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by

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Abstract

Organizational design in the context of new venture development is particularly challenging due to initially severe resource constraints. Deepening our understanding of differential productivity in the startup resource assembly process is therefore important. We address the twin questions of what assets are important to venture performance, and under what conditions are those assets especially important? We do so by considering initial venture idea assets and founder contracting experience. The resource-based view of the firm stresses developing the right assets, which accords with idea assets. Firm boundary theories of the firm emphasize structuring relationships in the right way given a set of organizational assets, which accords with founder contracting experience. Using unique survey data, we find that neither view by itself is as important as both theories taken together. We therefore advance an integrated perspective by showing that new ventures perform better when they both identify valuable resources and also assemble human assets with expertise in structuring organizational arrangements to commercialize those ideas. An important implication is that organizational resources have a range of potential values, and that realizing the upper range of value capture involves the additional ability to structure organizational relationships.

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Introduction

The literature on firm capabilities and the related resource-based view (RBV) of the firm argues that differences between firms in their strategic resources and in their ability to identify and develop rent-generating resources create differences in firm performance (Penrose 1959, Peteraf 1993, Barney 1991, Wernerfelt 1984). Alternatively, the theory of the firm literature stresses the organization of economic activity to highlight the importance of structuring and doing the right things with the available resources – making the best (efficient) decisions on governance issues (Grossman and Hart 1986, Hart and Moore 1990, Holmstrom 1999). There is a fundamental difference in the two basic views on how to think about the performance of firms. We lack an understanding of when each is most important and how resources and capabilities interact with contracting and governance decisions to generate firm performance. The former view emphasizes assembling ‘the right assets’ while the other focuses on where and why production of economic activity takes place - ‘organizing assets the right way’.

However, many firms struggle to develop assets and strategic resources precisely because they are resource constrained or lack the longstanding reputation needed to convince other parties to provide resources. Similarly, many firms are limited in their options to vertically integrate or make other contractual arrangements to optimally structure the firm due to a lack of experience, resources, or the reputation necessary to implement the desired type of organization. A standard implicit or explicit assumption in the prior literature is that the means of achieving ownership of resources or a standard set of options for organizational structure is equally important and available to all firms.

We address the neglected relationship between the ability to secure value-generating resources and the governance and contracting experience needed to develop and use those resources most efficiently. We do so by examining the conditions under which value is realized in entrepreneurial firms when those resources are combined with individuals on the founding team with expertise in structuring the appropriate organization to commercialize resources. We show that if we conceptualize resources or capabilities as having a range of potential values, then structuring the use of those resources in the right way is more likely to result in outcomes in the upper range of the distribution of potential values. As a

result, assembling the right assets *and* organizing them in the right way allows entrepreneurs to most effectively bring venture ideas to life. In bringing these two fundamental perspectives together, we respond to recent calls for tighter integration of existing theories of the firm and the development of a strategic theory of the firm (Mahoney and McGahan 2007).

The most important decisions shift away from firm boundary choices when resources and reputation are severely limited and minimization of transaction costs is obscured by prioritization of resource acquisition and firm development. For the entrepreneur, when resource constrained in forming a new organization, creating the governance contracts and incentive structures to successfully develop one key resource or capability for the market is vital. For example, initially the founders of a new search engine such as Google may be too fully occupied in developing their search and advertising algorithms to question whether servers to run them should be made or bought. Limited resources and reputation are directed towards concerns about hiring and incentivizing top programming or ad sales talent or how decision-making across the firm hierarchy will work to develop the basic venture idea. Once the organization has developed a threshold level of resources and stability has been achieved, the decisions of whether and how to integrate the production of servers or web applications into the firm is of greater importance. The purpose of this paper is to show how the value created through resources or capabilities is shaped by the firm's circumstances and the efficiency of the governance and contracting arrangements by the firm. A clear understanding of when specific types of assets and capabilities are important in driving performance under specific industry conditions is of utmost importance to resource constrained firms and entrepreneurs. Clarifying how to extract greater value from idea assets and the relationship between assets and contractual and governance issues is of importance to practitioners as well as to the strategic theory of the firm.

Literature and Hypotheses

Introduction. Early work emphasized the incompatibility and differences in assumptions of theories of strategic organizational assets and theories of the firm (Conner and Prahalad 1996), thus explaining why these literatures have historically developed their own distinct trajectories. Researchers

have recently worked on integrating these perspectives to better explain the locus of production (made internally, acquired in the marketplace, or jointly produced in an inter-organizational relationship) and differences in firm performance. On the theory of the firm side, much of the integration work has focused on transaction cost economics (TCE) to examine organizational boundaries under the thesis that firms will act to mitigate the threat of hold-up resulting from specific investments by producing internally rather than using the market (Williamson 1975). Indeed, misaligned transactions with respect to TCE-prescribed governance structures can be costly (Sampson 2004). Building on TCE theory, scholars integrating the RBV perspective have argued that the locus of economic production also depends on firms' assessment of their own capabilities as well as those of their potential partners (e.g., Argyres 1996, Foss 1996, Dyer and Singh 1998, Lieblin and Miller 2003, Mayer and Nickerson 2005, Mayer and Salomon 2006).

Yet, these studies focus on the firm boundary decision. This decision is of most importance to managers of more established firms in considering whether to make or buy an input. However, from the entrepreneur's perspective, the choice of firm boundaries, such as the decision to vertically integrate in a given upstream or downstream area, may not be of immediate importance. Resource constraints may render the choice moot, at least in the short run. Scholars have also noted that economic production need not be confined to the choice of internal production or market-based activity. Instead, network structures such as inter-organizational alliances can be important (Powell 1990). This channel is likely to be particularly important for startups, but the challenge is attracting attention and signaling quality to the alliance counterparty. Therefore, instead of examining the determinants of the locus of economic activity, we instead evaluate the circumstances under which two classes of startup assets are correlated with new venture performance: characteristics of the entrepreneurial idea and contracting experience on the founding team.

Our aim is to contribute to two areas of the literature seeking to integrate the two perspectives. First, we examine the role of initial venture idea assets (proxying strategic resources) and contracting experience (proxying organization of production issues). Given the special challenges associated with new venture development—operating under especially stringent resource constraints (which may

foreclose the ability to vertically integrate) and lacking organizational experience and reputation (which may raise transaction costs of inter-organizational production), we further examine when initial venture assets and contracting experience are especially important. Taken together, this analysis allows us to address two related puzzles in the literature: Why do some firms perform better than others even when they appear to have developed identical resources? And why do some firms perform better than others when they appear to have structured their economic relationships in the same ways?

A second way in which we aim to contribute to the literature integrating the strategic resource and firm boundaries literatures is by examining their joint effect. We develop the argument that the venture idea represents not a single determinative value, but actually a *distribution* of potential values depending on its pairing with founder knowledge and expertise in organizing, structuring, and contracting arrangements in which to appropriate value from the venture idea. Under this view, value is appropriated only when ideas for new resource, activity, or asset combinations are brought into contact and under the control of individuals with experience in how to embed them in a web of firm and market contractual relationships. The remainder of this section develops these two contributions to the literature.

Venture ideas as strategic assets. At the very beginning of new firm formation, very few assets are likely to be present outside of an idea and the individuals attempting to build a firm to commercialize that idea. Following Schumpeter (1942) and others, we refer to a novel combination of existing factors as the startup idea. We define venture idea assets as those useful in generating, screening, and developing ideas for novel resource combinations. For a new venture, we argue that *the* unique strategic resource (in the sense of being rare, valuable, inimitable, and nonsubstitutable) is the intangible venture idea.¹ We have in mind a wide-ranging conceptualization of the venture idea, which includes not only the business model (why the venture creates value for different stakeholders), but also the revenue model (the way in

¹ The capabilities and resource-based approach to the firm is a voluminous literature. Our goal is to apply common strands of this literature to our context at hand, while referring the interested reader to literature reviews for more detail about the evolution of the theory.

which the chosen business model enables revenue generation).² The venture idea asset is likely to be correlated with startup performance to the extent that the idea is novel, proprietary (or more generally has barriers to alternative entry), is superior to functional alternatives, and addresses a large and growing market segment.

Initial venture idea resources can have lasting organizational performance effects not only because of initial novelty, but also because of the dynamics associated with startup resource assembly over time. Firms with stronger venture idea assets are likely to be better able to screen new ideas from various communities for more valuable, novel resources. Further, venture idea assets allow the firm to be more productive in developing these new ideas and resources to a viable commercial product. A novel initial idea can also attract talented employees or managers to join the company in working toward commercialization. Similarly, financial resources will more easily flow to firms with more novel ideas and those with more capable workers, leading to a virtuous cycle toward organizational performance. These ideas are consistent with the literature on resources and capabilities, which has suggested both that R&D can result in novelty, which is a strategic resource (e.g., Dierickx and Cool 1989) and that there are significant and lasting differences in firms' abilities to maintain their novelty through their management practices (e.g., Henderson and Cockburn 1994).

We are also interested in the circumstances under which venture idea assets are likely to be particularly important in determining startup performance. We believe that industry appropriability conditions will be an important moderating variable in the relationship between idea assets and new venture performance. Consider an industry environment in which the startup faces a weak appropriability regime in which it is not able to capture much of the value that it creates through formal (patents, copyrights, and trademarks) or informal (speed in commercialization) means. The market for ideas wherein startups 'sell' their ideas to industry incumbents for commercialization is dampened by weak appropriation conditions due to the absence of alternatives should the incumbent firm try to expropriate

² A simple example of a business model is the value Google creates for its users by quickly matching internet content with users' queries and searches. While Google's revenue model is advertising-based, examples of alternative revenue models (given the same business model) include transactional or subscription-based revenue.

the startup (Gans et al. 2002). As a result, the startup is more likely to pursue self-commercialization rather than risk expropriation under weak appropriability conditions. Idea disclosure, which risks expropriation, is necessary when negotiating any deal terms, including price, with a counterparty. Since it is difficult for startups to compete with industry incumbents on the dimension of assets complementary to commercializing the innovation, such as expertise in sales/marketing, manufacturing, or navigating the regulatory environment, venture idea assets are likely to be particularly important in weak appropriability regimes. In addition, for self-commercialization by resource-constrained startups (which is made more likely in weak appropriability environments), investments in elaborating venture ideas may suffer due to bearing more of the cost of building downstream commercialization assets such as marketing and distribution. A similar logic holds if the startup employs partial or sequential idea disclosure under weak appropriability (as in Anton and Yao 2002, 2004) in contracting with counterparties while threatening broad idea dissemination (thereby creating competition and driving down rents for the would-be expropriating entity in the marketplace). In such a case, access to the venture idea is the critical missing ingredient for effective competition, and should be especially important in determining venture performance.

In an industry environment with a strong appropriability regime, however, markets for ideas move the basis of competition away from idea novelty and towards operational efficiency and other downstream factors for differentiation. Functioning markets for ideas, which are facilitated by strong appropriability conditions (Gans et al. 2002), magnify the importance of other factors for firm performance and reduce the importance of venture idea assets. The ability to access ideas and technology more easily in the market lowers barriers to entry for competing on the basis of technology and increases the importance of deal-making and downstream factors. With many potential sellers of ideas, a selling firm's bargaining position is shaped by its potential to develop marketing and operational efficiency if allowed to compete in downstream product markets. Firms that are better at forming contractual arrangements or that can differentiate themselves as partners with complementary assets are at an advantage when markets for ideas function more smoothly. Firms now have the option to license rather

than bear the full cost of developing complementary assets. In addition, stronger appropriability conditions increase incentives to invest in idea novelty, making innovations more ubiquitous and increasing stock on the supply side of the ideas market. A stronger appropriation environment therefore dampens properties of idea assets that under weak appropriation made them rent-generating assets – ex ante limits to competition, value, immobility, rarity and (with non-exclusive licenses) difficulty to imitate (Barney 1991, Peteraf 1993). The above discussion leads to two predictions:

H1a: Initial venture idea assets will be associated with higher performing firms.

H1b: Initial venture idea assets will be an especially important determinant of new venture performance when the firm operates in a weak appropriability environment.

Contracting experience and theories of the firm. The theory of the firm literature actually encompasses many different theories. Our goal here is to distill the common phenomenon these theories wish to explain as a stepping-stone to discussing why startup contracting experience is likely to relate to new venture performance. We also explore the conditions under which contracting experience is likely to be a particularly important driver of such performance.

Contracting and ownership are at the heart of several theories of the firm. Here, we discuss their importance in the TCE, property rights, and network approaches to the theory of the firm. TCE seeks to explain how firm boundaries and the locus of economic activity (stylistically firm-organized production in contrast to market-oriented exchange) relate to transaction hazards. The main proposition of the theory is that when market relationships involve specific investments (those which are worth more inside the specific relationship than outside) firms will seek alternatives to such economic organization such as through vertical integration (Williamson 1975). The property rights approach to the firm (Grossman and Hart 1986) starts from the premise that contracts are fundamentally incomplete in that all states of the world cannot be anticipated and contracted upon, and so a crucial benefit to asset ownership is control over residual rights (those not explicitly contracted upon). In this approach, firms can incentivize effort levels through correct decisions about to whom to allocate residual control rights, with implications for the division of rents between firms (Hart 1995). In the network approach to organization and production

(e.g., Powell 1990), firms have ownership of different assets, and they are motivated to pursue cooperative relationships (such as strategic alliances) to gain access to other resources in the value chain or to share risk, but also face challenges such as managing the joint enterprise, guarding against expropriation, and enticing the counterparty to participate in the first place.

From the standpoint of new ventures, while the TCE and property rights approaches to the theory of the firm are helpful in explaining the likely locus of production, they are also limited in that startup resource constraints may foreclose backward and/or forward integration options. Network forms of organization represent a mode of production intermediate between firm and market modes of organizing production, as may be particularly important for startups by achieving some of the benefits of ownership while incurring a different set of costs (we will return to a fuller discussion of these challenges below). While TCE, property rights, and network theories of the firm stress asset ownership to varying degrees (with associated levels of applicability to startup challenges), all three theories share the view that contracting is a critical ingredient in determining firm boundaries and performance. In TCE, knowing when to contract in the market is emphasized, while in the property rights approach, knowing how to contract is paramount. For the network form, with whom to contract, and on what basis is the relationship initiated and sustained are central questions.

These dimensions of contracting, both internal and external to the firm, are therefore likely to shape both firm boundaries and firm performance. Examples of internal contracting include decisions concerning the structure of firm decision-making hierarchies, recruiting, incentive and compensation systems, and promotion. Examples of contracting with external parties include deals to access external resources such as those held by suppliers, customers, manufacturers, innovators, and marketers. Since we take the perspective of the new venture, which has at most limited own-experience in contracting, we focus on contracting experience by startup founders in their prior career experience. Such experience can be helpful in the various dimensions of contracting which are at the heart of the theories of the firm discussed above. This is consistent with empirical evidence relating heterogeneity in contract design ability to organizational performance (Azoulay and Shane 2001, Shane 2001) whether by means of initial

skill in such structuring or by learning over time (Argyres and Mayer 2007, Mayer and Argyres 2004).

We are also interested in the conditions under which contracting experience is likely to be especially important in determining new venture performance. Our claim is that having venture capital (VC) funding is an important moderating variable in the relationship between founder contracting experience and venture performance. Consider a startup with VC funding. Such a venture has two assets: financial and reputational resources. Financial resources loosen startup resource constraints so that firm boundaries are more of a managerial decision variable in that backward or forward vertical integration might be feasible. Reputational resources, meanwhile, help make the option of relational contracting³ feasible for startups. New ventures do not have an established reputation (which is important for relational contracting, because it can signal quality and even the likelihood of being in existence over time) so the reputation of their affiliates such as VCs, who do have market track records, may serve as a signal of venture quality (Stuart et al. 1999, Hsu 2004). Consequently, when a startup is VC funded, the range of strategic options regarding firm boundaries is broader (including formal contracting, relational contracting, and vertical integration) relative to no VC funding (in which case formal contracting is the only option). For this reason, as the startup environment shifts from having VC funding to not having such funding, the importance of founder contracting experience increases with respect to venture performance, as formal contracting becomes the only avenue to expand organizational boundaries. We therefore predict:

H2a: Founding team contracting experience will be positively related to new venture performance.

H2b: Founding team contracting experience will be an especially important determinant of new venture performance when the firm has no venture capital funding.

Complementarity between venture idea assets and contracting experience. For the full value of a venture idea to be realized it must become embedded in within- and across-firm relationships, which is consistent with the notion that a venture idea is associated with a distribution of potential values, and realizing value from the upper part of that distribution depends on pairing the idea with other resources, which is enabled

³ We use the term relational contracting to encompass informal mechanisms (i.e., not based on formal contracts) of enforcing discipline in transactions, such as through anticipation of future relationships and/or trust.

through founder contracting experience. Consider the example motivating Hellmann and Perotti's (2009) work. To realize the full potential of a venture idea, the idea requires elaboration from experts outside of the firm's boundaries (as Hellmann and Perotti write (p.3): "firms incubate [venture] ideas, markets increase their chance of elaboration"). These experts are in a position, however, to expropriate the idea originator, who likely has comparatively fewer complementary assets for commercialization relative to the outside expert. To illustrate this, consider the case of an incumbent corporate venture capitalist with expertise in building-on and elaborating an idea from a new venture, but at the same time possession of complementary commercialization assets to quickly take the elaborated idea to market should they gain control of the idea. Contracting experience therefore comes into play in this situation, as structuring relationships can help enforce discipline so that external parties can help elaborate venture ideas. The remainder of this section develops our claim that idea assets when paired with contracting expertise bolsters venture performance.⁴

Before delving into those arguments, however, it is worth reflecting on the importance of our complementarity claim. Whether venture idea assets and contracting experience are complements or substitutes shapes our understanding of how theories of firm resources and firm boundaries should be integrated. For example, if ideas and contracting experience are substitutes, it might be better to delay bringing in contracting experience until a later stage of development or even harmful to bring in excess contractual structure too soon (however, simulation methods suggest that early-stage firms should always add more structure (Davis et al. 2009)). If they were complementary theories explaining separate aspects of organizations then we would not expect to observe an interaction effect. Rather than being conflicting theories, the recent literature argues that both organizational resources and theories of the firm shape firm boundaries (Madhok 2002, Silverman 1999, Argyres and Zenger 2009). In the arguments that follow, we extend this line of research by articulating a rationale for why particular strategic resources in the context of new venture development are likely to positively interact with factors shaping firm boundaries.

⁴ For other examples of firm productivity complementarity, see the empirical studies by Ichniowski, et al. (1997) and Bresnahan, et al. (2002).

Ventures with strong idea assets are likely to produce more uncertain and novel products, which also yields higher variance and a larger range of potential values compared with resources and products that are less novel. There is likely greater uncertainty about the firm structures and contracting decisions that are well aligned with efficient commercialization in such a novel products organization. A firm commercializing less novel resources is more likely to be able to observe similar firms and imitate their contractual terms whereas a firm with more unique resources must make these decisions on their own. In addition, firms with employees involved in novel tasks may face more potential contractual hazards such as unobservable effort levels and the need for workers to make specific investments that are not necessarily valued in the external labor market. For example, if optimal contractual arrangements incentivize specialized human capital investments or greater effort in developing the firm's non-human assets (Hart and Moore 1990) then they would unlock more of the potential value in novel ideas for resource combinations. In such firms, effort may be more unobservable and difficult to contract upon and outcomes may be more uncertain. Therefore contracting directly on output can be problematic, as failure could result from high- as well as low-effort (the former result through being unlucky, the latter through employee shirking).

In addition, firms with significant venture idea assets also have a greater complementarity with contracting experience because they are more likely to need to efficiently transfer (largely tacit) information through the organization. For example, if a venture is targeting new markets, sales and marketing personnel may have information on latent consumer needs that must be efficiently transferred back to the venture. Specialized investments could build greater tacit knowledge among researchers or those in sales and marketing. This tacit knowledge can be used to find new uses for the firm's resources (Penrose 1959). Contracting experience can help ensure these specialized investments in the firm are made and thus increase the likelihood that venture idea assets result in new uses and markets for the firm's resources. In these ways, venture idea assets would be even more valuable when combined with contracting experience for organizational structure, and so we predict:

H3: Founding team contracting experience complements venture idea assets in generating

additional value so that startups with both will be associated with higher performance.

Data and Measures

Empirical Strategy. We seek to understand if more of the variance in firm performance is explained when contracting experience is integrated with the organizational capabilities-based view. Two main empirical challenges must be overcome – measurement and identification. We will address measurement after introducing the empirical context and we delve more deeply into identification after building up from simpler models. The specification of the statistical model is as follows:

$$E[y_i | x] = \alpha + \rho'z_i + \beta'x_i + \Gamma'z_i x_i + \gamma'X_i + \eta + \varphi + \eta\varphi + \varepsilon_i \quad (1)$$

In this equation, y_i represents our measures of firm performance, x_i is a vector of characteristics representing founding conditions concerning the venture idea assets. The variable z_i is a vector of characteristics encompassing the sophistication of the founding team in terms of contracting (governance and transactional arrangements). The vector X_i includes our control variables. The variables η and φ represent year and industry sector dummies. Equation (1) provides a framework to assess whether idea assets or contracting experience are complementary (and $\Gamma > 0$).

Data. Despite much work on the determinants of performance among large firms (Schmalensee 1985, McGahan and Porter 1997, Rumelt 1991), and a good deal of literature on when large firms fail (Henderson 1993, Tushman and Anderson 1986), very little attention has been paid to testing theories of performance among entrepreneurial firms (for exceptions, see Eisenhardt and Schoonhoven 1990, Roberts 1991). This is an important omission, as formation is when much of the enduring competitive advantages, unique assets, or capabilities that form the foundation of many theories of performance and firm strategy are put into place (Burton and Beckman 2005). If only existing large firms are included in the sample then other firms might have had similar capabilities or similar internal organization but failed, leading to questions of survivor bias in empirical work. Thus, young entrepreneurial organizations would seem to be the most interesting and valuable place to test theories of the firm because of greater variation.

We use a dataset initially composed of 43,668 records of MIT alumni who responded to a 2001 survey of all living alumni (105,928 surveys were sent out for a response rate of 41.2%). These records

along with the traditional response bias analyses for characteristics of the individuals have been described previously so we refer the interested reader to that discussion (Hsu et al. 2007). Of the respondents to the 2001 survey, 7,798 individuals (17.9% of the respondents) indicated that they had founded a company. These individuals were then mailed a second survey in 2003 that asked detailed questions about the formation of their firms. 2,111 founder surveys were completed, representing a response rate of 27.1%. In 2006 we updated the information on the revenues and employment of the companies. Due to temporal right censoring, we drop all firms founded after 1998 in order to have enough time since founding for performance measures to have meaning. We also drop architecture and consulting firms to focus on firm founding rather than self-employment or partnership based firms. The advantage of our data is the ability to know the sources of the start-up idea and also the origins and details of the initial founding team along with the multiple performance measures.

Dependent Variables

Since our focus is on testing two different theoretical stances on the drivers of firm performance, we use two measures of performance as the dependent variables. The variable *log employees* uses the natural log of the employee count for the most recent fiscal year in operation. We also have data on acquisitions and initial public offering (IPO) exits that the firms underwent. The variable *exited* is equal to one if the firm experienced an acquisition or IPO and zero if not (as of 2003). The employee count is one measure of the firm size and a common goal of many entrepreneurs whereas not all seek acquisition or choose to initiate an IPO. However, some firms may have an acquisition or IPO before significant size in terms of employees has been achieved. We therefore seek result robustness across the two measures of firm size and liquidity event. When *log employees* is the dependent variable, we use OLS as the estimation method, and for analyzing *exited* as the dependent variable, we use a logit specification.

Independent Variables

Venture Idea Assets. Firm capabilities have typically been defined in terms of technological capabilities of the firm (i.e., mainframes vs. programming). The prior literature focusing on boundary decisions and capabilities has used patent-based measures (Silverman 1999), interviews with industry

experts and executives (Mayer and Salomon 2006), or labor productivity (Jacobides and Hitt 2005) as capability measures. Since young firms may be expected to lack patents (or still have them in the founder's names rather than the firm name) and a large number of observations precludes interviewing experts on each firm, we take a different approach. We measure venture idea assets via a composite index of observable characteristics of the founding team as related prior literature has done (Beckman 2006, Higgins and Gulati 2006) and also the source of the idea leading to the founding.

A growing literature examines the impact of scientists and faculty at the firm level in both large and entrepreneurial firms (Cockburn and Henderson 1998, Murray 2004). The initial founder characteristics should be expected to apply and have a strong imprint lasting later in the life of the firm (Burton and Beckman 2008, Stinchcombe 1965). Building on this work, we argue that the presence at founding of certain technical individuals more specialized in evaluating and developing ideas for new resource combinations represents the venture idea assets. For example, academic faculty members or researchers (particularly those in engineering and the sciences) have high levels of human capital but it tends to be focused on developing technologies and ideas for new resource combinations, not on structuring firms and governance issues. Following the line of previous work on star scientists as a source of unique capabilities for firms (Cockburn and Henderson 1998, Murray 2004, Rothaermel and Hess 2007, Zucker et al. 1998), we examine the impact of faculty involvement in new firm founding. Additionally, academic faculty members are busy and have high opportunity costs for their time, so tend to become involved in company founding only if the research is especially promising. Individuals better able to screen and develop novel ideas have higher opportunity costs to working with ideas with less potential. Human assets specialized in idea screening/development in the form of a university faculty member is a sign of a higher value idea for a novel bundle of resources/capabilities. Previous work has found a positive association between the presence in a young firm of a strong Chief Scientific Officer and the number of institutional investors deciding to provide financing (Higgins and Gulati 2006). We include a dummy variable for whether the entrepreneur indicated a *role of university faculty* and use the presence of such individuals at founding as an empirical proxy for an R&D capability for identifying and

developing non-human organizational assets. We also code *idea from research* if the founder indicated that the idea leading to the start-up product or service came from a research lab. *Idea from research* includes outside funded research while in school, graduate theses, in class, conferences, reading research literature, and other research. Our composite measure of *venture idea assets* is equal to zero if neither of these conditions are met, equal to one if only one is met and is equal to two if the firm has both a faculty member involved in founding and an idea from research. The results were consistent with using these measures independently as well. This is consistent with the findings of others that firms investing in one R&D activity also tend to invest heavily in related activities and competencies as well (Henderson and Cockburn 1994, Milgrom and Roberts 1990). Thus our measures are probably best interpreted as indicators of a stronger set of venture idea assets rather than as causal variables.

Contracting Experience. Most studies of the role of transaction costs have measured the level of contracting hazards in an industry or transaction and associated those with a higher likelihood of integration. In this work firm contracting has been defined in terms of hazards of contracting such as asset or timing specificity, observability, or risk of expropriation. Some have used different types of mortgage contracts to proxy for transaction risks (Jacobides and Hitt 2005); others have measured asset specificity, turnover in top management and lines of business (Kaplan et al. 2009). However, measures at the transaction or industry level do not shed light on firm-level variance in contracting. The few studies examining variation in firm contracting sophistication rather than external contracting hazards have relied on indirect measures. Studies have looked at contractual terms as a signal of sophistication such as the use of exclusive territories in franchising (Azoulay and Shane 2001) or changes in contract terms over time that cannot be attributed to other sources (Mayer and Argyres 2004). Building on prior work (Azoulay and Shane 2001, Shane 2001) we expect that the firm founders vary in the extent of their knowledge of efficient contracts and we use proxies for the level of contracting expertise present in the founding team.

Our measures for experience in contracting include a composite index of two proxies for contracting experience. Those with prior acquisition experience, and those playing non-technical (sales and marketing or finance) roles in the founding team will have more experience in structuring contracts.

Acquisition deals have been shown to be quite complex, entailing negotiation on multiple terms and contingencies that take up significant managerial time and attention (Hitt et al. 1990, Walsh 1989). Top executives often stay with the firm post-acquisition to help handle the complex post-acquisition integration and organizational design of the newly integrated firm (Larsson and Finkelstein 1999, Walsh 1989). We expect that managers who have gone through this complex acquisition and integration process would have greater experience in efficient contracting and governance issues. We include *prior acquisition* as a dummy variable proxying contracting experience since these individuals have structured new firms and completed complex deals to sell them to other companies. Hsu (2007) found that entrepreneurs with prior start-up founding experience had shorter timing to venture capital investment and higher valuation, which might also be signals of greater expertise in contracting issues. We include a measure of *contract founder*, which is equal to one if an individual present on the founding team was in a non-technical (sales, marketing, or finance cofounder) role. Our *contracting experience* index is equal to zero, 1 or 2 depending on if neither, one or both factors are present. Similar to our R&D capability measures, these are best interpreted as indicators or ‘proxies’ of greater expertise in contracting or organizational structure issues, rather than as causal variables themselves.

Moderating and Control Variables. Our predictions involve two moderating variables: VC funding and weak appropriability environment. We define a dummy variable, *VC*, indicating whether the venture ever received venture capital funding. We also define *weak appropriability* as a variable taking the value of 1 for the following industries: consumer products, software, electronics, aerospace, energy, finance, and machinery industries, and equal to 0 for biomedical and chemical industries. The industries in the weak appropriability camp are those in which formal intellectual property protection has been noted to be difficult (e.g., Levin et al. 1987).

A growing consensus from the entrepreneurship literature is that founding teams who had worked together previously tend to launch more successful firms (Roure and Maidique 1986, Eisenhardt, Schoonhoven 1990, Beckman 2006). A natural tendency towards homophily has been found as teams form (Ruef et al. 2003). Faster decision-making, better coordination, higher trust, and mutual

understanding all have been found in more homogeneous teams (Eisenhardt and Schoonhoven, 1990, Zenger and Lawrence 1989). A question on the survey asked, “Where did you meet the other founders?” We coded the responses for *team met via work* and *team met via family* based on survey responses. Another survey question asked: “What was the source of the idea for the product or service leading to the founding of the company? *Idea from work* includes responses of working in industry and also working with an outside company while in a university. A set of industry dummies controls for the industry segment identified by the entrepreneur (e.g., biomedical, chemicals, electronics). Since we know the employee count for a particular year, we include a set of *employee year* fixed effects. The set of year dummies captures temporal changes in the economy. In addition we include a control for the founding year and a set of founding year times industry sector fixed effects under the assumption that beyond general macroeconomic trends across fields, industry trends over time may affect performance as well. We control for the *number of cofounders* as well as the *functional diversity* of roles represented on the founding team. This control alleviates concerns that the contracting proxy is picking up logistics, finance or sales and marketing expertise. Finally to reduce concerns that the contracting proxy is picking up the experience level of the founder, we control for the *founder’s age* as well as educational attainment in the form of Master’s or Doctorate degrees. We also include a control for *angel*, which is a dummy variable indicating whether the venture received funding via an angel investor. To control for the fact that older firms tend to be larger and at greater propensity for an acquisition or IPO event, we control for *log firm age* as the natural log of the number of years the firm has been alive since the founding year.

Analysis and Results

Table 1 shows the univariate difference in means tests for *log employees* and *exited* conditional on low and high levels (0 and 2, respectively) of venture idea assets and contracting experience. Significance tests are reported for differences in conditional means from left to right in Panel A, showing that higher levels of idea assets, contracting experience and the combination of the two are associated with significantly greater firm size and likelihood of an IPO or acquisition. Panel B shows that idea assets are significantly more important for performance when firms are in weak appropriation environments.

Panel C shows that contracting experience is significantly more important for firm performance when firms lack VC funding.

Insert Tables 1 - 3 about here

Table 2 presents variable definitions and summary statistics. Table 3 is the pair-wise correlation table. While the univariate difference in means tests in Table 1 suggest initial support for our predictions, we turn our attention to Table 4 to examine if the results hold after introducing controls. Starting with the controls, we find that firms with a larger *number of cofounders* had significantly higher numbers of employees and were more likely to achieve an acquisition or IPO exit. Firms receiving venture capital (VC) funding were also significantly higher performers and older firms (*log firm age*) had significantly more employees and a greater likelihood of exit. Firms started by individuals with *doctorate degrees* were significantly lower in likelihood of exit events but not smaller in terms of employees. Turning to the tests of hypothesis 1a in model (4-1), the coefficient on idea assets is positive but fails to reach statistical significance. In (4-2) we substitute *exited* for *log employees* as the dependent variable and again find no significant difference in the likelihood of exit for firms with idea assets. Models (4-3) and (4-4) test hypothesis 2a that contracting experience is associated with higher performance. Contracting experience is associated with greater numbers of employees ($p < 0.05$). While the coefficient in (4-4) is positive, indicating a higher likelihood of exit, it does not reach statistical significance. Models (4-5) and (4-6) test hypothesis 1b that idea assets are more important in a weak appropriation environment. Supporting the hypothesis we find that the interaction term has a positive and significant coefficient indicating that idea assets in a weak appropriation setting lead to more employees ($p < 0.01$) and a greater likelihood of exit ($p < 0.05$). The coefficient on idea assets is now negative and significant, indicating that in strong appropriation environments, idea assets are associated with lower performance on average. Contracting experience remains positive but only significant at the 10% level in Model 4-5. Next, (4-7) and (4-8) test hypothesis 2b that contracting experience is more important when VC funding is absent. We include an interaction term for contracting experience and VC funding and find that its coefficient is negative and

significant for both dependent variables. This indicates that the impact of contracting experience is significantly greater (less) when VC funding is absent (present) and the firm's resources and reputation is more limited. Finally, (4-9) and (4-10) test the hypothesis of a positive interaction between idea assets and contracting experience. The coefficient on the interaction term is positive and significant at the 10% level for greater numbers of employees. In model (4-10), the coefficient is positive and significant ($p < 0.01$) indicating that firms with both idea assets and contracting experience are significantly more likely to have an exit.

Insert Table 4 about here

The real effects implied by this analysis are strong, especially for increasing the likelihood of an exit event in the form of acquisition or IPO. In a weak appropriation environment, having idea assets provides a 16.6% greater likelihood of an exit and 4.5% more employees for the average firm, holding all else equal. Idea assets increase the likelihood of an exit by 6 times in a weak appropriation environment compared to their effect in a strong appropriation environment. Without VC funding, contracting experience increases the likelihood of exit by 159% and employees by 11.9%. The presence of VC funding increases the likelihood of exit by almost 10 times, however, adding additional contracting experience when VC is present reduces the likelihood of an exit by 41.4%. When contracting experience is present, adding idea assets increases the likelihood of exit by 87.8% and employees by 8.2%. When idea assets are present, adding contracting experience on average increases employees by 14.9% and the likelihood of exit 20 times over when idea assets exist alone.

One concern is that unobserved venture idea asset quality might be driving both performance and the recruitment of cofounders with contracting experience. If firms with low value venture idea assets cannot attract cofounders with contracting experience (or individuals with contracting expertise seek out only the best ventures), then this endogenous matching process would cause us to find a spuriously high coefficient on the interaction effect between contracting and venture idea assets. This is a difficult empirical challenge to entirely overcome since our key independent variables are choices and not

randomly assigned to firms, but we offer some analysis and partial reassurance that it is not driving the results. First, information and ideas tend to be dispersed in society so ideas may be likely to occur to people regardless of their contracting experience. The analysis assumes that “mismatches” occur. The coefficients on the interaction terms will be biased upwards unless some firms make mistakes in firm formation. If matching is “inefficient” in the sense that the highest quality venture idea assets do not typically pair up with cofounders with the most contracting experience, then we can identify accurate effects. Results (available from the authors) use a subsample where we are more confident of seeing inefficient matching. Removing firms where the team and idea both came from the same source (less evidence of search for optimal pairings) gives us greater confidence of accurate results. The coefficients remain significant and of similar magnitude reassuring us that endogeneity is not driving the results.

To further test whether our contracting variables might be serving as a proxy for higher human capital founders who would only become involved if there is a chance for a very high outcome we ran additional robustness tests. We ran a probit of the likelihood of being in the top 5% of the revenue distribution or the valuation at exit distribution (in the case of IPO or acquisition). The results held, and the interaction term was positive and significant, alleviating this concern and showing that the likelihood of being in the extreme right tails of the distribution increased only when both capabilities and contracting expertise were present. Unobservable heterogeneity, mainly in the form of individual ability is a concern, but mitigated by the relative homogeneity throughout the sample in terms of educational background and high human capital levels of the respondents.

In interpreting the results from this study, it is useful to keep in mind the three issues of representativeness, response rates and self-reporting. It is important to note that the respondents are alumni and therefore the sample is not limited to those currently associated with MIT or to technology coming from MIT. While these individuals have all passed through MIT, they have had diverse experiences before matriculation and since graduation. We do not claim generalizability across the spectrum of entrepreneurial activity. A second issue is possible response bias. Graduates who were unsuccessful may not have reported failed firms. However, compared to the majority of datasets using

public firms for data availability reasons, our data should exhibit less success bias. Next, retrospective bias warns that older respondents may display a memory bias particularly when asked to recall details of the company formation process. The data also may suffer from self-reporting bias since the entrepreneur reported both the dependent and independent variables. As long as these biases are not correlated with idea assets or contracting experience then our results should not be affected.

Discussion and Conclusion

Overall, the results suggest that ownership of venture idea assets and contracting experience are both important for firm performance. However, they do not benefit all firms equally. Both exhibit strong contingencies with the external environment and further, they exhibit a strong interaction internal to the firm. Ownership of venture idea assets appears most important in weak appropriation environments. Contracting experience is most important when a firm lacks resources and a reputation. Internal to the firm, contracting experience and idea assets exhibit a complementary relationship where contracting experience allows the firm to realize greater value from the venture's idea assets. Firms that lack initial idea assets and contracting experience in the founding team are not able to catch up over time.

This study extends and challenges existing work on the resource-based view. First, we extend the theory into a context where resource constraints are binding and the firm does not have an established reputation. By examining the context of entrepreneurial firms, we see the origins of firms and new resources in a situation of low resources and very little reputation. Many firms face this situation but entrepreneurial firms offer an extreme case to better test these ideas. We examine the conditions under which certain resources and capabilities are relatively more important for firm performance. Rather than asking what general types of resources generate profits, we build on work asking under what environmental or internal firm conditions do specific resources matter more (Miller and Shamsie, 2001). We provide an alternative to the notion that resources and capabilities must meet general criteria or have certain characteristics to create competitive advantage. Resources that meet the criteria for generating profits in one context may not in a different environment.

Venture idea assets have typically been thought to be a likely candidate for rent-generating resources. However, we fail to find support for the first hypothesis (H1a) and the average effect of idea assets, as we have measured them, is not significant. Our results suggest that when managers have the insight to understand which assets will be relatively more important to have in their industry context, they must prioritize developing those assets alongside capabilities and expertise that support the value of those assets. We find the counterintuitive result that venture idea assets are relatively more important in weak appropriation environments where markets for ideas do not function well. As the prior literature has suggested, if inputs cannot be easily bought and sold or the relationship between resources and performance is causally ambiguous, this keeps all firms from adopting the resource and eroding the advantages (Lippman and Rumelt 2003). Further, our results support the recent line of literature emphasizing that the development of resources should not be considered in isolation, but should rather be assessed when combined with other capabilities within the firm (Makadok 2001). We find that venture idea assets offer a significantly greater performance increase when the firm's founding team has more contracting experience. Taken together, these findings highlight the idea that assets should not be thought of as having a single value for a firm. Realization of greater value depends on deploying assets in the optimal environment and with the right configuration of organizational assets and experience around them.

The findings also contribute to the growing line of literature bringing together firm capabilities and transaction cost economics. This body of work has generally focused on how both capabilities and transaction costs determine firm boundaries, with the implicit assumption that a similar choice set is available to all firms. We instead argue that for entrepreneurial firms, vertical integration may not be feasible due to resource constraints and relational contracting may be more difficult due to a lack of an established reputation. Alternatively, entrepreneurial firms can leverage the resources and reputation of venture capital firms. However, for entrepreneurial firms without such partners, formal contractual arrangement and thus contracting experience become more important. For instance, we show that when venture capital funding (or other partnerships bringing resources and reputation to the firm) is unavailable, then having a cofounder with deep experience in contracting is vital. Yet when venture capital is present,

bringing in a cofounder largely for contracting experience yields costs but little in the way of corresponding benefits not provided by the VC partnership. It is also likely that the VC has experience in contracting that may well substitute for lack of such experience within the company.

Implications for Capabilities. Firm resources and capabilities have both been theorized as driving firm performance but the relationship between the two has been unclear. The literature on capabilities has focused on performance-enhancing capabilities in established firms and another recent stream has examined how capabilities and transaction costs determine boundaries. Yet, it has overlooked how certain capabilities, in this case, more efficient contracting structures and systems may unlock greater value in certain types of resources. Our results, along with recent work, suggest that a promising direction is the integration of resource-based logics with contracting theories focused on internal firm building.

Besides shaping firm boundaries, we have shown that contracting experience has an interaction with venture idea assets. Experience in contracting allows teams to realize greater value from venture idea assets. We relax the assumptions in prior work that have emphasized the idea that assets are either generic and ubiquitous or specific to a single firm, by showing an intermediate case. Our results show that contracting experience may complement certain types of resources, such that when idea assets and contracting experience are combined, greater value is created than the sum of each individually. This process, by which idea assets and those with contracting expertise combine to generate greater value has not previously been theorized. Our results are not meant to suggest that either the resource-based literature or the organizational economics-based theory of the firm is wrong. Indeed, we see both effects in the data; however, each gives an incomplete view. Instead, each takes on greater importance depending on the industry environment. The implication is that we should assess the capacity of various contracting structures to raise the value of organizational resources rather than assuming rivalry between the theories. Broadly our results could be extended to suggest that the more novel the venture idea assets, the more important for successful commercialization is a match with individuals with contracting experience. This study provides important advances for the theory of the firm, beyond focusing on firm boundaries but rather in studying processes leading to firm performance.

Implications for Entrepreneurship. The movement in the RBV literature towards dynamic capabilities represents the idea that the beginning stages of new firm or business line formation have been under-theorized. Little research considers the origins of resources and capabilities so a major contribution of this study is examining initial resources and capabilities before they have become part of a well-established firm. Another implication of this study is for the formation of entrepreneurial teams. While a good deal of work has looked at the composition and experience of top management teams (Hambrick et al. 1996, Ruef et al. 2003), less work has looked at how different industry environments might shape the optimal founding team. The team can be conceptualized in terms of the venture idea assets and founder contracting experience. Neither is universally essential, but when both are present at founding, firms are more likely to develop and grow.

Finally, the focus on the evolution of startup firms over time and subsequent performance is related to the work flowing from the Stanford Project on Emerging Companies (Burton and Beckman 2005, Burton et al. 2002, Baron et al. 1999, Beckman et al. 2007). The overarching theoretical idea in that line of research is that some type of imprinting at the founding of a firm has a lasting effect on the organization, its strategic choices, hiring patterns, and performance (Stinchcombe 1965, Burton and Beckman 2005). Our results elaborate a mechanism through which entrepreneurs overcome the liability of newness that inhibits organizational formation (Stinchcombe 1965). Outside of a lack of legitimacy, another source of liability is that new firms often do not know exactly what assets to prioritize developing and which firm contractual structures will be best to commercialize a new idea. Our results shed light on which teams will be more likely to overcome this liability and realize the value in the ideas they are commercializing. Along with Beckman and Burton (2008), our results dispute the notion that firms can easily make up for initial inadequacies and weaknesses.

This study helps address the intersection between resources or capabilities and the theory of the firm. Recent work has focused on the choice of governance modes at firm boundaries given a firm's capabilities and hazards to contracting. However, many firms are constrained and the choice to vertically integrate may be limited by resources or appropriation environments and the option to contract may be

limited by reputational factors and limited resources. Given these constraints, we have sought to answer what types of specific resources and capabilities will matter more for the firm's performance. Specifically, in weak appropriation environments and when contracting experience is high, venture idea assets will matter more for firm performance. When the firm can leverage the reputation and resources of venture capital partners, then contracting experience matters less to the firm.

Most generally, this paper has proposed to integrate organizational economics theories of the firm, particularly its inner workings into strategic theories of capability development. This work may also aid existing efforts to better understand the fit between certain types of idea assets and the types of contracts or firm structures best suited to commercializing those ideas (Aggarwal and Hsu 2009). In integrating these literatures, we have sought to develop a more detailed conceptual model of venture idea assets and the process of firm development when choices are constrained. The results hold implications for managers and entrepreneurs in how to prioritize development of certain resources and capabilities and in founding team composition in different environments. Finally, the paper suggests promising avenues for future work integrating capabilities and the theory of the firm, in particular the performance implications of team choices in capability development and commercialization processes.

Table 1
Univariate Difference in Means Tests

Panel A	Venture idea assets		Contracting experience		Idea / contracting interaction	
	Low	High	Low	High	Low	High
Log # employees	2.994	3.552***	2.836	3.722***	3.240	4.183***
% Exited	0.279	0.500**	0.184	0.346***	0.344	0.421***
Panel B						
Venture idea assets / appropriation environment interaction						
	Low venture idea assets and strong appropriability			High venture idea assets and strong appropriability		
Log # employees	3.473			3.975		
% Exited	0.449			0.400		
	Low venture idea assets and weak appropriability			High venture idea assets and weak appropriability		
Log # employees	3.374			4.268***		
% Exited	0.432			0.800***		
Panel C						
Contracting experience / venture capital (VC) funding interaction						
	Low contracting experience and VC funding			High contracting experience and VC funding		
Log # employees	4.776			4.788		
% Exited	0.540			0.417		
	Low contracting experience and no VC funding			High contracting experience and no VC funding		
Log # employees	2.656			4.203***		
% Exited	0.209			0.524***		

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

Table 2
Variable Definitions and Descriptive Statistics

VARIABLE	DEFINITION	MEAN	SD
Dependent variables			
Log employees	Natural log of the number of employees	3.40	2.12
Exited	= 1 if venture was acquired or had an initial public offering	0.28	0.45
Contracting experience variables			
Contracting experience	= sum of <i>contract founder</i> + <i>prior acquisition</i>	0.32	0.53
Contract founder	= 1 if non-technical cofounder present (finance, marketing, etc.)	0.20	0.40
Prior acquisition	= 1 if at least one prior founded firm resulted in an acquisition	0.12	0.39
Startup resource variables			
Idea assets	= sum of <i>idea from research</i> + <i>role of univ. faculty</i>	0.24	0.46
Idea from research	= 1 if the venture idea arose through research	0.17	0.38
Role of univ. Faculty	= 1 if univ. faculty member played a role in venture founding	0.05	0.22
Control variables			
Weak appropriability	= 1 for consumer products, software, electronics, aerospace, energy, finance, and machinery industries and 0 for biomedical and chemicals industries.	0.86	0.35
VC	= 1 if the firm received venture capital (VC) funding	0.25	0.43
Angel	= 1 if the firm received angel investor funding	0.07	0.26
Team met via work	= 1 if the venture team met through work	0.54	0.50
Team met via family	= 1 if the venture team was related as family	0.09	0.29
Idea from work	= 1 if the venture idea arose through working in industry	0.60	0.49
Year founded	Year in which the venture was founded	1985	10.88
Number of cofounders	Count of the number of cofounders	2.02	1.79
Functional diversity	Count of the number of functions (engineering, finance, sales and marketing) present on the founding team (max 3)	1.22	0.46
Master's degree	= 1 if the founder/respondent's highest degree is a Master's	0.42	0.49
Doctorate degree	= 1 if the founder/respondent's highest degree is a Ph.D.	0.17	0.38
Founder age	Age of the founder/respondent	38.70	10.43
Log firm age	Natural log of the number of years in operation	2.73	0.63
Employee year	Most recent fiscal year for employee count	2000	5.70
Industry sector	Dummy variables for industries: aerospace, machinery and other manufacturing, biomedical and chemicals, consumer products, electronics and telecommunications, energy, finance and consulting, publishing, software, and other services		

Table 3
Pair-wise correlations

		1	2	3	4	5	6	7	8	9	10	11
1	Log employees	1										
2	Exited	0.38	1									
3	Contracting Experience	0.20	0.20	1								
4	Contract founder	0.15	0.15	0.82	1							
5	Prior acquisition	0.14	0.15	0.60	0.03	1						
6	Idea Assets	0.12	0.07	-0.02	-0.01	-0.03	1					
7	Idea from research	0.11	0.03	-0.02	0.00	-0.04	0.82	1				
8	Role of univ. faculty	0.05	0.08	0.02	0.02	0.01	0.58	0.00	1			
9	Weak appropriability	-0.01	-0.01	0.03	0.05	-0.01	-0.11	-0.13	0.01	1		
10	VC	0.40	0.28	0.14	0.10	0.11	0.14	0.14	0.05	-0.01	1	
11	Angel	0.06	0.04	0.17	0.18	0.05	0.03	0.00	0.06	-0.05	0.12	1
12	Team met via work	0.09	-0.01	0.10	0.11	0.02	-0.17	-0.21	0.01	0.08	-0.02	0.05
13	Team met via family	-0.04	-0.12	0.01	0.03	-0.02	-0.07	-0.05	-0.04	0.00	-0.12	-0.05
14	Idea from work	0.02	0.00	0.02	0.01	0.02	-0.36	-0.40	-0.06	0.12	-0.06	-0.09
15	Number of cofounders	0.26	0.20	0.45	0.50	0.09	0.10	0.10	0.08	0.01	0.24	0.21
16	Functional diversity	0.18	0.17	0.68	0.85	0.01	0.03	0.03	0.04	0.04	0.14	0.16
17	Master's degree	0.03	0.00	-0.02	-0.01	-0.03	0.07	0.07	0.01	0.01	0.03	-0.01
18	Doctorate degree	-0.04	-0.03	-0.01	-0.03	0.03	0.12	0.09	0.07	0.02	0.02	0.01
19	Founder age	-0.16	-0.14	0.08	0.00	0.14	-0.10	-0.11	-0.02	-0.08	-0.12	-0.03
20	Log firm age	0.24	0.20	0.02	-0.02	0.05	0.12	0.07	0.11	-0.11	-0.05	-0.07
21	Employee year	-0.03	-0.25	-0.10	-0.11	-0.03	0.00	0.02	-0.06	-0.04	0.00	0.03
22	Year Founded	-0.21	-0.18	0.02	0.01	0.01	-0.12	-0.08	-0.11	0.07	0.11	0.08
		13	14	15	16	17	18	19	20	21	22	
13	Team met via family	-0.15	1									
14	Idea from work	0.34	-0.04	1								
15	Number of cofounders	0.05	-0.02	-0.06	1							
16	Functional diversity	0.09	-0.02	0.04	0.54	1						
17	Master's degree	-0.07	0.04	-0.03	0.01	0.01	1					
18	Doctorate degree	-0.11	0.02	-0.06	0.01	-0.03	-0.06	1				
19	Founder Age	0.19	0.00	0.06	-0.06	-0.03	-0.03	0.01	1			
20	Firm Age	0.04	0.04	-0.01	-0.02	0.05	-0.03	-0.06	-0.05	1		
21	Employee year	-0.01	0.00	0.00	-0.13	-0.09	0.05	0.01	0.07	-0.03	1	
22	Year Founded	-0.04	-0.07	0.05	0.02	-0.02	0.07	0.06	0.15	-0.74	0.31	1

Table 4: Startup Size and Liquidation Event Regressions

VARIABLES	Ln(Emp) (4-1)	Pr(Exited) (4-2)	Ln(Emp) (4-3)	Pr(Exited) (4-4)	Ln(Emp) (4-5)	Pr(Exited) (4-6)	Ln(Emp) (4-7)	Pr(Exited) (4-8)	Ln(Emp) (4-9)	Pr(Exited) (4-10)
Idea assets	0.281 (0.261)	-0.120 (0.386)			-1.460** (0.670)	-1.164* (0.614)	0.324 (0.252)	-0.117 (0.393)	-0.144 (0.348)	-1.153** (0.559)
Contracting experience			0.599** (0.240)	0.385 (0.337)	0.489* (0.266)	0.040 (0.188)	0.963*** (0.274)	0.954** (0.405)	0.455* (0.252)	0.041 (0.365)
Idea assets*weak appr.					1.881*** (0.715)	1.318** (0.639)				
Contracting*VC							-1.017*** (0.378)	-1.489*** (0.523)		
Idea assets*contracting									0.737* (0.424)	1.824*** (0.676)
Master's degree	0.226 (0.217)	0.006 (0.301)	0.209 (0.211)	0.013 (0.300)	0.216 (0.244)	0.032 (0.175)	0.148 (0.210)	-0.065 (0.307)	0.183 (0.211)	-0.015 (0.308)
Doctorate degree	0.187 (0.276)	-0.914** (0.408)	0.235 (0.267)	-0.908** (0.406)	-0.240 (0.306)	-0.879*** (0.239)	0.243 (0.267)	-0.877** (0.409)	0.202 (0.269)	-0.836** (0.418)
Founder age	-0.013 (0.010)	-0.003 (0.014)	-0.018* (0.010)	-0.006 (0.014)	-0.008 (0.011)	0.001 (0.008)	-0.015 (0.010)	-0.002 (0.015)	-0.017* (0.010)	-0.003 (0.015)
Log firm age	0.969** (0.448)	0.252 (0.480)	0.140 (0.153)	0.208 (0.481)	0.947 (0.588)	0.046** (0.023)	0.106 (0.152)	0.345 (0.493)	0.125 (0.153)	0.019 (0.484)
VC	1.517*** (0.246)	1.746*** (0.365)	1.718*** (0.237)	1.719*** (0.361)	1.341*** (0.257)	0.810*** (0.189)	2.298*** (0.327)	2.664*** (0.506)	1.675*** (0.237)	1.757*** (0.371)
Angel	0.070 (0.339)	-0.827* (0.502)	0.089 (0.326)	-0.825* (0.500)	-0.140 (0.391)	-0.316 (0.279)	0.105 (0.322)	-0.878* (0.509)	0.045 (0.325)	-1.041** (0.523)
Number of cofounders	0.281** (0.114)	0.195 (0.147)	0.250** (0.111)	0.178 (0.148)	0.418*** (0.135)	0.158* (0.090)	0.282** (0.111)	0.227 (0.152)	0.212* (0.112)	0.166 (0.150)
Functional diversity	-0.138 (0.201)	0.126 (0.281)	-0.464* (0.247)	-0.107 (0.346)	-0.300 (0.282)	-0.021 (0.203)	-0.513** (0.245)	-0.132 (0.350)	-0.426* (0.247)	-0.018 (0.362)
Constant	3.292 (7.413)	-1.663 (2.250)	-29.03** (14.240)	1.256 (4.012)	-4.611 (3.760)	-8.361*** (1.428)	-27.17* (14.090)	-0.591 (3.996)	-29.43** (14.190)	2.162 (4.210)
Year founded F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Employee year F.E.	Y	N	Y	N	Y	N	Y	N	Y	N
Industry F.E.	Y	Y	N	N	Y	Y	Y	Y	Y	Y
Year founded*Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	413	323	400	323	294	311	400	323	400	323
R-squared	0.527	0.207	0.560	0.210	0.522	0.193	0.573	0.229	0.566	0.228

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Models 4-3 and 4-4 substitute *weak appropriability* for the industry fixed effects. *Team met via work*, *idea from work*, and *team met via family* were included as controls but coefficients are not shown to save space.

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