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**ORGANIZATIONAL DECISION-MAKING AND INFORMATION:
ANGEL INVESTMENTS BY VENTURE CAPITAL PARTNERS**

Executive Summary

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ABSTRACT

We study information aggregation in organizational decision-making for the financing of entrepreneurial ventures through the phenomenon of private angel investments by venture capital partners outside of their employer. We propose a formal voting model with costly tacit information and find empirical support for the model.

INTRODUCTION

Why do we trust groups to make some of our most important decisions? US criminal cases are determined by the unanimous vote of a jury, and a board of directors has the power to hire and fire the CEO by a majority vote. Why not one juror or one director? When preferences are aligned, groups can deliver superior decision quality relative to that of a single agent (Condorcet, 1785) because of their ability to aggregate information across agents. Information aggregation represents an important differentiating capability for organizations (Cyert & March, 1963; Gavetti, Levinthal, & Ocasio, 2007), and it is thus relevant to understand the optimal organizational structures that enable this capability and their associated boundary conditions (Csaszar & Eggers, 2013).

In the setting of entrepreneurial finance, optimally aggregating information is especially crucial for financial intermediaries because information is low and at a premium. Entrepreneurial ventures lack any of the capital assets or organizational infrastructure present in larger incumbent

firms, and thus they are difficult to value using straightforward explicit information: these ventures may have unproven management teams, enter new and undefined market segments, and develop cutting edge but untested technology products (Aldrich & Marlene, 1994). The lack of explicit information is further exacerbated by information asymmetry that results from entrepreneurs having greater access to information about their firm than outside parties (Dessein, 2005). As a result, non-traditional tacit information, such as “gut feel” about an entrepreneur or industry, play a large and pivotal role in the decision-making process in entrepreneurial finance (Huang & Knight, 2015; Huang & Pearce, 2016). To facilitate capital investments into these entrepreneurial firms, we have dedicated financial institutions, such as venture capital firms, angel investors, crowdfunding platforms, and accelerators, which seek to address these information problems and invest in high risk, high reward ventures. These institutions specialize in identifying investment opportunities from a vague choice set, acquiring and aggregating external information to evaluate and execute investments, and monitoring their investments ex post.

We study two particular organizational forms in entrepreneurial finance, venture capital firms and angel investors, which differ starkly in their decision-making structures. Venture capital firms are administrated by a general partnership. The partners individually source investments and collect intimate information about those investments through due diligence, which they then bring to the whole partnership for consideration. The venture capital partnership then makes decisions by committee through a formal or informal vote on the deals brought in. Angel investors also individually source investments and collect information, but unlike a venture capital firm, they make the investment decisions by themselves. Basic voting theory suggests that committees can more effectively aggregate information among informed parties than the parties acting individually (Condorcet, 1785). All else equal, we might expect a group decision-making process to outperform an individual decision-making process.

We examine a particular phenomenon where the information aggregation advantage of the venture capital organization may break down: individual angel investments by partners of venture capital firms. Partners of some venture capital firms make their own angel investments into ventures their firm ultimately chooses not to invest in; we refer to these partners as *angel partners*. As a requirement of employment with the venture capital firm, the partners have a fiduciary duty, a *duty of loyalty*, to the venture capital firm. As such, the venture capital firm

must always have the right of first refusal on any possible deal, and the partners can only invest in deals that the firm would not do. Thus, we observe angel investments made by the venture capital partners that were necessarily rejected or “passed over” by the firm decision-making criterion while meeting the partner’s personal criterion for an investment. Between 2005 and 2013, over 500 US venture capital firms have partners who made such angel investments on the side. We ask why an individual partner would still pursue a deal when her colleagues, whose opinion she presumably respects, voted against it. It is a paradox and open question as to why a partner would take on substantially more personal financial risk to pursue her own investment.

To explain this phenomenon, we argue that there is a tradeoff in group decision-making between the benefits of information aggregation and the cost from the participation of uninformed agents, driven by a disincentive to acquire costly tacit information about the venture among the individual agents. This tension presents a fundamental boundary condition for group decision-making, namely that in some cases of heterogeneous information, the group decision underperforms an individual decision.

We offer a stylized formal model to explain the observed phenomenon. A committee of agents with homogenous utility functions must make a dichotomous choice about whether to invest in a particular project that can turn out to be good or bad. A sourcing agent receives a costless private signal, representing tacit information, which is costly to the other members of a committee. The agents all share a public signal component representing explicit information. The other agents have the option to acquire the private signal at cost; this decision is endogenous to the model. The committee then engages in a voting process with a pre-determined threshold. For the model, we find there is no pure strategy equilibrium where all agents acquire the costly private signal, but we find there is an equilibrium where some or no agents acquire the costly private signal. The comparative statics of the model generate a number of empirical hypotheses to test. First, projects funded by an angel investor will exhibit weaker explicit characteristics than those funded by the VC. Second, projects funded by the angel investor will have a higher associated cost to acquire the necessary tacit information. Third, projects funded by the angel investor will have less informative tacit information.

We test our theory on a large sample of investments made by venture capital partners, in the form of individual angel investments, and their employing firms, in the form of traditional venture capital investments. We find that the venture capital partners, acting independently,

make investments into younger firms with less educated, less experienced, and younger founding teams, but these investments perform similarly or better on some financial metrics even when controlling for investment size, stage, and industry. Geographic distance and VC inexperience in an industry category increase the probability the investment is taken up by a partner and not the VC.

This project makes a number of contributions across the strategy and finance literature. This work is the first to document the investment patterns of venture capital affiliated angel investors, and it also contributes to the still relatively small literature on angel investors, who normally represent a heterogeneous and difficult group to study. Second, we are among the first large sample empirical studies of committee decision-making and one of the only to make some inroads into the micro-structure of the organization itself. Most of the prior work has been conducted in lab experiments (Kotha, Nai, Narayanan, & Puranam, 2015) and simulations (Csaszar & Eggers, 2013). Third, we contribute to an emerging stream of work studying specialized decision-making structures as part of a “behaviorally plausible, decision-centered perspective on organizations” (Gavetti, Levinthal, & Ocasio, 2007). Finally, the particular empirical setting at hand in this study is thematically related to work on spin-outs, companies founded by former employees of incumbent firms (e.g., Klepper, 2001).

THEORY

A primary purpose of the firm is to acquire, integrate, and then apply information for its productive use in the form of knowledge (Grant, 1996). In the setting of venture capital, nearly all venture capital firms have a formal or informal mechanism, usually a vote, held for aggregating information from its partners when evaluating a possible deal. This information aggregation structure has direct implications for the ability of the organization to receive knowledge, or in other words, its absorptive capacity (Cohen & Levinthal, 1990).

A key challenge for the organizational use of information is the transferability of said information. *Explicit information* is easily and credibly transferable, functioning as a public good. Explicit information can be costlessly aggregated by the organization since it is easily transferable. Examples of explicit knowledge relevant to the venture investor include educational characteristics and work experience of the founding team and the prior financial performance of

the startup and its chosen market (e.g., Bernstein, Korteweg, & Laws, 2016), facts that would be easy to record and communicate. Entrepreneurs create business plans and financial statements for the purposes of communicating this explicit knowledge to investors, and investors can share these documents amongst themselves to communicate this explicit knowledge with each other.

On the other hand, *tacit information* cannot be codified and is only revealed by its application, and thus its transfer between people is costly (Kogut & Zander, 1992). Tacit information plays a key role in the decision process for venture investors (Huang & Knight, 2015). Examples of tacit information include the investor's trust in the entrepreneur's character and intuition about future market trends, which are acquired through direct interaction with the entrepreneur or long-term personal experience respectively. The social psychology literature has focused on intuition, affectively charged judgements that arise through rapid and non-conscious associations between different ideas, as a major component of decision-making at the individual level. For example, Huang and Pearce (2015) show that "gut feel", a blend of analysis and intuition derived from the interpersonal relationship between the individual investor and the entrepreneur, has a real effect on investor decision-making. Indeed, the investor's intuitive assessment of the entrepreneur and other informal channels of information often make up the most important component of the investor's decision-making process, more so than the formal business plan (MacMillan, Siegel, & Narasimha, 1985; Kirsch, Goldfarb, & Gera, 2009). Furthermore, symbolic actions, such as professionalism, and other factors gleaned through personal interaction play a deep role in venture investor decision processes (Zott & Huy, 2007). Thus, an important component of the information used by investors to evaluate early stage ventures is captured in this tacit information, and the ability to utilize this tacit information is a key source of competitive advantage for venture investors who are able to optimally utilize it.

This distinction in transferability of information presents a key inefficiency in simple group decision-making processes like voting. When all information is explicit, information can be shared among all participants and thus participants will be informed when they vote. When there is tacit information, some of the agents in a group may not acquire that information because the information acquisition process is individual costly to each agent. In a standard voting mechanism with no abstentions, agents who have not acquired the costly tacit information will still vote but vote in an uninformed fashion, making their vote worse than useless as they dilute the quality of the group decision that would have occurred without them. We henceforth refer to

the explicit information as being *public*, since it is shared by all agents, and we refer to the tacit information as being *private*, since it is private to each agent and not shared. This choice of terminology is made to better align with norms in game theoretic formal modeling.

We propose a formal model to elucidate on the boundary conditions of group decision-making through a voting mechanism when some information is heterogeneous or costly to individual agents. For a committee voting by majority rule, where the voters are equally informed (all information is public), the Condorcet jury theorem says that adding more voters asymptotically increases the probability the decision will be correct (Condorcet, 1785). However, we consider the case where there is heterogeneity in information available to the members of the committee by modeling the tacit component of information as an endogenous outcome of the model (Persico, 2004). We represent shared explicit information through a public signal, and the non-sharable tacit information is represented by a private signal. The committee decision then notably deviates from efficiency and optimality. The primary channel by which agents can credibly express their opinion in a voting environment is through their vote. In most settings, every agent's opinion counts equally, but not every agent voting may be informed. This challenge sets up the primary theoretical tension at the heart of our theory: the benefit of aggregating information across the agents of the group versus the cost of participation of uninformed agents. We propose that this tension, driven by the introduction of costly private (tacit) information into the model, results in the VC partner angel investing phenomenon. We proceed with our model to show the existence of equilibria demonstrating this trade-off and to derive a set of comparative statics for the purposes of empirical testing. The full analytic model is available from the author.

Hypothesis 1: Projects funded by an angel investor will appear worse on observable characteristics, such as founding team education and experience.

Hypothesis 2: Projects funded by an angel investor will have a higher cost of information acquisition, as measured by geographic distance between the entrepreneurial firm and the investor.

Hypothesis 3: Projects funded by an angel investor will have lower less information content in the private signal in investments done by the angel relative to those done by the VC.

DATA

The identification of individual vs. group investment decisions comes from the phenomenon of venture capital firm partners who also make angel investments on the side with their personal funds. As a requirement of employment with the venture capital firm, the partners have a fiduciary duty to the venture capital firm first, and this *duty of loyalty* requires all partners to disclose any potential opportunity that the partnership entity would be interested in taking. They have to wait until the partnership passes on the opportunity before they can personally engage it. Thus, we empirically observe investments made by the venture capital firm and those rejected by the venture capital firm while receiving an angel investment from a partner.

The main dataset is constructed from the universe of venture capital and angel investment rounds from January 1, 2005 to December 31, 2013, as identified in CrunchBase. Much of the data, particularly on investment events, is entered by TechCrunch staff based upon their own reporting and SEC Form D filings. The rest of the data is crowdsourced from the public or drawn from AngelList, a website for connecting startups with angel investors.

We identify all individual angel investors whose primary occupation is in a venture capital, private equity, or angel stage investment firm that has made an investment into a startup in our sample. The final sample consists of 879 unique individuals making investments out of 726 organizations into 8342 different startups. We construct the data at the investment-level, so each observation represents an investment by either the VC or the angel partner.

To study the distribution of observable characteristics that make up the public signal in our theoretical model and test *Hypothesis 1*, we construct a number of entrepreneurial firm and founding team characteristics at the time of the investment event: firm age, founder age, founder prior entrepreneurial experience, and founder education (MBA, PhD, engineering, etc.).

To proxy for the cost of information acquisition and test *Hypothesis 2*, we look at the geographic distance between investments and their investors. We calculate geographic distance between venture capital firms and their investments by calculating the geodesic distance in

kilometers between the two, i.e. the length of the shortest curve between two points along the surface of a mathematical model of the earth (Vincenty, 1975).

To proxy for the information content of the private signal and test *Hypothesis 3*, we look at the investment experience of the venture capital firm in specific categories of business models, technology methods, and technology platforms. For a given VC-venture or angel partner-venture investment round, an experience measure is constructed for the investing or employing VC by taking the count of investments executed by the VC prior to the date of the focal investment round in the category of the startup that is receiving investment.

While we make no predictions about financial performance, differences in financial performance of investments by angel investors vs. venture capital firms is certainly of empirical interest and included for such reason. We construct a number of outcome variables to evaluate investment performance as commonly used in the entrepreneurial finance literature: future funding rounds, exit events (IPO/M&A), and exit valuation.

EMPIRICAL STRATEGY

We test the main hypothesis and compositional differences in financial performance with two models. In the main model, we run an ordinary least squares (OLS) model with organization fixed effects and year fixed effects on the sample of investments we study. The organization fixed effects control for time-invariant effects common to the members of the venture capital organization and to the venture capital organization itself; the identification assumption being made here is that the angel investor and their parent organization share the same mean investment preferences and performance.

To address the issues of confounding compositional differences between the angel partner and VC investments, such as differences in stage and industry, we introduce a matching model where we match each angel investment one-to-one with a venture capital investment made by their parent firm. The primary issue with the first specification is that financial constraints and investment theses limit the types of investments that can be made by individual investors with respect to venture capital firms. The venture capital firms have greater access to capital from their limited partners and thus can make larger investments, which often happen at later stages. Angel investments are usually limited to the earlier stages where the investors can make smaller

investments. There are also numerically many more venture capital investments than angel investments in our sample. Starting with the full sample of angel partner investments, we match each angel investment with the venture capital investment that is in the same industry code, closest in total round size, closest in round date, and with a maximum difference in \$1 million in round size.

RESULTS

Across all empirical models, we find evidence in support of our empirical hypotheses. In support of Hypothesis 1, we find that the venture capital partners, acting independently, make investments into younger firms with less educated, less experienced, and younger founding teams. For Hypothesis 2, we find that in the range of 100–1000km, greater distance is associated with a higher probability an investments taken up by the angel partners and not the employing VC firm. For Hypothesis 3, we find that VC inexperience in a business model, technology method, or technology platform is associated with greater probability that the investment is taken up by a partner and not the VC. Finally, we present a descriptive analysis of venture financial performance, and in the matching model we fail to find significant difference between investments by the angel partners and their employing VC firms.

REFERENCES AVAILABLE FROM THE AUTHOR