suggest that many start-ups cannot secure outside funding because the mechanisms that investors use to control mistakes discourage them from financing businesses where information is highly incomplete. These businesses can subsequently become candidates for outside funding as more information about their prospects becomes available. This explanation conforms to my previously reported findings about high-growth start-ups. I studied

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\* Complementarities may however offset the disadvantages of co-mingling units. For instance, an in-house VC unit may help a large firm realize more value from opportunities that spill over from its bureaucratic units when selling the right to exploit the opportunities involves high transaction costs. The trade-off between complementarities across bureaucratic and entrepreneurial sub-units and reductions in the efficiency of top-management decision-making is consistent with Gompers and Lerner’s (1999) data. They find that in-house VC units are more likely to survive within large firms if they can take advantage of the parent’s technologies and relationships than if their investment activities are stand-alone.

100 businesses formed between 1981 and 1983 that appeared on *Inc.* magazine's list of the 500 fastest growing privately held companies in the United States. The companies in my sample recorded a more than eighteen-fold median increase in revenues between 1984 and 1988 and more than an eight-fold increase in employees. Eighty percent of these ventures were financed principally by the founders' personal savings and borrowings; another 8% relied on the family and friend's of the founders as their principal source of funds and only 12% used funds provided by arm's length individual investors or professional venture capitalists.

Information about the prospects of these businesses was highly incomplete. The founders did not start out with proprietary ideas or valuable intellectual property whose value a prospective investor could assess in advance. Only 6% even claimed to have started with unique products and services and only 3% had patents. Many founders also did not have deep business or industry experience and lacked ex-ante information about factors (such as their capacity to persuade customers to purchase undifferentiated products from an undercapitalized start-up) that seemed to play a significant role in the subsequent performance of their business. The founders did not devote many resources to research or planning either; apparently they discovered the missing information by actually starting their ventures (Bhidé 2000).

## **7. Application 2: VCs vs. Angels**

The existing literature suggests that the *raison d'être* of VCs lies in their ability to solve information asymmetry problems. As Kaplan and Stromberg (2002) observe, tests of this hypothesis have been indirect; for instance, researchers who have shown that VCs specialize in high technology projects have relied on the assumption that such projects involve more severe information asymmetry problems than opening new restaurants (Amit, Brander and Zott 1997). Furthermore, the hypothesis does not easily explain why VCs avoid projects with *symmetrically* incomplete information that angel investors are prepared to finance.

*Stylized facts.* Prior research suggests that VCs extensively scrutinize investment proposals before making investments. (See Pence 1982). Some of this scrutiny addresses information asymmetry problems – for instance, VCs seek to determine whether entrepreneurs actually have the managerial ability they claim to possess by checking references with previous employers. According to academics and practitioners, VCs also however use criteria that imply a bias against projects where information is symmetrically incomplete (Kaplan and Stromberg 2002). For instance, VCs are attracted to businesses that serve large and growing markets rather than unproven niche markets that may or may not grow (e.g. personal computer software

companies like Lotus and Intuit in the 1980s rather than Microsoft in 1975). VCs also avoid businesses started by inexperienced founding teams.

The incompleteness of information does not merely affect the pricing of capital – e.g. charging inexperienced founders a risk-premium to reflect their lower expected success rates. The pattern of new business financing suggests that VCs reject projects where the available information falls below the threshold requirements of their routines instead of charging a risk premium. Historically, venture capital firms have provided start-up financing to less than one percent of new businesses formed in the United States each year. According to PricewaterhouseCoopers/Venture Economics/National Venture Capital Association's *MoneyTree Survey*, VCs financed just 42 seed and start-up companies in the fourth quarter of 2001.

The tendency of VCs to favor “later stage” companies that have initially been funded by founders and individual investors is also consistent with a bias against incomplete information. According to the *MoneyTree Survey*, VCs financed more than 14 times as many later stage and expansion stage businesses in the fourth quarter of 2001 as they did seed and early companies. The National Venture Capital Association’s annual report shows that in 1996, 77 percent of companies receiving venture capital funding were three years old or older. Similarly, the Association’s more recent annual reports (which do not report the ages of companies receiving VC funding) classify only 22% of total VC disbursements in 1999, and 23% in 2000, as “early stage”.

Venture angels apparently conduct less extensive due-diligence and have less stringent information requirements than do VCs. Freear et al (1995) report that a median time of 2.5 months elapses between an angel’s first meeting with an entrepreneur and the receipt of funds. The equivalent time for comparable VC investments is 4.5 months. Angels are more willing to provide capital to inexperienced entrepreneurs and to “pre-revenue” businesses with unproven markets and technologies (Freear et. al. 1992, Wong 2002). Overall, Freear et al. (1992) estimate that angels finance ten times as many businesses as do VCs. Moreover, the angel investors aren’t just friends and relatives who provide funding for emotional reasons or because they have access to better information about the entrepreneur’s true ability than do VCs. Many angels are cashed-out entrepreneurs (Sohl 1999). Like VCs, angels often have no prior relationships with the entrepreneur; indeed Andrew Wong's interviews (reported to me in personal correspondence) suggest that VCs sometimes pass on investment opportunities they consider “immature” to angel investors.

These stylized facts conform to my propositions. Proposition 1 suggests that because angels and VCs make investments after direct review of proposals they will both have lower

tolerances for incomplete information than self-financed entrepreneurs do. However, because VCs raise their capital from "passive" limited partners, VCs adopt more standardized evaluation routines than angel investors and therefore have lower tolerances for incomplete information (proposition 2).

An alternative hypothesis, which may be teased out from the existing literature, is as follows. VCs, who specialize in solving asymmetric information problems, prefer experienced entrepreneurs because experienced entrepreneurs are more likely to have adverse private information about their true capabilities than inexperienced entrepreneurs. Similarly VCs prefer later stage investments, because entrepreneurs who seek later stage financing have lower incentives to make truthful forecasts and maximize effort than entrepreneurs who seek seed funds and face the prospect of more financing rounds.

This does not explain however why VCs who raise funds from passive investors develop the capacity to solve asymmetric information problems and individual "angel" investors do not. Moreover as mentioned, the direct evidence on the investment criteria used by VC firms does not suggest that VCs seek out ventures with information asymmetry problems the way pawnbrokers target individuals with impaired credit. More plausibly, the causality runs in the opposite direction. A lower tolerance for symmetrically incomplete information leads VCs to undertake projects where they face more severe information asymmetries. Therefore, VCs may devote more effort to control such problems than do angel investors.

### **7. Application 3: Large public companies vs. VCs**

Bankman and Gilson (1999) provide the following explanation for the difference between VC-backed start-ups and the projects undertaken by large firms: established companies cannot provide adequate incentives for all employees to develop their ideas within the firm, so some leave to start new firms. But, Klepper's (forthcoming) evidence suggests that employees often start businesses after their employers have rejected their projects. Bankman and Gilson's model also does not explain why large firms often reject opportunities to license technologies that VC-backed entrepreneurs may exploit. Stanford University, for instance, assigned the rights to a workstation technology to Andrew Bechtolsheim, a graduate student who had been developing the technology, after established computer companies showed no interest. Bechtolsheim licensed the technology to several VC-backed start-ups. Eventually he contributed it to Sun Microsystems (that was also VC-financed) where he became a co-founder (Bhidé 1989). This is not an isolated case: Shane's (forthcoming) study of MIT's technology licensing suggests that new firms are more likely than are existing firms to license a novel technology.



Proposition 3 can help explain why large firms reject opportunities like the Sun workstation technology that VCs find attractive: large companies control errors through joint decision-making by large teams and highly standardized routines. These mechanisms provide advantages in undertaking complex projects, but they also lead to a low tolerance for incomplete information vis-à-vis VCs. Next I argue that my explanation is consistent with the evolution of internal controls in large companies and stylized facts about decision-making in VC firms.

*Historical evidence.* The historian Alfred Chandler's accounts of the evolution of public companies suggest a close nexus between project complexity and the development of error control mechanisms. Prior interpretations of Chandler's work by Williamson (1975) and other theorists have emphasized the ability of large corporations to control conflicts of interest. An alternative reading suggests that the problems involving honest mistakes that firms encountered as they undertook increasingly complex projects played an equally important role in the development of their internal control systems.

According to Chandler, firms initially grew by increasing the volume of their outputs using innovative labor saving technologies. These technologies stimulated the development of mechanisms to control conflicts of interest and mistakes. In the prior "putting out" system of production, workers were paid according to a piece rate (Chandler 1977); assembly line manufacturing required the control of effort through time and motion studies and the employment of foremen and supervisors. The greater complexity of the new technologies also increased the problem of controlling mistakes. In the railroads, mistakes sometimes had fatal consequences, as in the collision of two passenger trains in 1841. "The resulting outcry", according to Chandler (1977) "helped bring into being the first modern, carefully defined, internal organization structure used by an American business enterprise."

High volume production encouraged firms to grow through vertical integration. General Motors (GM) for instance acquired some of its "up-stream" suppliers such as the Fisher Body Company (Chandler and Salsbury 1971). According to Williamson (1975) vertical integration mitigates problems of opportunistic behavior by placing specialized up-stream and downstream units under common ownership. Common ownership however does not by itself eliminate inadvertent mistakes. For instance, an upstream unit may build excess capacity because it overestimates the requirements of the downstream unit. By the 1920s, most large U.S. companies adopted "functional" organizational structures to control such problems (Chandler 1962).

Growth through diversification followed growth through vertical integration. Diversification further increased the problems of teamwork and placed an "intolerable strain on existing administrative structures." The problems of manufacturing and marketing a number of

product lines "made the tasks of departmental headquarters exceedingly difficult to administer...The coordination of product flow through several departments proved even more formidable" (Chandler 1962). These problems led large diversified companies to establish "divisions" with dedicated resources. For instance, after a financial crisis in 1920-1, General Motors formed the Cadillac, Buick, Oakland, Olds, and Chevrolet divisions. Between 1921 and 1925 GM created divisional offices, considerably expanded its central office staff, formed inter-departmental committees, and "worked out highly rational and systematic procedures" to coordinate the operating divisions and plan policy for the organization as a whole. By 1925, the divisional and general office staffs "were drawing up comprehensive over-all plans for all operating units" based on "carefully thought-out, long term forecasts" (Chandler 1962).

According to Alfred Sloan, who served as the chief executive from 1923 to 1946, GM also developed a "tradition of selling ideas, rather than simply giving orders." All levels of management had to "make a good case" for their proposals; the manager who wanted to "operate on a hunch" would "find it hard to sell his ideas to others". But the sacrifice of possibly brilliant hunches was compensated for by the "better-than-average results" of policies that could be "strongly defended against well-informed and sympathetic criticism." GM's approach provided a safeguard against "ill-considered decisions by assuring that basic decisions were made only after thorough consideration by all parties concerned" (Sloan 1964). In my terms, joint decision-making by many experts created a strong bias against incomplete information but, according to Sloan, provided more than offsetting advantages in undertaking complex projects.

*Contrast with VCs.* VC firms comprise far fewer individuals than the financial analysis and planning staffs GM has employed at its central offices since the mid-1920s. For instance, Sahlman (1990) found Institutional Venture Partners, a relatively large and prominent firm, had just six partners and two associates. VCs also use less rigid decision-making procedures. At GM Sloan established a "detailed procedure" for "an independent impartial review and checking of all phases" outside the division proposing a large project. An appropriations committee "functioning under both the Finance and Executive Committees" was formed to conduct these reviews with the help of the financial staff (Sloan 1964). The partner of a VC firm who is convinced about the merits of an investment typically requires the approval of just the other partners. Apparently, investors rely more on the individual capabilities of the partners (assessed on the basis of their track records) than on highly standardized routines.

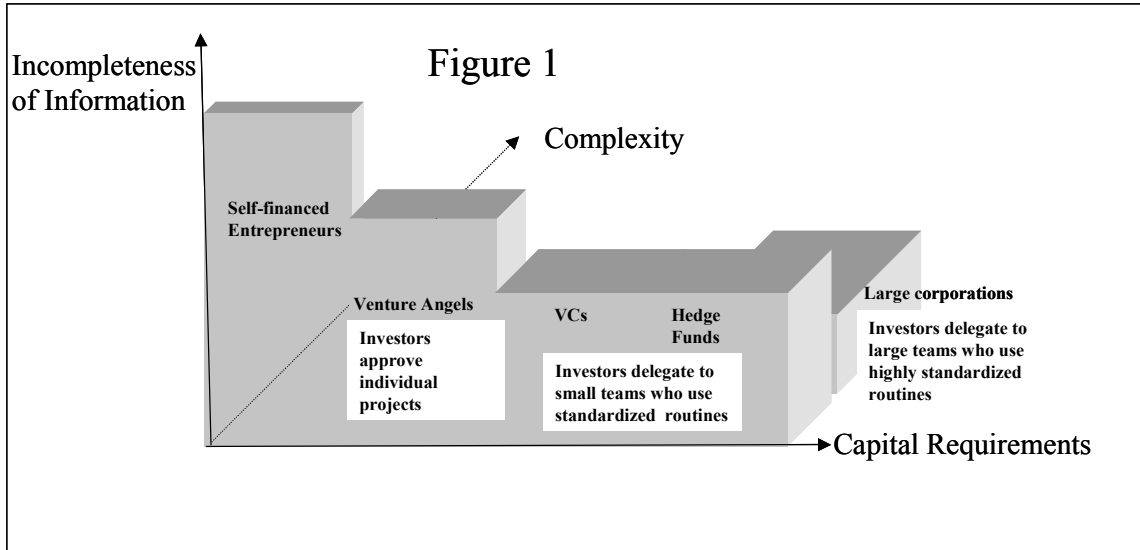
The greater discretion accorded to individual partners allows VCs to undertake projects with less complete information than public corporations. A VC who does not have to "strongly defend" an investment proposal in front of bosses and appropriations committees can use

"hunches" to fill information gaps. Moreover when there isn't much informational grist for the analytical mill, reliance on hunches does not lead to more mistakes. Conversely if such businesses succeed in generating sufficient favorable evidence about cash flows and investment opportunities, VCs transfer ownership of their equity stakes to stockholders of publicly traded companies either through a public issue or indirectly through acquisition by an existing firm. And, consistent with proposition 3, VCs tend to invest in simpler projects that do not require large teams. In contrast to a large pharmaceutical company like Merck, a typical venture capital backed biotechnology company does not employ a large sales force, or many personnel in its marketing, finance, treasury or government relations functions. Rather, VC's seem to rely on the efforts of personnel in just of one or two functions such as product development or engineering.

## **8. Summary and Conclusions**

To summarize:

- Mechanisms used to control the mistakes of well-meaning but unqualified decision-makers help organizations pool the resources of many providers. The mechanisms also however encourage organizations to avoid projects where information is symmetrically incomplete.
- The optimal form of control mechanism also depends on the magnitude and nature of resources pooled. In particular, control through direct investor approval has advantages in undertaking projects with low capital requirements whereas projects with high capital requirements favor indirect control through routines. Similarly complex projects favor the use of larger teams and more rigid routines to control errors than is optimal for simple projects.
- Organizations that use different combinations of control mechanisms tend to specialize in projects with different capital requirements, complexity and completeness of information. (See Figure 1).



My analysis leads to several other predictions and hypotheses (See appendix 1); however, interactions between problems of symmetrically incomplete and asymmetric information lie outside its scope. To highlight issues involving symmetrically incomplete information, I assumed away information asymmetry problems. I also focused on the financing of new projects where problems of asymmetric information are arguably less severe than in transactions involving the sale of existing assets. For instance, investors have fewer concerns about private information when they finance new restaurants than when they purchase established restaurants.

In fact, both kinds of problems co-exist in virtually all contexts and mechanisms to control one set of problems can exacerbate the other. For instance, we have seen that VCs tend to avoid inexperienced entrepreneurs; this exacerbates information asymmetry problems because experienced entrepreneurs have more private information about their true abilities. Similarly “lemon laws” intended to protect consumers from dishonest sellers of used cars may have a chilling effect on sellers who are diffident about their knowledge of the true condition of their cars. These interactions represent a topic for future research.

## Appendix 1: Extensions

The propositions about error control mechanisms suggest further hypotheses and questions about the:

*Risk aversion under “moderately” incomplete information.* Decision-makers can have highly incomplete information about distributions that have very low “true” variance and can therefore make estimation errors that are as large as their errors about high variance distributions. The true variance of returns will therefore have little effect on project choices made by risk-neutral investors or decision-making teams. We can however plausibly assume that the **convergence of estimates as more information becomes available is greater when true distributions have low variance**. Therefore, even risk neutral investors will favor low variance distributions as they receive some information. But, as information becomes complete and all estimates converge to the true value, risk-neutral investors will ignore differences in variance.

To illustrate, imagine a group of investors who have a required rate of return of 9% per year. The group faces an opportunity to invest in a Peruvian and a Sri Lankan restaurant. The "true" distribution of returns for both types of restaurants has a mean value of 10%; but the distribution of returns of Peruvian restaurants has low variance whereas the distribution of returns of Sri Lankan restaurants has high variance. As discussed, when investors have no data about the profits, differences in prior knowledge and experience lead them to form different estimates. For simplicity, assume that individual estimates are equally dispersed around 10% for both restaurants; therefore, investors are as likely to choose one as the other. Suppose now that all investors receive data about the profits of some existing Peruvian and Sri Lankan restaurants. The data will be more tightly clustered around 10% for the Peruvian restaurants (whose profits have low variance). We may reasonably assume that investors' updated estimates are more likely to approach the true 10% value for a Peruvian restaurant, thus increasing the likelihood of its approval. But, if investors receive a large amount of profit data, everyone's estimates for *both* restaurants will tend to converge to 10% and investors will not favor one or the other.

*Design of contracts.* Contractual terms can help mitigate differences in subjective estimates and not just conflicts of interest. One example is the use of “milestone” or “benchmark” compensation provisions in VC financing contracts. Milestone provisions typically give the entrepreneur a higher share of the firm’s equity upon the attainment of some previously agreed upon goal, such as reaching a given revenue target. Although such arrangements often are used, they do not represent a routine feature of VC-entrepreneur contracts – for instance, they were

found in less than half the cases studied by Kaplan and Stromberg (forthcoming) – and were more prevalent in early stage financings than in later stage financings.

Incentives do not provide a convincing explanation for why milestone provisions are used in some contracts but not others, and more importantly, why they are used more often in early stage financings. As discussed in section 7, problems of shirking and deliberate misrepresentation should increase in later round financings and lead to a more frequent use of milestones. A subsequent study by Kaplan and Stromberg (2002) also raises questions about an incentive-based explanation. They find "a significantly positive relationship between external risk [deriving from symmetrically incomplete information] and benchmark compensation, which is contrary to the theoretical predictions" of traditional agency based models.

Differences in the estimates of VCs and entrepreneurs about each other's judgment help explain these patterns. My interviews with VCs suggest that VCs try to avoid milestone provisions because they can lead to conflicts and perverse incentives. For instance, if the entrepreneur is on the verge of attaining a revenue milestone, the VC has an incentive to withhold help; or the entrepreneur may over-invest in sales and marketing to reach the milestone even when sacrificing profitability for revenue reduces the total value of the firm. VCs said they reluctantly use milestones to "bridge the gap" between their estimates of the value of the venture and the entrepreneurs' estimates, rather than to discourage slacking or the pursuit of "private benefits". Such gaps, we expect will be wider in the early stages of a venture when information is highly incomplete.

*Partitioning of projects.* The proposition that organizations financed by passive investors avoid projects with highly incomplete information and that self-financed individuals and owner-managed organizations cannot undertake projects with large capital requirements implies the avoidance of projects with high capital requirements and highly incomplete information. Under the assumptions of section 1, such neglect cannot be rectified by normal price mechanisms. If ignorance or inertia leads to the under-pricing of properties located in low-income neighborhoods, knowledgeable investors will move in to take advantage of the higher returns. Awareness of the avoidance of large projects with highly incomplete information does not have this effect however. In contrast to properties located in low-income neighborhoods, the projects with highly incomplete information that individuals or organizations can imagine promoting are virtually infinite. Adverse selection problems will cause investors to finance only those promoters who they believe can pick the good ones. But, because promoters cannot develop

credible reputations and routines for projects that no one has previously undertaken, they cannot easily raise the funds required to undertake large projects with highly incomplete information.\*

The partitioning of such projects into sub-projects that have lower capital requirements or more information can help mitigate their neglect. For instance, an entrepreneur who lacks the capital to purchase a large but untested petroleum deposit might develop a sub-parcel. An oil company that has the capital but lacks the entrepreneur's tolerance for incomplete information might commission geological studies instead. Or it may wait for entrepreneurs to develop sub-parcels, and if this produces favorable evidence, buy out the interests of the entrepreneurs. Such strategies can however reduce both the private and social returns – for example when carving up a large field into sub-parcels requires sub-optimal drilling and exploration techniques.

*Duration of control ceded to professional managers.* Rigid decision-making routines encourage investors to delegate control of their resources for extended periods by protecting investors against the departure or the impairment of the judgment of particular individuals. An organization's reliance on individual judgment instead of formal routines will encourage investors to reserve the right to withdraw funds after appropriate notice or to delegate control for shorter, fixed periods. Control for extended duration in turn gives organizations advantages in sharing a common asset across projects with different start and finish dates.†

Differences between large public firms and VCs conform to this hypothesis. The charters of public companies like Merck anticipate perpetual life and thus encourage managers to undertake projects whose development testing and marketing can span several decades. These companies also seek to exploit “synergies” across projects, for instance, by using common sales and marketing staff for multiple products. Venture capital partnerships in contrast usually have a fixed term of about ten years that gives VCs a four to six year exit horizon for investments. VCs therefore tend to use the ease of exit as an investment criterion (MacMillan, Siegal and

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\* Relaxing the assumptions listed in section 2 undermines this proposition. For instance, individuals who don't face wealth constraints can undertake projects with large capital requirements and highly incomplete information on their own, as did the billionaire Ludwig in trying to develop a timber and pulp enterprise in the jungles of Brazil (Bhidé 2000). Similarly, if charismatic individuals (such as Frederick Smith, founder of Federal Express) can overcome the skepticism of investors about promoters who don't have a track record with similar projects, (i.e. Assumption III. does not hold) they may raise large amounts of capital for pioneering ventures. Episodic “gold-rush” behavior may also lead investors to believe that the extreme attractiveness of a certain class of investments swamps adverse selection problems and encourage organizations that rely on passive investors to suspend their normal routines. This likely occurred in the recent Internet-related boom (between 1998 and early 2000).

† Financing practices of the British East India Company illustrate the problems that arise with limited durations of control. In the early years, the Company raised capital for individual voyages; however its “permanent” trading posts provided services to all voyages. The difficulty of valuing these services and conflicts of interests that arose between voyages eventually led the Company to secure “permanent” capital. (Baskin and Miranti 1997)

Subbanarasimha 1985) and include liquidation provisions in their financing contracts with entrepreneurs (Kaplan and Stromberg forthcoming) that facilitate exit. VC funds also make less of an effort to exploit synergies across projects – each tub in their portfolio stands on its own bottom. Some VC firms (e.g. Kleiner, Perkins) may occasionally try to facilitate mutually beneficial transactions between portfolio companies; but VCs usually do not require one portfolio company to choose an option that would cause it to incur a small loss in order to produce a larger gain for the other company.\*

According to Black and Gilson (1998) the liquidation of investments helps capital providers identify VCs with superior skills. My hypothesis suggests a different interpretation: VCs believed to have superior skills can raise funds from investors without using costly bureaucratic routines, but only for limited periods. Some venture capitalists have tried to adopt structures to extend the duration of their control over investors' funds. For instance, in the 1960s American Research and Development operated as a closed-ended publicly traded fund and other VCs have used "evergreen" partnership structures. These alternatives did not catch on however. Apparently the same set of institutional investors who cede perpetual control to the managers of public companies have been unwilling to do so to the general partners of VC firms.

*Heterogeneity of Organizations.* The incentives faced by individual organizations to limit the types of projects they undertake (see proposition 3) suggest a progressive tendency towards heterogeneity across organizations. In an underdeveloped economy that uses simple technologies we should see few businesses use costly evaluation routines. As some businesses seek to exploit technologies that require the large-scale pooling of capital and expertise they develop large decision-making teams and highly standardized routines. This facilitates the further exploitation of complex technologies but limit the organization's ability to undertake projects with highly incomplete information and create opportunities for individuals and firms that have not developed large teams and rigid routines.

Lucas (1978) has discussed how the average size of firms increases as an economy grows. Similarly, Schumpeter (1942) argued that increasing firm sizes reflect the superior ability of large organizations to undertake the "new combinations" that lead to economic growth. But growth in the proportion of economic activity accounted for by large firms does not imply a diminution in the activity of small firms if the total level of activity increases. Increasing

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\*It might be argued that the reluctance to maximize the joint value of the two companies derives from fiduciary restrictions faced by the VCs rather than concerns about exit. Note however that the fiduciary restriction reflects a choice made by the VCs to own less than 100 percent of the equity of their portfolio companies. Moreover LBO partnerships that do own all of the equity of their portfolio companies also avoid commingling assets and activities.



'average' size can simply reflect greater heterogeneity and more specialization in the sorts of investments that different organizations undertake.

*Value of duties of care.* The legal duties of a fiduciary include duties of loyalty and of care. The former, which pertains to matters involving self-dealing, may help fiduciaries make credible commitments to refrain from misappropriating resources. Duties of care represent a special case of the law of negligence and cover matters that do not involve the self-interest of the fiduciary. What economic value might duties of care provide?

Legal duties of care likely help professional managers to bind themselves to using procedures to avoid mistakes. For instance, according to Section 4.01 of the American Law Institute's Principles of Corporate Governance, officers and directors must perform their functions "with the care that an ordinarily prudent person would reasonably be expected to exercise in a like position and under similar circumstances." The application of this standard to the functions of directors results in a duty to "employ a reasonable decision-making process to make decisions." Directors have an incentive to discharge this duty because of an associated "business judgment rule." The rule helps protect directors from liability if rational decisions made in good faith turn out badly because of unforeseeable circumstances provided they had employed a reasonable decision-making process. Moreover, the business judgment rules generally pertain to specific decisions; they do not limit the liability for negligent decision making procedures (Eisenberg 1993).

Organizations can also choose a level of care that suits the types of projects they tend to pursue. Whereas the American Law Institute's model incorporation articles bind the directors and officers to make decisions with the care of an "ordinarily prudent person", VC partnership contracts in contrast often limit the general partners' liabilities to acts of "gross negligence."

*Governance of owner-managed organizations.* Rules requiring the approval by all resource providers represent a common control mechanism in owner-managed organizations. For instance, in traditional partnerships, common practice, buttressed by laws such as the Uniform Partnership Act in the United States, stipulate that "every out-of-the-ordinary matter must be decided by unanimous consent, whether it implicates conflicting interests or common interests among the partners" (O'Neill 1993). These unanimous approval rules constitute an error control mechanism that encourage resource providers to pool their resources by providing safeguards against lapses in each other's judgment, but they also create a bias against incomplete information.

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