Innovation-Driven Entrepreneurship

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Innovation-driven entrepreneurship (IDE) is viewed as a key driver of economic growth. This review provides a structured guide to the key themes of the growing literature on the economics of IDE, which differs substantially in its nature from other types of entrepreneurship. We describe the key themes of the growing literature speaking to the central economic questions raised by IDE, including who enters into IDE activity, the nature of its founding teams and organization, its financing, the strategic choices faced by IDE founders, and policy and programs to support IDE activity. The tendency of much of the empirical economics literature to date to confound IDE with other types of entrepreneurial ventures offers a significant opportunity for research focused specifically on the IDE phenomenon.

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1. Introduction

The introduction and incorporation of new ideas into the economy is pivotal to our current understanding of economic growth (Romer 1990; Grossman and Helpman 1991; Aghion and Howitt 1992; Klette and Kortum 2004). New and innovative entrants play a central role in seminal growth models: the arrival rate of new innovative entrants determines the extent to which firms profit from innovation, and, in turn, the propensity for future investment in innovative activity, driving overall economic growth.

The concept of the entrepreneur as an important source of this integration of innovation into the economy dates back as far as Schumpeter (1942). Schumpeter describes the entrepreneur as engaging in a process of "creative destruction" in which newer (and better) products and modes of production are continually introduced to the market to replace old products and production methods. Recent empirical studies have further emphasized the importance of new firm entry in fostering economic growth (e.g., Davis and Haltiwanger 1992; Davis, Haltiwanger, and Schuh 1998; Haltiwanger, Jarmin, and Miranda 2012; Decker et al. 2014). These empirical studies support the notion that economic growth is fundamentally grounded in business dynamics—the process of firm entry, expansion, contraction, and exit (e.g., Jovanovic and MacDonald 1994). For example, studies using US Census data show that job growth is disproportionately driven by new firms (Davis and Haltiwanger 1992; Davis, Haltiwanger, and Schuh 1998; Haltiwanger et al. 2012; Decker et al. 2014; Fairlie et al. 2023).

These young firms, however, exhibit a positive skewness in their growth rate distribution. Newer studies have shown that the relationship between entrepreneurship and economic growth is not primarily driven by the sheer *volume* of new firm activity but rather by a smaller subset of high-growth startup outcomes (Haltiwanger et al. 2012; Decker et al. 2014). This phenomenon is observed not only in the US, but also across many other developed countries (Bravo-Biosca, Criscuolo, and Menon 2016). The small number of firms that realize high growth represent an ex post measure of entrepreneurial success. Ex ante, entrepreneurs sort into a variety of types, including those with the express intent to integrate new, innovative ideas into the economy. Some of the firms that eventually experience high growth outcomes may have intentionally aimed to innovate and grow, while others may achieve significant growth without any initial intent to innovate. Many of the firms that experience these successful growth outcomes, however, appear to have been founded with innovation in mind (Luttmer 2011; Guzman and Stern 2020).

Although the level of innovation orientation of new founders is not always straightforward to ascertain ex ante, it is of considerable interest to entrepreneurs, policy makers, and researchers.[1] Empirically, innovation-driven startups seemingly play an outsized role in the economy, consistent with the importance ascribed to innovation-driven entrants in economic theories of growth, venture capital (VC) backed firms—which are almost exclusively innovation-driven—account for over 50% of the new public offerings on US stock markets (Kaplan and Lerner 2010), 20% of US stock market capitalization, and 44% of research and development spending in the US (Gornall and Strebulaev 2021). They are also highly concentrated geographically. For example, firms in Silicon Valley alone account for close to 50% of venture capital allocations and nearly 20% of patents in the US—despite only representing 2.5% of the US population (Kerr and Kominers 2014; Guzman and Stern 2015; Kerr and Robert-Nicoud 2020). This geographic clustering has a dramatic impact on the productivity of inventive labor (Moretti 2021). Within these clusters, increased VC activity correlates with increased in employment and aggregate income (Samila and Sorenson 2010), consistent with findings that VC-backed firms grow larger and employ more people on average (Puri and Zarutskie 2012; Kerr, Nanda, and Rhodes-Kropf 2014), and the existence of wage multipliers for workers in other sectors of the economy in regions with robust innovation-driven entrepreneurial growth (Moretti and Thulin 2013).

In economic theory, the general definition of an entrepreneur has been varied, ranging from individuals who take economic risks (Knight 1921; Kihlstrom and Laffont 1979), to those who innovate and render older technologies obsolete (Schumpeter 1942), to those who assemble human, physical, and information resources in an efficient manner (Lazear 2004). Researchers have studied populations ranging from subsistence entrepreneurs (typically defined as poverty-driven individual entrepreneurship that provides for the entrepreneur and their family as a substitute for low-wage employment or unemployment), to the self-employed (freelancers, consultants, lawyers, and doctors in private practice, and gig economy workers), to the incorporated employer business, whether oriented towards a traditional business model or towards innovation. We begin by emphasizing the need for researchers—and especially those interested in informing policy and identifying driving

[1] Recent studies propose methods to partially predict growth intentions ex ante, taking advantage of the fact that founders themselves at founding have information about the underlying innovativeness of their idea and their level of ambition and make costly choices at that time consistent with their objectives and potential (such as patenting) that are observable and that correlate with the eventual high-growth outcomes of interest to economic researchers (Guzman and Stern 2015; 2020).

mechanisms—to differentiate in their work between varying types of entrepreneurial activity, given that each type has distinct dynamics and needs.[2]

Given the importance of introduction and integration of new innovation for economic growth, this article focuses on *innovation-driven entrepreneurship* (IDE) in particular.[3] Innovation in an IDE venture could be thought of as the product of technological or scientific advances, business model innovation, or business process innovation—"new blueprints" in the language of Luttmer (2011) or "new recipes" in the language of Romer (1990). In contrast, a non-innovating, "traditional business" entrepreneur will typically be characterized by the use of existing business approaches to solve existing problems in existing markets, and for which there is significantly less uncertainty. Although traditional business entrepreneurs are a vital part of the overall economy, studies of small business owners often emphasize the low growth prospects of the modal such entrepreneur (see e.g., Evans and Leighton 1989; Hamilton 2000; Schoar 2010; Hurst and Pugsley 2011; La Porta and Shleifer 2014; Levine and Rubinstein 2017). Most entrepreneurs operate small traditional businesses and are different from the Schumpeterian view of "innovation-driven" entrepreneurs—with little ex ante desire to grow, innovate, or bring new products to market.

Our categorization of IDE and non-IDE in this review intentionally abstracts away from the size aspect of the oft-referred to term "small and medium-sized enterprises," often referred to as "SME." Small firms with regional aspirations can still be characterized by significant innovation, and traditional businesses with limited innovation can still grow large and compete globally. Differentiating between innovation-driven and non-innovation-driven is a matter of degree. Although we refer to these groupings as if they are distinct categories, they may overlap at the margin, with assignment to a specific category subjective and dependent on the assignor's perception of the degree of innovation involved. New ventures can vary substantially in the degree to which they pursue radical innovations, incremental innovations, or any innovations at all. Small innovations may be present

[2] Schoar (2010) provides an excellent discussion of subsistence entrepreneurship for the interested reader. An overview of the literature on self-employment can be found in Parker (2004). While both these categories of entrepreneurial activity are important and influential areas of research that deserve their own coverage, they are distinct from the process of creating an incorporated, employer business, whether innovation-driven or non-innovation driven.

[3] Our definition builds upon the typology first offered in the management literature by Aulet and Murray (2013), who coined the term "innovation driven entrepreneurship" and delineated between IDE and small and medium-sized enterprises (SMEs).

even in ventures typically considered "traditional." In this sense, innovation-driven ventures and non-innovation-driven ventures can be thought of as two ends of a spectrum.[4]

How then should one think about "innovation-driven" in this setting? One way to characterize IDE is to view "innovation" through the lens of differentiation, as discussed by Rajan (2012). Rajan characterizes differentiation as the process in which an entrepreneur assembles a team and assets to create an organization that produces distinctive goods and services. In Rajan's framework, the differentiated nature of the venture's activities is critical for value creation, but also introduces risk and uncertainty, complicating the coordination of enterprise-building activities and access to financing. Rajan argues that producing differentiated products often requires the acquisition of special skills that have little outside market value, the establishment of facilities in locations with few alternative uses, and the assembly of machinery in new ways that make them hard to sell and replace. To manage these complexities, the initial structure of the firm typically involves the entrepreneur maintaining significant ownership and control over assets. Such an arrangement supports differentiation and incentivizes collaboration with others. Here too, differentiation exists on a spectrum, and the categories may overlap at the margin.

An innovation-driven startup under this characterization introduces significant differentiation from existing approaches and competitors.[5] In line with canonical endogenous growth theory, new entrants are motivated to invest significant resources in innovative differentiation in order to sweep the market from incumbents and become product market monopolists, driving the creative destruction central to Schumpeter's view of the modern market-based capitalist economy. This differentiation allows innovators to create significantly different output value relative to their inputs of capital and labor. Thus, an innovation-driven startup creates a new "recipe" in the economy, allowing them to generate a unique markup in value compared to their competitors (Aghion and Howitt 1992; Klette and Kortum 2004; Luttmer 2011).

Although entrepreneurial firms that do not initially aim to innovate can do so, the ex ante innovation-orientation (or intention) of IDE is important. The drivers of founding, operating, funding, growth, and success likely differ substantially for such companies versus the typical small business.

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[4] Our review specifically focuses on innovation-driven entrepreneurship because the nature of IDE firms is sufficiently distinct to warrant a separate treatment. We leave coverage of other types of entrepreneurial activity to others.

[5] This differentiation typically occurs in two main forms: creating a new class of products that satisfy the same need in a radically different way (e.g., the car versus a horse cart), or providing a novel input to an existing product that significantly improves it (e.g., a solid-state hard drive versus a spinning disk).

The high risk and uncertainty associated with new, innovative business models and technologies impact a variety of inputs into the entrepreneurial production function. Innovative new ideas take many forms, ranging from brand-new discoveries to innovative recombinations of existing material and labor (Luttmer 2011). Theory suggests that the limits to innovation-driven growth lie in our ability to process these ideas into usable form (Weitzman 1998). This combinatoric feedback process likely requires specialized human capital and team structures. The uncertain nature of the innovative process, which makes it difficult for agents to construct precise probabilistic models (Admati and Pfleiderer 1994), means that innovation-driven ventures require different approaches to financing and enter into different contracts with their investors. Founders of innovation-driven ventures have imperfect information and limited resources, which challenge their ability to discern the "correct" strategic choice. Because IDE differs from traditional new business entrants along the above dimensions, policy and programs to support IDE specifically may also differ.

Despite this, researchers often treat all types of entrepreneurs—from the self-employed gig worker, to the small business entrepreneur opening a corner store, to the ambitious engineering prodigy seeking to disrupt an industry—as a homogenous group (Hurst and Pugsley 2011), confounding our understanding of the true impacts of entrepreneurial activity on the economy. For example, different definitions of entrepreneurship lead to different conclusions about the rate of entrepreneurial activity: population-level indices such as the Business Dynamics Statistics Database suggest a secular decline in the rate of business dynamism and new firm formation overall (Hathaway and Litan 2014; Decker et al. 2016), while research focused on VC documents a sizable increase in the funding of innovation-driven entrepreneurial businesses (Gornall and Strebulaev 2021).

It is with this broad framework in mind that we undertake to present a guide to the key themes in the literature on IDE. Much of the IDE literature to date has been empirical, often comprising descriptive studies that attempt to frame the phenomenon and make comparisons to the predictions of canonical theory papers. A smaller subset has aimed to measure causal effects within the phenomenon. Given the potential breadth of the topic, we focus our discussion on papers that either offer key theoretical insights or important empirical patterns that form the foundation of our understanding of how IDE differs from other types of entrepreneurship. Our goal is not to be encyclopedic, but instead to provide a structured introduction to the key literature. By necessity, this means that some very well-executed papers in the IDE space are not included in this survey. For the interested, we include a supplemental reading list in the Online Appendix. Given that the study of

entrepreneurship is interdisciplinary, references from psychology, sociology, and management are part of our discussion. We occasionally refer to such studies in our review, though we may not discuss them in detail, and instead refer the interested to existing reviews from those fields (see e.g., Kerr, Kerr, and Xu 2018; Botelho, Gulati, and Sorenson 2024). The Online Appendix also provides references to papers in adjacent disciplines that are related to the topics we cover.

Tables 1-5 provide short summaries of the literature in each category covered and list the studies we discuss by topic and subtopic. We restrict ourselves almost entirely to studies that provide findings specific to IDE, and distinguish between theory papers, descriptive empirical studies, and causal empirical studies. Many studies make use of assumptions to categorize entrepreneurial ventures as IDE or non-IDE; throughout the review, we rely on our professional judgement to determine whether such assumptions are reasonable and categorize studies accordingly.[6]

The survey proceeds as follows. Section 2 covers entry into IDE activity, while Section 3 discusses innovation-driven startup founding teams and organization. Section 4 discusses financing of IDE ventures. In Section 5, we explore the strategic choices faced by innovation-driven startup founders. Section 6 offers a brief discussion of policy and programs to support IDE activity. Section 7 concludes with thoughts on directions for future research.

2. Entry Into Innovation-Driven Entrepreneurship

Presumably, individuals will enter into entrepreneurship only if the utility of entry exceeds their utility for wage employment. Many factors may enter this utility function: Entry may happen when an individual expects to earn more from entrepreneurship than from wage employment, and/or when they highly value the non-wage aspects of entrepreneurship. In the theoretical literature, the mechanisms that separate entrepreneurs from wage workers can be grouped into three broad buckets: (i) individuals with distinct preferences such as low risk aversion or non-pecuniary preferences against wage labor (e.g., Kihlstrom and Laffont 1979; Hamilton 2000); (ii) individuals with distinct human capital or entrepreneurial quality (e.g., Levine and Rubinstein 2018); and (iii) individuals with greater access to resources, such as wealth or credit (e.g., Evans and Jovanovic 1989). Ultimately, these theoretical models propose different mechanisms by which the rewards of entrepreneurship outweigh the risks for some individuals but not others. The applicability of each mechanism to IDE

[6] Some studies mentioned as motivation in our discussions, but that do not directly relate to IDE, are omitted in the tables.

depends on how likely it is to shape or constrain the decision-making of the populations of individuals that are predisposed to engage in IDE activity.

Below, we discuss the economic theories of entrepreneurial entry and relate key mechanisms to entry into IDE in particular. Table 1 provides a summary of the literature discussed in this section, highlighting key citations for each subsection. The table separates research into descriptive, causal, and theoretical categories. Additionally, the table indicates whether each study's results specifically focus on innovation-driven ventures. It is worth noting the lack of causal research regarding founding teams and organization, primarily due to the challenges of randomizing these aspects and the lack of natural experiments that induce exogenous changes. In many ways, any discussion about entry into IDE is a discussion about the need for future research, as more is unknown than known.

2.1. Preference Differences

Most theoretical entry models posit that entrepreneurs start firms when the expected returns to business formation exceed their certainty equivalent or outside option. Yet, Hamilton (2000)'s seminal paper analyzing the returns to entrepreneurship writ large reveals that the median entrepreneur earns 35% less than they would have in wage employment. Analyzing broader financial measures, follow-on research supports the conclusion that the returns from entrepreneurial activity are generally insufficient justify entry (Moskowitz and Vissing-Jørgensen 2002; Hall and Woodward 2010). These findings highlight a puzzle, indicating that an additional element in the entrepreneur's utility function might rationalize entrepreneurial entry. Notably, with the exception of Hall and Woodward's study, which focuses on VC-backed entrepreneurs, the studies exploring the returns to entrepreneurial activity look at large populations of small business owners, and do not distinguish IDE from other types of entrepreneurial entrants. Two key questions arise for researchers: can preference differences help explain entrepreneurial entry in general? And how and to what extent do various preference channels apply to IDE, specifically?

Following on Knight (1921)'s argument that bearing risk is an essential characteristic of entrepreneurship, risk aversion has been a central focus in theoretical and empirical studies of entrepreneurial entry. Kihlstrom and Laffont (1979)'s influential theoretical model uses heterogeneity in risk aversion to explain why some individuals choose entrepreneurship over less risky wage work. The distribution of reward, risk and uncertainty presented to a potential entrepreneur is substantially different as we move along the spectrum from traditional business entrepreneurship to IDE. Admati and Pfleiderer (1994) emphasize the massive uncertainty that accompanies IDE, which makes it very

difficult for agents to construct precise probabilistic models, especially if they are "boundedly rational" and have limited processing powers. IDE entrants may thus differ in their levels of risk- and uncertainty-aversion relative to the population at large, and potentially, relative to other types of entrepreneurial entrants.

Empirically, studies suggest that entrepreneurs in general are less risk averse relative to the general population, using risky actions, such as investment choices or illicit behavior, as a proxy for risk aversion (e.g., Hvide and Panos 2014; Levine and Rubinstein 2017). Other studies, using survey instruments to assess risk aversion, also suggest that general populations of entrepreneurs have lower risk-aversion than those in wage employment (Cramer et al. 2002; Puri and Robinson 2013). These studies consider a variety of populations that mix both IDE and non-IDE entrepreneurs, and methods of measuring risk aversion that are not incentive compatible elicitations, raising questions regarding interpretation and replicability (for example, Koudstaal, Sloof, and van Praag (2016) find differences in risk aversion between traditional business entrepreneurs and managers in survey-based measures of risk aversion, but not when using incentive-compatible elicitations).

A number of studies have attempted to address risk aversion in IDE entrants in particular, with mixed conclusions. The most notable study to explore risk aversion in IDE founders is Hall and Woodward (2010), who examine the distribution of payoffs to VC-backed firms, finding that the average individual payoff for an entrepreneurs is $4 million. This distribution, however, is highly skewed by a small proportion of billion dollar exits. Despite the high expected payout from IDE, Hall and Woodward (2010) argue that individuals with standard levels of risk aversion should still prefer wage labor over entering into IDE, implying that innovation-driven startup founders may either have lower risk aversion or non-pecuniary preferences driving them to start firms. Follow-on research by Ewens, Nanda, and Stanton (2024), however, indicates that founder compensation in innovation-driven startups increases substantially after achieving key milestones, reducing the non-diversifiable risk relative to that typically faced by IDE founders at the earliest stages of startup development and facilitating the entry of entrepreneurial talent with higher risk aversion. To date, only one study that we are aware of has directly measured the risk preferences of innovation-driven entrepreneurs. Using the updated Barsky et al. (1997) instrument for measuring risk aversion, Bailey et al (2024) measure risk aversion in a population of founding teams of 558 IDE startups across the US, finding a mean risk preference of 3.60 on a scale of 1 (most risk averse) to 4 (most risk loving), as compared to Barsky et al.'s population mean of 1.72, indicating that the IDE entrepreneurs in their sample are

considerably more risk loving than average. Greater understanding of potential differences in risk preferences between IDE and non-IDE founders would be useful. Koudstaal, Sloof, and van Praag (2016) use a multiple price list measure that differs from the escalating price list measure used in Bailey et al (2024), making comparisons difficult. Larger samples and direct comparisons using the same incentive compatible elicitations would be valuable in determining whether the entry decisions for IDE and non-IDE founders are substantively different.

Overconfidence and optimism have also been linked to entrepreneurial entry in general, as individuals with higher levels of these traits are more likely to undertake a risky project regardless of their risk aversion. Early surveys showed that entrepreneurs in general were overly optimistic about their odds of success (Cooper, Woo, and Dunkelberg 1988), and lab experiments suggested that overconfidence in one's ability predicted excess entry in entrepreneurship simulations (Camerer and Lovallo 1999). Multiple studies using nationally representative surveys have shown that individuals with higher levels of optimism and overconfidence are more likely to become entrepreneurs, though not IDE in particular (Landier and Thesmar 2009; de Meza et al. 2019), and that business owners exhibit higher optimism and overconfidence as compared to non-entrepreneurs (Puri and Robinson 2007; Holm, Opper, and Nee 2013).

While there is limited research specifically focusing on IDE, in related work, Åstebro, Jeffrey, and Adomdza (2007) find that independent inventors, a subset of innovation-driven founders, have higher levels of both optimism and confidence relative to a random sample of wage workers, and inventors with higher levels of optimism were more likely to continue working on a project that received negative evaluations of its quality. Overall, findings of higher levels of optimism and over confidence among entrepreneurs in general have been characterized as a potential source of over-entry (e.g., de Meza et al. 2019).

Researchers have also argued that non-pecuniary benefits of entrepreneurship influence the decision to start one's own small business. Hurst and Pugsley (2011) find that a large share of US business owners are motivated by factors other than money, such as wanting flexible work hours, to be their own boss, or to pursue a passion. Only 32.2% entered because they felt they had a good business idea. For many non-innovation-driven founders, entrepreneurship fits into a broader set of labor market choices that emphasize workplace autonomy (Benz and Frey 2008). As a result, it is unclear whether and which types of non-pecuniary preferences are dominant drivers for innovation-driven entrepreneurs. Hurst and Pugsley (2011) show estimates that suggest a negative correlation

between entry driven by non-pecuniary preferences and a desire to achieve growth or to develop proprietary technology. Non-pecuniary preferences might play an important role in IDE, but specific non-pecuniary preferences may differ between innovation-driven venture and non-innovation-driven venture founders. Exploration of this topic would be welcome.

There are a range of other behavioral preferences and personality traits that might differ between IDE and non-IDE, most of which have only been studied in mixed populations. Moskowitz and Vissing-Jørgensen (2002) posit that higher-order risk preferences may help explain their private equity premium puzzle, proposing that entrepreneurs may have a preference for skewness. Individuals with higher levels of internal locus of control (Rotter 1954) are more likely to start incorporated businesses relative to becoming self-employed or engaging in wage labor (Levine and Rubinstein 2017). Additionally, research has connected entrepreneurial entry to prevailing cultural norms in a region, which may impact preferences (Barrios, Hochberg, and Macciocchi 2024). Kerr, Kerr, and Xu (2018) provide an extensive review of research on the personality traits of entrepreneurs in economics, psychology, and sociology. Studies that focus on IDE specifically are lacking.

2.2. Human Capital Differences

Human capital likely plays a particularly strong role in entry into IDE, as the individuals capable of creating highly differentiated firms may require specialized human capital. Several leading theories emphasize that entrepreneurs and innovators have unique human capital traits—including creativity, analytical skills, education, and managerial acumen (Schumpeter 1942; Lucas 1978; Evans and Jovanovic 1989; Gennaioli et al. 2013; Hvide and Oyer 2018). In many theory models of entrepreneurial entry, the decision to start a firm is governed at least in part by a skill parameter which can be interpreted as the portion of an individual's human capital profile useful for entrepreneurship (see e.g., Lucas 1978; Kihlstrom and Laffont 1979; Levine and Rubinstein 2018).

There is strong evidence to support differences in the pre-entry human capital accumulation and cognitive traits across different types of entrepreneurship. Queiró (2022) finds that entrepreneurs in Portugal with more education are more likely to grow firms to a larger size. Levine and Rubinstein (2017; 2018) find that human capital substantively differs between individuals who are classified as self-employed versus those who incorporate their business. "Jacks-of-all-trades" theories suggest that entrepreneurs require a wide breadth of human capital in order to overcome the organizational limitations of new, small firms (Lazear 2004; 2005). Other theories emphasize non-routine cognitive

skills, such as creativity, analytical flexibility, and generalized problem solving (Levine and Rubinstein 2017; Bernstein, Colonnelli, et al. 2022).

Empirically, in samples of engineers and inventors more broadly, the probability of IDE entry increases when individuals develop more exposure to varied tasks either through more frequent job hopping, exposure to smaller firms, or different roles (Burton, Sørensen, and Beckman 2002; Elfenbein, Hamilton, and Zenger 2010; Åstebro and Thompson 2011). Overall, research suggests the existence of a premium on possessing a variation of skill types, especially for innovation-driven entrepreneurs. Empirical studies also suggest that this premium may be bolstered by age: it may take time to acquire the skills required to successfully enter growth entrepreneurship, especially in societies where key roles are already filled by older individuals (Liang, Wang, and Lazear 2018; Azoulay et al. 2020). The literature lacks causal estimates on the returns to variation in age and experience, however. The fact that innovation-driven ventures have larger founding teams (as we discuss in Section 3) is consistent with the possibility that individual skill diversity can be less important for certain types of ventures, if the needed skill diversity can be assembled across a team.

Education has also been a subject of much interest. Administrative data sets on the US population suggest that educational inputs are critical for both patenting and entry into entrepreneurship, although not into IDE specifically (Bell et al. 2019; Chetty et al. 2024). Innovation-driven startup founders are more likely to have graduate degrees, especially in science, technology, engineering and mathematics (Burton, Sørensen, and Beckman 2002) and entrepreneurs with elite schooling have a greater breadth of human capital relative to non-entrepreneurs (Lazear 2004). There is little systematic work attempting to understand why certain degrees and certain universities are more fecund producers of IDE, however, despite the fact that IDE spinouts from universities have a profound impact on their local economy (Kolev et al. 2022). New work has begun to explore the considerable heterogeneity in university commercialization of research, utilizing movements by academic researchers across universities to identify the importance of both university-specific and geographic-specific factors matter for commercialization (Lerner et al. 2024). Some universities might produce more IDE entrants because they are closer to the frontier of academic knowledge, providing more valuable economic opportunities to their students (Gofman and Jin 2024). Certain universities and departments might provide more fertile ground for IDE because they were founded with a particular orientation towards positive impact on the economy, shaping the career expectations of both the professors and

their students to create and commercialize technologies (See e.g., Stuart and Sorenson 2003; Stuart and Ding 2006; Rosenberg and Steinmueller 2013).[7]

In addition to human capital accumulation from education and the workplace, innovation-driven entrepreneurs are distinguished by their access to information about valuable opportunities obtained from working in highly innovative firms. Innovation-driven entrepreneurs can bring ideas and intellectual property that are unused or underutilized in incumbent firms into their new ventures, a phenomenon commonly referred to as spin-outs or spinoffs (Klepper and Sleeper 2005). Employees from innovation-driven firms that have spawned more entrepreneurs in the past are more likely to spawn subsequent IDE in the future (Habib, Hege, and Mella-Barral 2013; Babina 2020). Similarly, venture backed firms, a strong signal of IDE, tend to disproportionately spawn from innovative, fast-growing firms that themselves were previously venture-backed (Agarwal et al. 2004; Gompers, Lerner, and Scharfstein 2005). The ideas and skills that spillover to startups may also benefit from the incentives offered to the corporations they spin out of: corporations that receive R&D tax credits are more likely to spin out VC-backed startups (Babina and Howell 2024).

Finally, peer effects also appear to be related to entry into entrepreneurship. Descriptive evidence suggests that there is a relationship between entrepreneurial entry and contact with former founders in a variety of settings including the workplace, educational settings and the home (Nanda and Sørensen 2010; Sørensen and Fassiotto 2011; Lerner and Malmendier 2013; Lindquist, Sol, and Van Praag 2015; Hvide and Oyer 2018). This work, which focuses on entrepreneurship in general, rather than on IDE specifically, indicates that an individual's social network may provide an important set of resources that increase the likelihood of subsequent entrepreneurial entry. For example, using Danish registry data, Nanda and Sørensen (2010) find a positive relationship between having workplace peers that are former entrepreneurs and entry into entrepreneurship oneself. In the Danish data, peer influences are strongest for those who have less exposure to entrepreneurship in other aspects of their lives. Wallskog (2024), using the LEHD, shows that individuals with a greater number of co-workers with prior entrepreneurial experience are more likely to enter into entrepreneurship, particularly for women and minorities.

[7] There has been some discussion within economics about how the field might be more purposefully oriented towards practical impact (Roth 2002; Duflo 2017). Some work has provided focused and detailed accounts of the dynamics of IDE rich universities like MIT (e.g., Roberts 1991), but there is still not a more general account of why some universities are substantially better at IDE.

While the descriptive population-level evidence suggests a positive correlation between peer entrepreneurial experience and entry, experimental evidence finds causal evidence of the opposite: Lerner and Malmendier (2013) use the random assignment of MBA students to Harvard Business School sections and find that exposure to peers with past entrepreneurship experience reduces the likelihood of entry to entrepreneurial activity post-graduation. Lerner and Malmendier (2013) suggest that these opposing results may be driven by the fact that individuals may be more accustomed to looking for feedback for their ideas from classmates than from co-workers. Population differences could also explain these contradictory findings; Harvard Business School MBAs may be more sophisticated than the average individual in population level studies such as Nanda and Sørensen's or Wallskog's, and may have deeper relationships with their peers in the program that moderate their interpretation of peers' past experiences. Given the contrast between the descriptive and experimental evidence, and the lack of distinguishment between different types of entrepreneurs in these studies, further research to better understand the causal pathways that social networks and peer effects have for IDE entry would be welcome.

2.3. Resource Constraints

Several leading theories suggest that liquidity constraints should limit entry into entrepreneurship (e.g., Bernanke and Gertler 1989; Evans and Jovanovic 1989; Kiyotaki and Moore 1997; Cagetti and De Nardi 2006). While theory and empirical evidence to date underscores a strong link between wealth and entry into traditional, non-innovative, business entrepreneurship, the connection to IDE entry is far less clear. IDE entry has traditionally required higher upfront entry costs than non-IDE (Bajari, Benkard, and Levin 2007). More recently, Ewens, Nanda, and Rhodes-Kropf (2018) document that, particularly for software-related IDE, entry costs have significantly decreased due to technological advancements such as the introduction of pay-by-use cloud computing. Entry costs for innovative businesses more generally, however, are still substantive, resulting in the development of specialized financing intermediaries to support IDE ventures (as we discuss in Section 4). The equity investments prevalent in these institutions allow innovation-driven entrepreneurs to source capital and earn income before the firm generates revenue, thereby reducing the entrepreneur's dependence on pre-existing wealth (Ewens, Nanda, and Stanton 2024).

To date, there is little data on the connection between household wealth and entry into IDE specifically. While exogenous changes to the cost of entry into IDE due to cloud computing spurred IDE entry (Ewens, Nanda, and Rhodes-Kropf 2018), it is not clear whether this increase was related

to relief of wealth constraints or due to changes in the incentives of financiers. In populations that do not distinguish between IDE and non-IDE entrepreneurs, Krishnan and Wang (2018) show that reducing student debt increases entrepreneurial entry, and that this effect appears to be particularly strong in high-tech industries. Recent work has also connected household wealth, especially intergenerational wealth, on the likelihood of founding firms more generally, and especially those with steep growth trajectories (Chetty et al. 2024); a trait most common among innovation-driven startups (Guzman and Stern 2020). Increases in career and income flexibility related also have been shown to spur entrepreneurial entry, but the effects are not specific to IDE (Barrios, Hochberg, and Yi 2022; Gottlieb, Townsend, and Xu 2022). In our Online Appendix, we offer a review of a substantial literature on the relationship between entry into self-employment and household wealth and health insurance coverage—two empirical proxies for liquidity constraints—as well as government programs that subsidize entrepreneurial entry.

3. Founding Teams and Organization

Having discussed why individuals enter IDE, a related set of questions concern (i) whether individuals choose to be solo founders or co-founders; and (ii) the implications of this choice for the venture. There is great heterogeneity regarding the number of founders present (and necessary) for an entrepreneurial venture. Descriptive data demonstrates that many traditional businesses are solo-founded. The Small Business Administration estimated that were 31.7 million small businesses in the US in 2017. Of these businesses, 25.7 million (or 81%) did not have employees, and 22.3 million (or 70%) were sole proprietorships.[8] Innovation-drive firms, which aim to introduce differentiated products through novel ideas, require the acquisition of specialized skills. This often necessitates the addition of teammates (Aldrich and Zimmer 1986; Greve 2003; Rajan 2012). Not much is systematically known about the likelihood of observing solo founders versus founding teams in IDE, however, or the mechanisms driving these observed differences. Similarly, research on the performance implications of this choice is limited.

Given the expectation of founding teams in innovation-driven ventures, discussion of the optimal composition and incentivization of founding teams is also warranted. Although small businesses are often perceived as being led by the founder in perpetuity or passed down generationally, research on

[8] https://cdn.advocacy.sba.gov/wp-content/uploads/2020/11/05122043/Small-Business-FAQ-2020.pdf

IDE demonstrates a different trend. Stakeholders, namely investors, often seek to replace founders as the firm grows as part of broader professionalization efforts (Hellmann and Puri 2002). Furthermore, IDE firms are often exited via sale to other entities, with founders typically departing the combined enterprise (Kim 2022), raising questions around founder succession.

Table 2 provides a summary of this section, highlighting key citations for each subsection. The table separates research into descriptive, causal, and theoretical categories. Additionally, the table indicates whether each study's results specifically focus on innovation-driven ventures. As with entry, much of the work to date has been descriptive.

3.1. Founding Teams

Entrepreneurs must handle many tasks (Lazear 2004; Roach and Sauermann 2015; Sorenson et al. 2021), and as a result may be limited by their weakest skill. Bernstein, Korteweg, and Laws (2017), using a randomized email experiment with a popular IDE financing website, show that early-stage investors in innovation-driven startups are more likely to focus on information about founders than on other aspects of a startup, such as their market traction. Survey data further confirms the importance of the founding team for investors, with "team" the top factor considered by VC investors in evaluating investments (Gompers et al. 2020).

Individually, IDE entrepreneurs tend to have a more diverse skill set than non-entrepreneurs (Lazear 2004). Work that has found promising outcomes for solo-founded businesses has focused on samples where expectations for growth are initially low (Greenberg and Mollick 2018), such as crowdfunding. Given the increased importance of novel skill combinations in IDE, solo-founded innovation-driven ventures may be at a disadvantage relative to founding teams. Åstebro and Serrano (2015) provide one of the few systematic academic studies of innovation-driven ventures; while descriptive, they show in a Canadian IDE sample that ventures with multiple founders are twice as likely to commercialize their technology, and that team-based ventures have 29% higher revenue relative to having a solo founder.

Measuring causal performance differences between solo founded ventures and ventures with founding teams is particularly difficult because many new innovation-driven ventures fail early, creating empirical challenges in finding data on unsuccessful ventures, especially in the earliest phases when choices about founding teams are occurring. A greater effort is likely needed to collect data on failed ventures (Botelho and Chang 2023; Botelho and Marx 2025; Botelho, Fehder, and Miric 2023). Field studies, such as Bailey et al. (2024), offer one avenue for gathering such data at

the early stages of a venture's development. Other challenges stem from the lack of random variation in founding team size. Given the paucity of evidence, even descriptive studies would be valuable.

The composition of the founding team is also of import. A substantial body of research in management, psychology, and sociology emphasizes the importance of founding team composition in problem solving (see the Online Appendix for a list of references). These studies also note that team formation processes can yield suboptimal teams, complementing the perspective of canonical economic models, which suggest that high performing teams should be characterized by cooperative specialization of skills (Alchian and Demsetz 1972). As a new firm expands its team to encompass a broader portfolio of skills, several challenges emerge with the increasing team size. First, the chance of team-related moral hazard increases (Holmström 1982). Given that entrepreneurs often exhibit overconfidence (Camerer and Lovallo 1999), self-perception biases may hinder the formation of teams with the right mix and level of skills. Gervais and Goldstein (2007) argue, however, that these biases could also generate subtle but positive spillovers to the productivity of other founders and workers in the firm. Finally, alignment between team members is less likely as size increases but is consequential for commercialization strategy (Eesley, Hsu, and Roberts 2014).

The formation of the founding team, and the subsequent recruitment of employees and partners, offers another fruitful area for economic research. Individuals being recruited may respond in different ways to the signals produced by original entrepreneur's ideas and experimentation. Here, the theoretical work on optimism and persuasion within firms (Van den Steen 2005; Gervais and Goldstein 2007) becomes particularly relevant. In these theoretical models, the strong beliefs of a central individual can motivate effort and coordination among others in the organization, who observe these beliefs and the corresponding actions. A key insight is that such beliefs—even if miscalibrated—can lead to better outcomes than situations lacking strong beliefs, because of their coordinating effect amid uncertainty. Economic theory thus suggests that innovation-driven entrepreneurs must carefully balance persuading others and being persuaded by new information.

One of the challenges for researchers is the lack of data that offer comprehensive information on founding teams, particularly those with detailed data on team members' characteristics and backgrounds. Thus, there are few studies connecting founding teams to the performance of their startups. A consistent finding is that founding team members across types of entrepreneurship exhibit homophily across various characteristics and traits (Ruef, Aldrich, and Carter 2003). The available evidence suggests that founding teams with skill and experience diversity are associated with higher

performance. D'Acunto, Tate, and Yang (2020) use employer-employee linked data to show that increases in skill diversity are related to higher employment and sales growth, an effect which is partially driven by new firms in innovative industries. Data on other types of homogeneity or heterogeneity and causal studies are limited. Gompers, Huang, and Wang (2017) offer an exception; using the random assignment of MBAs to sections, they find that homophily in ethnicity increases in founding team performance, which is driven by improving the worst performing teams.

Once the founding team is in place, it is important to ensure that members are correctly incentivized. Many IDE founding teams create formal contracts detailing the ownership percentage given to each founder. Despite the significance of this decision, research on the factors influencing observed equity splits and their impact on subsequent founder behavior and venture outcomes are sparse. Hellmann and Wasserman (2017) offer an initial look into the black box of equity splits, finding that teams with equal splits of equity are associated with worse ex post performance than those where founders split equity based on relative expected value of future contributions.

Determining the optimal founders' agreement is challenging due to several economic features. Founders often cannot predict in advance who will contribute the most to the firm, whose contributions will be most responsive to equity incentives, or how to isolate the individual value of each founder's contribution.[9] Additional issues include the nature of managerial compensation, which is especially relevant in VC-backed ventures. One of the only studies of compensation in IDE firms is Ewens, Nanda and Stanton (2024), who explore the evolution of compensation over the life of VC-backed firms. Ewens, Nanda, and Stanton argue that, theoretically, increases in CEOs' compensation after a key milestone should be large enough that non-diversifiable risk held by founder CEOs falls substantially after achieving it, confirming empirically that that founders receive substantial increases in cash compensation as they reach development of the startup's first product.

3.2. Succession and Evolution

It is expected that a venture's founding team will evolve over time, as team members depart or are replaced. The reasons for founder replacement vary, including disagreements on vision, the need for different skill set, or the prioritization of the venture's idea over its founder(s). Founders, especially those of innovation-driven ventures, are frequently replaced. The likelihood of founder

[9] Psychological studies have explored the perception of fairness in the unequal division of equity amongst founders. We review some literature on this topic in our Online Appendix.

CEO replacement increases after a startup receives VC investment, as the VC investors "professionalize" the management of the firm (Hellmann and Puri 2002). Kaplan, Sensoy, and Strömberg (2009) study 50 VC-funded firms that eventually went public from early business plan to initial public offerings, and find that 28% of CEOs at the time of the initial business plan remain as CEOs at the time of public offering. In a comprehensive database of VC-backed startups augmented with hand-collected data on founder turnover events, Ewens and Marx (2018) find that about 20% of founders of VC-backed ventures are replaced.

Although the effect of founder replacement on a venture's future performance is less well understood. Ewens and Marx (2018) utilize changes in non-compete laws in fourteen US states to demonstrate a positive, causal, relationship between founder replacement and subsequent startup performance. In contrast, studies utilizing census-levels data that do not distinguish between IDE and non-IDE employer businesses find the opposite effect. Choi et al. (2023) use the exogenous death of founding team members in US Census data to examine the relationship between founding team member departure and performance, finding that the death of a founding team member adversely affects eventual outcomes, even in high tech industries. Becker and Hvide (2022) conduct a similar exercise using Norwegian administrative data, finding that founder death in very young firms leads to lower levels of startup employment, sales, and survival, with the effects stronger when the founder has high human capital. The differences in these findings are likely attributable to a number of factors. First, Ewens and Marx study VC-backed, IDE firms, while Choi et al and Becker and Hvide study all new employer businesses, regardless of type. Second, the studies differ in the nature of the turnover event; death of a founder may affect the remaining team members in a manner different from the mere departure or firing of a founder CEO. Both studies that find negative effects for founder death deal with unexpected replacement of the founders. Purposeful replacement by a VC investor as a startup grows is substantively different than an unexpected replacement, and voluntary departure of a founder in the interest of professionalizing the firm differs from his or her firing and replacement due to poor performance or fit. Further study on founder departures of different natures has the potential to deepen our understanding of the role of founders in the firm.

4. Financing

One of the most important issues facing entrepreneurial firms is their ability to access capital to fund their growth and operations. Canonical results in financial economics suggest that in standard market conditions debt is preferable to equity in the pecking order of external financing (Myers 1984).

This stems from a number of reasons, including costly state verification (Townsend 1979; Diamond 1984) and adverse selection (Myers 1984; Myers and Majluf 1984; Nachman and Noe 1994). For innovation-driven ventures, who are often commercializing unproven technologies and services, attracting external capital through debt channels can be extremely difficult (Leland and Pyle 1977; Stiglitz and Weiss 1981; de Meza and Webb 1987). A startup's value rests on intangible assets, which are hard to value ex ante, give rise to strong information asymmetries, provide little collateral, and are difficult to sell ex post (Hochberg, Serrano, and Ziedonis 2018). Even though loans would allow entrepreneurs to avoid costly dilution of ownership stakes, theoretically and practically, external debt is widely viewed as an unlikely way to fund risky projects in the absence of tangible assets or stable cash flows to secure the loan (Hall and Lerner 2010).

As a result, most IDE efforts are financed through equity, and much of the empirical literature in entrepreneurial finance has focused on understanding this financing channel. New ventures face four fundamental problems that form the basis for much of corporate finance theory: agency problems, information asymmetries, control issues post-investment, and hold up problems. Many of these issues are exacerbated for IDE, as both internal uncertainties and external risks associated with market acceptance are magnified in the presence of untested innovation.

Table 6 lists primary categories of available sources of financial capital for IDE and the stage of company development to which they typically are allocated. The most well-known type of equity financing provider for innovation-driven startups is VC, and the associated venture debt industry. [10] At the earlier stages, angel financing—funding from rich individuals—is most common. Over the last decade, however, the price of early-stage experimentation in certain types of IDE has fallen significantly, shifting the allocation of financial and human capital towards smaller, faster, higher-risk projects, which has led to the emergence of new forms of financing and support programs. At the later stage, changes in securities laws and market dynamics have led to the entry of non-traditional investors such as hedge funds and mutual funds. While the financing landscape for IDE has been evolving, with the introduction of new financing channels such as crowdfunding and token sales, these new approaches have yet to emerge as true competitors to angel and VC financing. Here, we focus our discussion on the larger, more prevalent channels.[11]

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[10] Many thorough survey papers have been written on the VC industry, and we invite the reader to explore the topic in more detail through existing surveys (see e.g., Da Rin, Hellmann, and Puri 2013; Lerner and Nanda 2020).

[11] A reference list of recent papers on these newer approaches to financing, along with references to other notable papers on financing of IDE not discussed here, is available in the Online Appendix.

Table 3 provides a summary of the section, highlighting key citations for each subsection. The table separates research into descriptive, causal, and theoretical categories. Additionally, the table indicates whether each study's results specifically focus on innovation-driven ventures.

4.1. Venture Capital

An initial description of the VC industry was provided by Gorman and Sahlman (1989) and Sahlman (1990)'s seminal papers on the structure and governance of VC organizations. VC firms specialize in investment in new ventures characterized by high risk and uncertainty, but also high growth potential.[12] In their historical review of the VC industry, Kaplan and Lerner (2010) argue that the VC industry plays an outsized role in the economy, with VC-backed firms constituting over 50% initial public offerings on US stock markets. Other statistics similarly support the potential importance of VC as a specialized financial intermediary: VC-backed firms account for 20% of US stock market capitalization, and 44% of research and development spending in the US (Gornall and Strebulaev 2021).

VC firms can be categorized into a number of types, each with a unique focus. These include independent VC firms, corporate VC arms who often have strategic interests and invest the capital of large corporations, and bank-affiliated VC firms.[13] Much of the literature to date (with some notable exceptions) has focused on traditional independent VC firms. VC firms and the funds they raise vary widely in both size and industry and geographic specialization. Hochberg and Westerfield (2010), using a model of optimal project selection in which a portfolio manager observes a limited pool of heterogeneous investment opportunities, show that specialization and fund size are substitutes: smaller funds tend to be specialized, while larger funds tend to be more generalist. Hochberg, Mazzeo, and McDevitt (2015) use a structural model to show that this specialization serves as a product differentiator for VC funds when competing with other investors.

In addition to the wide variation in fund specialization and size, there is significant heterogeneity in fund returns, with an inter-quartile spread between managers that dwarfs that seen in other asset

[12] For a description of the origins of the VC industry and its institutionalization in the 1980s as a result of reductions in the capital gains tax rate and amendments to the Employee Retirement Income Security Act, see e.g. Gompers (1994). In addition, Nicholas (2019) provides a historical account of the emergence of VC and Korteweg and Sensoy (2023) connect this historical account to the fundamental economics of funding innovation in the face of uncertainty.

[13] In addition to private, independent VC firms, many large corporations also maintain VC investment arms, with mixed results (Gompers and Lerner 2000; Masulis and Nahata 2009; Chemmanur, Loutskina, and Tian 2014). Corporate VC divisions often have strategic goals in addition to (or instead of) financial goals, and their portfolio companies are frequently acquired by the corporate venture capitalist's parent corporation (Benson and Ziedonis 2010).

classes, such as mutual funds. Kaplan and Schoar (2005), in a seminal paper in the field, show that fund performance within a given VC firm appears to persist over time, a finding that has been expanded upon, theoretically explained, and empirically tested in a number of follow-on studies (see e.g., Hochberg, Ljungqvist, and Vissing-Jørgensen 2013; Harris et al. 2023). Kaplan and Schoar's persistence finding is important because it suggests VC investors have skill, either in selection of which ventures to invest in or in adding value to their portfolio companies. Following this intuition, Sørensen (2007), in a key contribution to the literature, uses a structural two-sided matching model to separately estimate the contributions of value-added influence and deal selection to VC investment success. Both selection of investments and value-added influence appear to have a significant effect, with the effect attributable to selection of investments somewhat higher than that attributed to value-added contributions by the VC.

What then are these value-added activities? Unlike the arms-length transactions often modeled in the finance literature, VC investors are widely believed to offer more than just capital. A number of papers explore key aspects of venture capitalists' influence on their portfolio company investments. Lerner (1995), in one of the first attempts to evaluate VC value-added activities, shows that VC investors' involvement as members of their portfolio companies' boards of director increases when the need for oversight is greater. Hellmann and Puri (2000) use a hand-collected dataset on Silicon Valley startups to show that VC investment is associated with a significant reduction in the time to bring a product to market, particularly for innovative companies.

The findings in these papers, while descriptive, have spawned a slew of follow-on studies taking a systematic approach to evaluating VC contributions along several dimensions of value-added activity. Hellmann and Puri (2002) show that VC investment is associated with a variety of startup professionalization measures, such as adoption of human resource policies, stock option plans, hiring of marketing executives, and replacement of founders with outside CEOs. Hochberg, Ljungqvist, and Lu (2007) use measures from economic sociology to provide causal evidence that the extent and position of VC firms in networks of investors contribute to portfolio company success, igniting a larger literature on the importance of VC networks for both startup and VC fund performance. Lindsey (2008) focused on strategic alliances, showing that such cooperative structures are more frequent between startups that share a VC investor, with these alliances improving the probability of startup success. Bottazzi, Da Rin, and Hellmann (2008) provide more evidence on VC firm's contributions to professionalization of the startup, finding that they are active in recruiting,

fundraising, and other interactions. On the governance side, Hochberg (2012) provides causal evidence that VC-backed companies exhibit lower levels of earnings management, more positive reactions to the adoption of poison pills, and more independent board structures prior to IPO. Using exogenous variation in the introduction of new airline routes that reduce travel times between VC investors and their portfolio companies, Bernstein, Giroud, and Townsend (2016) show that VC on-site involvement leads to increases in both innovation and likelihood of successful exit.

The ability to add value beyond provision of funds is recognized by innovation-driven startups. Hsu (2004) uses a sample of MIT startups who received multiple investment offers from VC firms to show that innovation-driven startup founders will accept lower valuations in order to access higher-status VC firms who they believe will add more value to their startup. Job seekers are more interested in working for startups funded by successful venture capitalists than for those whose investors lack positive track records (Bernstein, Mehta, et al. 2022). Founders also recognize that there is heterogeneity across VC firms in their ability to provide access to certain value-added resources (Stuart, Hoang, and Hybels 1999). Hochberg, Lindsey and Westerfield (2015) explore the combination of different aspects of value-added resources across VC syndicate ties, showing that VC investors pick investment partners in order to combine capital with scarce resources, suggesting that concerns over agency conflicts in partnering are dominated by the desire to accumulate higher levels of certain resources that can be used to enhance the performance of their portfolio company investments. The VC networks formed by syndication ties, however, also have other consequences for innovation-driven ventures that may be viewed less favorably. Hochberg, Ljungqvist, and Lu (2010) show that more densely networked markets experience less entry; incumbent VC firms appear to strategically react to threats of entry by freezing out any incumbents who facilitate entry of new VC firms into the market. Consequently, entrepreneurs are forced to accept lower valuations in order to access the limited supply of funding.

Because innovation-driven ventures requires a sequence of experiments over time, each reducing the risk and uncertainty associated with the venture (Nanda and Rhodes-Kropf 2017; 2016; Ewens, Nanda, and Rhodes-Kropf 2018), investment in innovation-driven ventures is conducted through a process of staged capital commitment, in which investment occurs in sequential rounds of financing, each of which is meant to enable achievement of milestones that reduce the riskiness of the venture and lead to the exercise of the VC investor's real option to continue or abandon the venture (Gompers 1995). Admati and Pfleiderer (1994)'s early and influential paper provided a first foray into

identifying the type of financial contract that should be used in staged VC investments. Their model of multiple stage investment decisions demonstrates how conflicts of interest and informational settings in an IDE environment can be resolved by the presence of a VC investor who not only provides capital, but also monitoring. Admati and Pfleiderer's model places emphasis on the effects of the massive uncertainty that typically acompanies innovation-driven ventures, which makes it difficult for agents to construct precise probabilistic models, and solves for fixed fraction "robust" contracts in which it is not critical that a specific probabilistic model be correct. Following Admati and Pfleiderer's work, a number of theory papers have used the staged financing setting to explore VC contracts, including Cornelli and Yosha (2003), who motivate the use of convertible securities in VC investment, and Bergemann and Hege (2005), who explore the roles of relationship financing versus arms length financing.

More generally, financial contracting theories in the entrepreneurial setting typically address how conflicts between the principal and agent affect ex ante information collection, contract design, and ex post monitoring. This literature typically takes one of four approaches to understanding the principal agent problem between the investor and entrepreneur: (i) principal-agent theories (e.g., Holmström 1979; Lazear 1986); (ii) incomplete contracting (Grossman and Hart 1986; Hart and Moore 1990); (iii) contingent control theories (e.g., Aghion and Bolton 1992; Dewatripont and Tirole 1994); and, (iv) hold up problems (e.g., Hart and Moore 1994).

Empirically, the terms and contract structures used in VC align themselves to the uncertain nature of innovation-driven startups and the staged investment process (Kaplan and Strömberg 2003; 2004). Theoretical models of financial contracting predict that the characteristics of the contracts between VC investors and entrepreneurs will be related to the extent of the agency problems in place. In some cases, the predictions across the various model approaches are consistent. For example, theory models of all approaches have clear predictions for management of internal risks, given that entrepreneurial ability is unknown, operations are hard to monitor, and that the entrepreneur has discretion over actions, decisions, and funds usage. Theory in this setting predicts that when internal risks such as these are higher, performance sensitive contracts should be used (e.g., Holmström 1979), that contingent compensation should be more pronounced (e.g., Lazear 1986), that the VC investor should receive control in more states of the world (e.g., Aghion and Bolton 1992; Dessein 2002; 2005), that the VC investor should have a greater ability to liquidate the investment if the startup is performing

poorly (e.g., Ross 1977; Diamond 1991), and that entrepreneurs should be tied tightly to the startup through vesting of their equity holdings (e.g., Hart and Moore 1994).

In contrast, theory models have less consistent predictions regarding the contractual terms that should be in place in the presence of external risks and uncertainties. As the potential for significant changes in an innovation-driven startup's external environment increases (e.g., rate of new information about customers, competitors, or the arrival rate of new technologies), the role of the control rights becomes complicated by the need for both the entrepreneur and investor to invest in costly information acquisition to arrive at better decisions. Work following in the canonical incomplete contracting tradition (Grossman and Hart 1986) has argued that control rights should be allocated to the entrepreneur in settings where the acquisition of external information will be more likely to improve outcomes to minimize underinvestment in information acquisition (Aghion and Tirole 1994). On the other hand, work stressing the information asymmetries between the investor and entrepreneur suggest that entrepreneurs will cede formal control to investors in environments with higher uncertainty because they can use their more developed information to push choices that they prefer giving them higher real authority (Dessein 2005). Relatedly, external uncertainty may also make monitoring of the entrepreneur more difficult, leading to changes in optimal allocation of incentives and control (Dessein 2002; 2005; Prendergast 2002).

Empirical evidence on actual VC contracts with entrepreneurs suggests that agency and hold-up problems are important in contract design and monitoring, but risk sharing between investors and entrepreneurs is not. Kaplan and Stromberg (2003; 2004)'s seminal papers analyze a set of such contracts in detail, describing their features and comparing them to the predictions of theory. Higher internal risk of the entrepreneurial venture is associated with more VC investor control, more contingent compensation for the founders, and more contingent financing. External risk is similarly associated with more VC investor control and contingent compensation, as well as increases in the strength of VC investor liquidation rights, which is highly inconsistent with optimal risk-sharing between risk averse entrepreneurs and risk neutral investors. The features of VC contracts, however, appear to be highly consistent with the predictions of models such as Prendergast (2002) and Dessein (2002; 2005).

Overall, the literature examining VC contracts has concluded that contracts are structured in a manner that upholds many central theories of financial contracting between an investor and an entrepreneur. Cash-flow rights matter in a way that is consistent with the principal-agent theories of

Harris and Raviv (1979), Holmström (1979), Lazear (1986), and others. Consistent with incomplete contracting such as in Grossman and Hart (1986) and Hart and Moore (1990; 1998), the allocation of control rights between the VC investor and entrepreneur is central. VC financings separately allocate cash flow rights, board rights, voting rights, and other control rights, and incorporate contingent contracting features that allocate increased control to the VC investor in the event of poor performance, and to the entrepreneur in the event of good performance, supportive of theories such as Aghion and Bolton (1992) and Dewatripont and Tirole (1994). Finally, VC contracts include non-compete and vesting provisions that make it more expensive for the entrepreneur to leave the firm, thus mitigating the potential hold-up problems between the entrepreneur and the investor described by Hart and Moore (1994). Other work has built upon these important initial studies, expanding on the relation between contracting theories and real world contracts (e.g., Hellmann 1998; Ewens, Gorbenko, and Korteweg 2022).

Although innovation-driven startups generally rely on equity financing, and are often unable to utilize debt markets, there are a few exceptions to the "no debt" rule. The first and foremost of these exceptions is venture debt, arm's-length (formal) loans supplied by banks and other for-profit financial institutions to innovation-driven startups. Although technology startups and outside debt seem poorly suited for one another in theory, evidence suggests that the venture lending market is surprisingly large and active, accounting for roughly $5 billion to startups annually (Ibrahim 2010; Robb and Robinson 2014). There is an especially large and active market for innovation-driven startups with patent portfolios where the size of the debt issued is tied to the firm-specificity of the patents and the presence of existing equity investors (Hochberg, Serrano, and Ziedonis 2018)—consistent with the predictions of Holmstrom and Tirole (1997).

4.2. Other Entrepreneurial Financing

Although VC firms are the investors most often associated with innovation-driven ventures, VC firms are typically not the first investors in new innovation-driven ventures. Most innovation-driven startups obtain their initial financing from angel investors—individuals, or groups of individuals who make small equity investments in new companies—via a priced sale of equity, through the use of convertible debt notes, or simple agreements for future equity that convert to equity upon achievement of certain milestones. The literature on angel and friends and family financing of IDE is considerably less robust than that for VC, primarily due to relative difficulty in obtaining large representative data sets for analysis. Early research has suggested that friends and family finance is

a poor source of risk capital for entrepreneurs (Lee and Persson 2016), while empirical examinations of angel financing suggests that angel investment may add value to new ventures (Kerr, Lerner, and Schoar 2014; Lerner et al. 2018).

Angel financing is often a precursor to VC financing, establishing a complicated relationship between angel and VC investors with aspects of both substitutes and complements (Hellmann and Thiele 2015). Angel financing appears to provide substantial value added effects in regions with well-developed IDE communities (Kerr, Lerner, and Schoar 2014), while globally, proper table setting policies are needed to ensure its effectiveness (Lerner et al. 2018). Likely because angel financing is often used at the earliest stages of the venture, angel investors appear to respond most strongly to information about the founding team, rather than product or market traction indicators (Bernstein, Korteweg, and Laws 2017).

Newer sources of financing have also emerged in recent years, such as equity and rewards-based crowdfunding and token offerings. Given that these sources have a relatively small market share in the financing ecosystem for IDE, we do not discuss them here. Other, smaller, sources of funding for IDE worth mention, however, include certain non-dilutive government grant programs specifically designated to promote innovation and economic growth, which we discuss in more detail in the Policies and Programs section of this survey. Finally, a recent emerging trend in innovation-driven entrepreneurial finance has been the emergence of non-VC investors such as hedge funds, pension funds, mutual funds, and sovereign wealth funds as late stage investors in private, venture-backed companies (see e.g., Kwon, Lowry, and Qian 2020; Ewens and Farre-Mensa 2020; Chernenko, Lerner, and Zeng 2021). The entry of these financiers, who traditionally did not fund uncertain private growth stage startups, has occurred alongside the more general growth of the private equity growth fund industry (Lattanzio, Litov, and Megginson 2023).

5. Strategic Choices

The process of selecting and implementing corporate strategy differs significantly between innovation-driven startups and non-innovation-driven firms. Gans, Stern, and Wu (2019) argue that innovation-driven ventures face a broader array of choices and greater uncertainty about the impact of a strategy on firm value. The larger signal space that must be searched over by innovation-driven entrepreneurs relative to their non-IDE counterparts comes from two sources: the multiplicity of opportunities provided by recombinant innovation and the flexibility that IDE offers in pursuing multiple entrepreneurial strategies for the same opportunity. A complication that arises from this

larger signal space is that entrepreneurs have imperfect information and limited resources, which challenge their ability to discern the "correct" strategic choice (Agrawal, Gans, and Stern 2021). As a result, this resource constraint creates a fundamental search problem unique to innovation-driven entrepreneurs, setting them apart from non-IDE and influencing the characteristics required for success in IDE.

The literature reviewed in this section is presented in Table 4. As in prior sections, the table separates research into descriptive, causal, and theoretical categories. An emerging set of studies provide theoretical insights into how early-stage entrepreneurs make strategic choices regarding their position relative to incumbents and customers. Others, drawing from broader economic models of optimal search under uncertainty, explore experimentation and learning in an entrepreneurial context. Much of the empirical literature is descriptive, particularly as relates to the impact of strategic choices on outcomes.

5.1. Types of Choices

Perhaps the most fundamental difference between IDE and non-IDE is the nature of the opportunity. Traditional business entrepreneurship is characterized by a limited, known, set of choices. This is reflected in certain canonical models of entry which assume that the distribution of profitability of the business is known. These models suggest that entry and exit dynamics are primarily governed by idiosyncratic productivity, the entrepreneur's risk tolerance, and capital availability (Kihlstrom and Laffont 1979; Evans and Jovanovic 1989). In contrast, innovation-driven entrepreneurs, who often face an uncertain distribution of profitability, face a broader set of interconnected choices, including which technologies to employ, whether to compete or cooperate with incumbents, investments in intellectual property, and where to locate their firm.

Innovation-driven entrepreneurs pursue opportunities that involve novel recombinations of technologies or business models previously unseen in the economy. Often, they must choose amongst a large set of potential technologies and customers for relatively similar ideas. The recombination process inherently offers numerous potential commercialization strategies, each with potentially high economic value. For example, the introduction of a general-purpose technology, such as the computer, can take decades to be fully integrated into the economy, enabling a broad range of opportunities for both IDE and research and development by incumbent firms.[14] More broadly,

[14] See Bresnahan (2010) for a literature review on general purpose technologies.

innovation by innovation-driven ventures and incumbents generates spillovers across industries, providing new possibilities for recombination (Griliches 1992; Bloom, Schankerman, and Van Reenen 2013). Empirical work in the management literature supports the existence of "multiplicity of paths" for commercializing a given technology. For example, using a case study of multiple contemporaneous startups pursuing the same technology (3D printing), Shane (2000) documents substantial differences in customer bases and business models, largely related to the work and educational backgrounds of the founders.

Gans, Stern, and Wu (2019) model this multiplicity explicitly, positing that IDE founders must adopt a process for choosing among uncertain alternatives for commercializing their idea. Learning without commitment yields multiple viable alternatives, and the interplay between uncertainty and learning leads to an endogenous gap between optimization and choice. In their view, choice, rather than the strategic environment, is the foundation of IDE strategy. In Agrawal, Gans and Stern (2021)'s model, founders face uncertainty regarding both the quality of their idea as well as the efficacy of each possible strategy they could choose. Conducting a single test conflates the signal of the efficacy of the particular strategy and the quality of the idea, and resolving this conflation requires exploring multiple strategies. Lowering the cost of testing multiple strategies, identifying the types of tests likely to reduce signal conflation, and optimally sequencing tests enhances choice. In addition to choices of technology and customer, IDEs face a choice in the type of relationships they can establish with incumbents. For non-innovation driven entrepreneurs, other proximate firms in their industry are primarily competitors, as their products are not substantially differentiated and they pursue the same customer base. In contrast, innovation-driven ventures have more flexibility in positioning themselves relative to incumbents by investing more heavily in differentiating innovations (Callander and Matouschek 2022). Furthermore, the innovations developed by an innovation-driven startup can complement or even enhance an incumbent's existing products, providing opportunities for cooperation. Indeed, innovation-driven startups can create substantial value within an industry by licensing their innovations to incumbent firms through the market for ideas, a mode of entry that is unique to IDE (Arora, Fosfuri, and Gambardella 2001).

The value of cooperation with incumbents versus direct competition for innovation-driven startups is driven by industry-specific factors. Differences in the effectiveness of investments in intellectual property rights across industries, along with differences in the necessity for startups to duplicate expensive assets already owned by incumbents, creates distinct commercialization

environments. These environments determine the extent to which innovation-driven ventures and incumbents have incentives to engage in bargaining (Gans, Hsu, and Stern 2002; Gans and Stern 2003). Generally, the ability of an innovation-driven venture to exclude incumbents through property rights creates an effective channel for bargaining (Gans, Hsu, and Stern 2002; 2008). In their theory model, Gans and Stern (2000) show that conversely, when incumbents can easily duplicate the innovation of an innovation-driven entrant, successful cooperation is less likely; furthermore, when pre-existing assets complement the innovation (e.g., sales and regulatory functions in the pharmaceutical industry), this can create the dual effect of increasing the likelihood of cooperation while also decreasing the share of the total value to the innovator. For example, Chatterji and Fabrizio (2016) show that when contracting frictions were exogenously introduced for a population of innovators in the medical device industry, the entrance rate of new medical device ventures increased.

Whether an innovation-driven venture chooses to compete or cooperate, investments in intellectual property are a key strategic choice. In a survey of innovation-driven founders, Graham et al. (2009) shows that the value of patents for preventing competitors from copying varies significantly across industries, with particularly high importance in biotechnology and IT Hardware. At the same time, they find that many IDE firms ultimately choose not to patent due to cost considerations. The acquisition of patents not only has real effects in forestalling competition but also appears to serve as a signaling mechanism to investors about the startup's underlying quality: Conti, Thursby, and Rothaermel (2013) offer a signaling model and empirical evidence suggesting that VC investors appear to value patents more highly than other potential signals of quality, such as previous friends and family financing. More recent work suggests that the use of patents as a signal of quality has basis: using exogenous variation in patent examiner leniency, Farre-Mensa, Hegde, and Ljungqvist (2020) find that startups that "win" the examiner "lottery" experienced higher growth and follow-on innovation rates, particularly for early stage startups and for less experienced founders.

IDE founders similarly face a choice of where to found their new venture. The benefits from choice of a particular customer set, technological approach, intellectual property strategy, or whether the startup will compete or cooperate with incumbents, can be enhanced by strategic choice of the geographic location in which the venture will operate. For example, startups pursuing a cooperation strategy may benefit from choosing a location with proximity to key incumbents. Building on new ideas often requires specialized human capital, which can be concentrated in the region where the initial invention occurred (Zucker, Darby, and Brewer 1998). For founding teams and employees,

clusters may offer other benefits: Botelho and Marx (2025) find that employees in the automated speech recognition industry are more likely to stay in that industry if there is a larger cluster of startups in their area, thus preventing a brain drain from the industry.

Moreover, some locations, particularly industry clusters, offer specific benefits for innovation-driven firms. Theoretical models of spatial clustering of IDE firms, such as Arzaghi and Henderson (2008) and Kerr and Kominers (2014), speak to the importance of localized agglomerative forces for innovation-driven firms that are driven by information exchange rather than hard resource proximity. Consistent with the predictions of these models, innovation-driven ventures tend to be geographically clustered not only in particular regions (e.g. Silicon Valley) but also in particular sub-regions of those regions (Kerr and Kominers 2014; Guzman and Stern 2015). A large literature has emerged in recent years on agglomeration in innovation-driven industries, which offers further insights on the importance of industry clusters and innovation-driven clusters in particular (Glaeser 2010; Moretti and Thulin 2013; Chatterji, Glaeser, and Kerr 2014; Carlino and Kerr 2015; Moretti 2021).[15]

Notably, while non-innovation-driven firms often demonstrate substantial home bias (Michelacci and Silva 2007), innovation-driven ventures show substantially higher rates of mobility. Even after founding and operating for a number of years, IDE ventures are more likely to move to areas of higher IDE activity, such as Silicon Valley (Guzman 2024). More research is needed, however, on the factors that drive initial choice of location and industry clusters by IDE founders.

5.2. Search and Commitment

The multiplicity of paths available to innovation-driven entrepreneurs creates a significant search problem. All entrepreneurs face substantial resource constraints in exploring the potential of their ideas. For IDE, however, the potential application of an innovative idea across multiple industries and various modes of competition, as discussed above, exacerbates this search problem. While innovation-driven entrepreneurs may attempt to test the attractiveness of different approaches before committing to a given path (Gans, Stern, and Wu 2019), tests conducted in one area of the search space may not provide informative insights about other paths due to the complementarity between strategic elements (Milgrom and Roberts 1995). This contrasts starkly with traditional business entrepreneurs, who can quickly learn about their unique productivity and profitability in a known

[15] A large body of research has documented the prevalence of agglomeration in many industries and countries (see e.g., Duranton and Puga 2004; Rosenthal and Strange 2004; Glaeser 2010) for reviews of the larger literature on agglomeration, not all of which is specific to innovation-driven enterprises).

business environment simply by entering and operating for a period of time without significant search efforts (Evans and Jovanovic 1989).

Recent literature on founder search across strategies builds upon foundational theories of search and optimal stopping under conditions of uncertainty, which examine the tradeoffs between experimentation costs and outside opportunities, usually characterized as reservation wage (Adam 2001; Nishimura and Ozaki 2004; Bergemann and Hege 2005). The IDE context is further complicated by the inability of experimenting entrepreneurs to fully disentangle the fundamental quality of their innovation from the total value of the innovation and their strategic choices, as discussed in detail in Chavda, Gans, and Stern (2024), Gans, Stern, and Wu (2019), and Agrawal, Gans, and Stern (2021). The ability of IDE founders to experiment with different strategies impacts their expected payoffs from innovation-driven ventures. Thus, as suggested by Ewens, Nanda, and Rhodes-Kropf (2018)'s empirical work, the cost of experimentation over time and across industries serves as a fundamental determinant of the rate and diversity of IDE entry.

Empirical research has recently begun to explore how innovation-driven ventures respond to signals about their growth potential, suggesting that formal programs can improve this process. Pitch competitions and mentor matching programs, for example, can reduce the cost of experimenting with novel ideas by providing high-quality early feedback on their potential (Scott, Shu, and Lubynsky 2019). This information can facilitate early abandonment decisions, allowing lower-quality ideas to be shut down while certifying higher-potential projects (Howell 2020; 2021). In a field experiment, Bailey et al. (2024) demonstrated that a focused education program had similar effects, helping to terminate low-quality startups while improving the performance of higher-quality firms.

6. Policy and Programs

We will end with a brief discussion of policy and programs to support IDE activity. Many regions have attempted to institute policies and programs to support IDE activity in an attempt to harness the positive externalities from such activity for their local economies. Despite their supposed ex ante promise, however, the success of most of these efforts has been limited at best (Lerner 2013; 2021). Table 5 provides a summary of the literature covered in this section. As in prior sections, the table separates research into descriptive, causal, and theoretical categories. The bulk of the work discussed in this section is empirical in nature, and often convincingly identifies causal relationships.

6.1. Human Capital

A first category of potential interventions aims to support the novel human capital required for IDE entry and growth. For example, the ability to enter the emerging biotechnology industry during the 1970s and 1980s was tied to co-authorship with "star" scientists that were creating the underlying scientific discoveries. These networks of connections created clusters of biotechnology in the cities where these star scientists were located (Zucker, Darby, and Brewer 1998). Similar patterns have been documented in the pursuit of integrated circuits in Silicon Valley, the assembly line production of automobiles in Detroit, and the pursuit of the petrochemical revolution in Cleveland (Bresnahan, Gambardella, and Saxenian 2001; Lamoreaux, Levenstein, and Sokoloff 2006; Klepper 2010). Access to information about technical and scientific advances can attenuate quickly with geographic distance; for example, Jaffe, Trajtenberg, and Henderson (1993) show that citations to patents are strongly related to geographic localization, especially when a cited technology is new.

Studies exploiting policy changes show convincingly that appropriate policy can increase the local supply of individuals with appropriate human capital endowments for IDE. For example, consistent with single state case studies of non-compete enforcement (e.g., Marx, Strumsky, and Fleming 2009), Jeffers (2024) convincingly shows that increases in enforceability of non-compete clauses brought about by state-level court rulings across the US lead to widespread declines in employee mobility in knowledge-intensive occupations, and further provides evidence on declines in new firm entry in these industries. Given that working within companies at the vanguard of new technologies is associated with a higher likelihood of spinning out a startup (Gompers, Lerner, and Scharfstein 2005), and that this relationship is tightly tied to corporate R&D allocation (Babina and Howell 2024), the relative paucity of work exploring policies designed to enhance human capital spillovers between established and startup innovation-driven ventures is notable. Clusters of related industries in a region can facilitate entrepreneurship by allowing novel recombinations drawn from firms in multiple related industries (Delgado, Porter, and Stern 2010), offering opportunity for policies that relate to industry agglomeration to have positive spillover effects for the supply of IDE-appropriate human capital.

Other policy opportunities that relate to the supply of IDE human capital are based in immigration. A substantial portion of that IDE has been generated by immigrants (for a review, see Kerr and Kerr 2020). In part because they are more likely to migrate to areas of new technical opportunity (Kerr 2010), foreign-born innovators provide strong positive externalities for innovation in general, especially for native-born inventors (Moser, Voena, and Waldinger 2014; Bernstein,

Diamond, et al. 2022). In addition to contributing substantially to inventive activity, immigrants are more likely to enter into entrepreneurship than similarly educated native-born workers (Hunt 2011; Azoulay et al. 2022). Despite immigrants' contributions to entrepreneurship, multiple features of US immigration policy may restrict immigrants' ability to pursue entrepreneurship, potentially pushing them back to their countries of origin (Khosla 2018; Kerr and Kerr 2020; Agarwal, Ganco, and Raffiee 2022). Given the high demand for immigrant STEM graduates in Silicon Valley and the US, immigration policy may become increasingly crucial as cross-border investments drive convergence to the global technological frontier (Akcigit et al. 2024). Kerr and Kerr (2021) provides an excellent motivating discussion of the immigration policy topics of interest, but more work is needed on the relation between immigration policy and IDE activity.

Finally, further exploration of how optimism and overconfidence relate to founding innovation-driven ventures, which are attempting larger recombinative experiments in the economy than non-IDE, would be beneficial. Theoretical work notes that the exploration of new opportunities creates new information for others in the economy (Bernardo and Welch 2001). If optimistic innovation-driven entrepreneurs are more likely to explore novel recombinations, the spillover effects of information about the value of these recombinations could be substantial, particularly according to recent theories of economic growth (Jones 2023). Understanding the behavioral underpinnings of IDE entry may be particularly valuable in crafting policies that enhance economic growth. Specifically, encouraging IDE through policies that support innovative exploration could lead to significant knowledge spillovers, driving innovation and thus economic benefit.

6.2. Intellectual Property

Intellectual property policy is an additional opportunity for policy intervention. Formal intellectual property rights, particularly patents, play an important role in startup innovation and in the facilitation of technology transfer between firms in the market for ideas. More re-deployable patent portfolios can be used to collateralize financing such as venture debt (Hochberg, Serrano, and Ziedonis 2018), and are often sold quickly to operating companies in the same industry when the startup fails, retaining value beyond the original venture and team (Serrano and Ziedonis 2024). Research suggests that various aspects of IP policy can have important impacts on IDE activity.

First, the grant or denial of property rights for innovation can have substantial impacts. Patent applications are quasi-randomly allocated to examiners, and startups that draw lenient examiners for their patent applications exhibit higher employment and sales growth over the subsequent years, and

pursue more additional innovation (Farre-Mensa, Hegde, and Ljungqvist 2020). Similarly, when the Bayh-Dole Act (1980) transferred ownership interest in university research-based patents from the federal government to the universities, technology transfer from universities to the corporate world increased dramatically (Henderson, Jaffe, and Trajtenberg 1998; Sampat, Mowery, and Ziedonis 2003), and both corporate patenting and VC investment in university counties, specifically in the industries most tied to the local universities' research strengths, increased (Fehder, Hausman, and Hochberg 2024). How quickly patents are granted is also important. Gans, Hsu and Stern (2008) exploit the significant variation in the timing of when the USPTO informs the patent applicant of the rights to be granted, causally demonstrating that the licensing of IP by startups for commercialization purposes is driven by the timing of property rights grant. Using quasi-random assignment of patents to patent examiners, Hegde, Ljungvist, and Raj (2022) similarly demonstrate that patent grant delays reduce startup employment, sales growth, financing, future innovation, and survival. These deleterious effects of patent grant delays also spillover to rivals, suggesting that slower patent grants have negative externalities.

Hegde, Ljungqvist and Raj (2022) further demonstrate the importance of the scope of the patent granted. Broader scope of a patent grant has positive effects on the applicant startup but imposes negative externalities on rivals' growth and innovation. Given recent theoretical models of economic growth that stress the number of innovative recombinations explored in the economy (Jones 2023), it is unclear how to weigh the tradeoff between increasing success chances for a given startup through broader patent scope versus the negative impact on its rivals.

Finally, policy that addresses the recent emergence of non-practicing entities, i.e. patent trolls, can also affect startup growth, innovation, and financing. Analysis exploiting the staggered adoption of anti-troll legislation suggests that laws that address patent trolling lead to increases in startup employment, particularly in the IT space, primarily through the increased ability to attract VC and patent-backed venture debt (Appel, Farre-Mensa, and Simintzi 2019).

A related area for program and policy support is universities, a key source of both novel ideas and human capital. Institutional differences in licensing policies and incentives to professors at the university-level correlate with the rate of startup spin-outs (Lach and Schankerman 2008; Belenzon and Schankerman 2009). Moving away from professor ownership of research-based IP to the US model of university ownership reduced professorial entrepreneurship and patenting in Norway by 50% (Hvide and Jones 2018). In the US, the Bayh-Dole Act's transfer of ownership interest from the

federal government to universities encouraged widespread patenting of university discoveries and led to significant increases in VC investment and innovation-driven startup activity in university vicinities, particularly in the industries tied most closely to local universities' innovative strengths (Fehder, Hausman, and Hochberg 2024). More recently, research by Babina et al. (2023) documents that higher shares of federal research funding at a university increases the chances of high tech entrepreneurship. Policies and programs that accelerate the production and translation of basic research out of universities should therefore be of first-order interest to policy makers.

6.3. Financing

Finally, lack of access to capital to grow innovative new companies is frequently cited by policy makers as a key reason for lack of IDE activity in a region, and despite the dearth of reliable evidence on the efficacy of such efforts, funding has been one of the most frequently targeted areas for intervention by policy makers. One prominent example of such interventions is tax-credit schemes to encourage angel-investing; while these programs do appear to lead to the allocation of more early-stage capital, they do not seem to lead to increases in employment, patenting, or other markers of IDE (Lindsey and Stein 2019; Denes et al. 2023). Another avenue favored by policy makers are efforts to create government-backed local VC funds, or to attract existing, experienced VC investors to invest in the local region. Many such programs have been failures, though successful examples do exist—such as Israel's Yozma program (Lerner 2009). In the US, evidence suggests that politicians funnel public pension fund dollars to local, under-performing, VC funds at the expense of pensioners and taxpayers (Hochberg and Rauh 2013). Generally, there is little evidence to suggest that funding-related efforts of these types are effective, despite their prominence.

One financing intervention that has been shown to positively affect startup growth and VC fundraising is the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs administered by US federal agencies, and which award non-dilutive funding to startups across a large range of technology areas, markets, and risk levels. In early work on these grant programs, Lerner (1999) showed that awardees grew considerably faster than companies in the same locations and industries that did not receive awards. Later work's use of quasi-experimental identification approaches confirms the positive impacts on grantees. Howell (2017) shows that an early stage SBIR award has large positive impact on both the production of patents and revenue for awardee firms and increases the probability of raising subsequent VC financing. In an important recent contribution to the literature, Myers and Lanahan (2022) show that state matching

programs that provide matching grants to firms that receive SBIR grants also exhibit broader social effects: for every patent produced by grant recipients, three more are produced by other firms.

Encouraging more investment in regions that lack an existing VC cluster, while challenging, may potentially be addressable. Venture capitalists may be willing to invest in startups outside of their home region if the expected return is significant (Chen et al. 2010). Facilitating the creation of a pool of high-quality startups through cheaper programs such as accelerators have been shown to causally impact the supply of IDE activity and VC investment in the region (Fehder and Hochberg 2024). Investments that decrease the amount of time required for an investor to evaluate or monitor a startup in a region, such as the introduction of direct flights from locations with VC presence, increase VC investors' willingness to allocate capital there and lead to boosts in innovative and financial performance for portfolio companies (Bernstein, Giroud, and Townsend 2016). In an illuminating survey of government incentive programs, Lerner (2021) points to a number of the key failure points that have limited the success of programs to increase local investment in IDE, including the deployment of funding to areas without strong potential for returns (in the name of "leveling the playing field"), poor timing of program launch, as well as the human capital involved in administration of such programs, suggesting policy reforms that could address the challenges.

6.4. Support Programs

Recent work suggests that a variety of support programs can increase IDE activity by reducing the cost of experimenting with novel ideas. In a randomized controlled trial with innovation-driven startups, entrepreneurship training has been shown to quickly shut down lower-quality startups and improve the ability of those that remain to raise financing and grow employment (Bailey et al. 2024). Pitch competitions similarly provide early go/no-go signals as to whether an entrepreneur should continue to pursue their venture. For example, Howell (2021) shows that receiving negative feedback in a competition increases venture abandonment. Winning such competitions can also provide startups with cash prizes. Using a large sample of US pitch competitions and a regression discontinuity framework, Howell (2020) shows that winning a round of a competition increases the probability of a startup raising follow-on funding. Utilizing the fact that some "wins" involve no cash prize, Howell suggests that winning also provides easier access to external capital through certification. In contrast, in a large randomized controlled trial with African IDE startups, McKenzie (2017) finds that winning a large cash prize in a competition has significant effects on future performance through alleviation of funding constraints, with no evidence of a certification effect.

Other programs not only provide feedback to innovation-driven startups, but also have spillover effects for their local entrepreneurial ecosystems more broadly. For example, Fehder and Hochberg (2024) utilize the staggered introduction of such programs in the US as well as synthetic control methods to show that programs such as seed accelerators (Hochberg 2016; Cohen et al. 2019; Fehder 2024) have spillovers that increase overall IDE activity in the region, drawing VC funding for a new population of startups that do not formally participate in the program.

To sum, we note one aspect that has been missing in much of this literature is an attempt to quantify the magnitude of costs and benefits for different policies and programs. Similarly, establishing the welfare effects of encouraging high human capital individuals to engage in IDE rather than remaining in employment in established innovative firms remains a desirable topic for future research. With this in mind, we turn next to a discussion of future directions for research in IDE.

6.5. Gender, Race, and Socioeconomic Gaps

The entrepreneurship literature reveals a significant gap in understanding how founder gender and founder race influence the entrepreneurial process. Existing evidence paints a stark picture for underrepresented individuals across different types of entrepreneurship, particularly in terms of founding rates, access to resources, and venture outcomes. For example, Gompers and Calder-Wang (2017) document that, consistent with homophily-based hiring and homophily-induced information flows, from 1990 to 2016, women represented less than 10% of the of the entrepreneurial and venture capital labor pool, with even bleaker statistics for Hispanic and Black entrepreneurs (2% and 1% respectively). Cook, Marx, and Yimfor (2022) document that Black founders raise approximately one-third of the amount of VC funding raised by non-Black founders in the five years immediately following founding, they are less likely to locate geographies with significant VC presence and are less likely to patent. Using the hiring of Black partners at VC firms to identify causal effects, they show that Black partners at VC firms are more likely to fund Black founders, and, in particular, are more likely to fund successful Black founders, suggesting that this pattern is not driven by homophily, but rather by a superior ability to identify high-potential Black founders.

These patterns generally align with findings in larger population-representative samples that include both IDE and non-IDE entrepreneurship and which find that racial minorities, while exhibiting greater interest in entrepreneurship ex ante, are less likely to launch a venture ex post (Bennett and Robinson 2024) and that Black-owned new businesses face more difficulty in raising external capital (Fairlie, Robb, and Robinson 2022). A common thread across this work is a lack of

access to key resources, including experience and networks, offering a potential opportunity for policies and programs to help narrow the gap. Additionally, recent research suggests that when different types of rating systems are implemented on platforms, it can affect the way new minority small businesses are rated, and thus their performance (Botelho et al. 2025). Programs that encourage the use of platform design choices that minimize deleterious effects on minority ventures may thus be useful and worth exploration.

Female IDE founders face biases at multiple stages of the entrepreneurial process, and in investment in particular. Using data from US entrepreneurial pitch competitions and controlled experiments, Brooks et al. (2014) show that investors prefer pitches of the exact same idea that are presented by men over those presented by women. In a controlled experiment with investors evaluating investment opportunities with male and female founders, Kanze et al. (2020) demonstrate that female founders whose ventures target male-dominated industries receive significantly lower funding and valuations than those with ventures targeting female-dominated industries. Their findings further suggest that this effect is attributable to investors perceiving lower levels of fit between founder and venture for female founders operating in male-dominated industries. Further consistent with gender biases, Ewens and Townsend (2020) find that male investors appear to be less interested in female founders relative to observationally similar male founders, despite the fact that the male-led startups they express interest in under-perform the female-led startups. Increased gender diversity in VC firms appears to mitigate some biases, however. Calder-Wang and Gompers (2021) show that when senior VC partners have more daughters, their propensity to hire female partners grows, and their deal and fund performance improves. Other recent research suggests that some gender differences may be attributable to gender-based networking frictions (Howell and Nanda 2024), again suggesting potential avenues for improvement through targeted programming.

Finally, recent research has begun to explore to explore the effects of social economic status in IDE in particular. Bell et al. (2019) explores differences in the propensity of children to become inventors along race, gender, and parent socioeconomic status, and show large gaps in inventorship between the children of high- and low-income families. Their work emphasizes the importance of differences in environment and exposure to innovation during childhood. Chetty et al. (2024) explore how parental income, race, and gender shape rates of entry into entrepreneurship, particularly in high growth or “star” ventures, which are often IDE in nature. As with inventorship, differences in entry rates appear to be related to childhood environment, labor market experience, and access to financial

capital. Importantly, labor market experience in entrepreneurial sectors emerges as the most significant factor, suggesting that increasing access to entrepreneurial experience for underrepresented groups through targeted policies and programs could significantly reduce the gap in entry rates. We are aware of a number of interesting research projects in progress which suggest that further work along these dimensions will be a fruitful area of research in the coming years.

7. Summary, Discussion, and Directions for Future Research

The recognition of the differences between types of entrepreneurship has grown in importance over the last decade, and with it, the volume of research focused on IDE in particular. Many open questions and areas for future research remain, however. To wrap up our discussion, we touch on these briefly below.

At a basic level, our understanding of certain aspects of IDE is fundamentally limited by the availability of data. Some areas of research (such as VC) are well-developed, simply because of the availability of relatively comprehensive data through commercially available databases. In contrast, other areas of IDE remain black boxes primarily because no data is available for empirical exploration. More generally, the availability of data presents a clear constraint for progress in the field. One of the most significant challenges is the lack of data covering representative samples of innovation-driven entrepreneurs. Population-level databases on employer firms such as the Census LEHD and representative sample surveys of prospective entrepreneurs such as the PSED present population-level data, but with limited ability to distinguish between innovation-driven and non-innovation-driven entrepreneurs. As a result, analyses of these data often confound different types of entrepreneurship. Researchers often attempt to restrict samples by industry or to match firms to USPTO data, but both of these methods provide imperfect identification of IDE.[16] In contrast, data sources such as Crunchbase and Pitchbook collect near-population-level data on early-stage entrepreneurs through self-reporting and web scraping. Inclusion in these databases thus requires entrepreneurs to reach early milestones or make certain choices on public visibility, limiting the inclusion of "stealth" entrants, entrepreneurs not focused on public visibility, and early failures in the data. Furthermore, many non-IDE firms can and do list their information on these databases, further confounding the data for the researcher. The inability to clearly distinguish between IDE and non-

[16] Many IDE startups may not seek to patent new technology, preferring to rely on trade secrets or first-to-market advantages.

IDE in the data sources that are the most representative on other dimensions means that some of the most fundamental empirical findings on entrepreneurship represent an average over all types of entrepreneurship (IDE and non-IDE).

Data constraints are a primary reason that many interesting areas of IDE have not been studied. One of these topics is the success and failure of innovation-driven ventures, often referred to as "exit." In most existing large-scale data sources, it is difficult to identify when and why firms have exited, particularly in downside cases. The ability to distinguish between "lifestyle" firms, "living dead" firms, and firms that have been disbanded is substantially limited either because reporting on the firms is periodic and does not require a yearly or quarterly update, or because data is sourced from web presence which often is not updated, nor removed immediately when the firm disbands. Whereas in decades past IPOs were the majority of successful venture-backed startup exits, they now account for only 10% of exits for venture-backed startups (NCVA 2020).[17] Although a large and substantive literature explores the notion of startup company exit via IPO (see e.g., Ewens and Farre-Mensa 2020; Huang, Ritter, and Zhang 2023), much less is known about exit through other modalities.

This is a target-rich area for future research. For example, research suggests that acquisition may be preferred by entrepreneurs in certain industry environments (Gans and Stern 2000; 2003; Gans, Hsu, and Stern 2002; 2008). Other frontier research has begun to shed light of the role of exit through acquisition, with explorations of topics such acquihires (acquisitions in which the startup is purchased as a way to hire its team, see e.g. (Kim 2022), the role of the competitive landscape and competitor acquisitions (Conti, Guzman, and Rabi 2020), and exploration of killer acquisitions—acquisitions in which the incumbent purchaser buys the startup in order to dismantle it (Cunningham, Ederer, and Ma 2020; Callander and Matouschek 2022). Still, many open questions remain with regards to how acquisitions affect founders, employees, investors, and the acquirers themselves.

A second example—which has received even less attention—is venture failure. A high proportion of innovation-driven ventures eventually fail. Estimates of the failure rates for innovation-driven ventures range between 75-91% (Ljungqvist and Richardson 2003; Puri and Zarutskie 2012; Startup Genome 2019). Economic theory suggests that IDE failure may still create human capital that is valuable to established firms (Manso 2016; Levine and Rubinstein 2018), yet there is little research

[17] The decline in IPOs and its causes has been the subject of a number of recent research papers in the finance literature. See e.g. Gao et al. (2013), Doidge et al. (2013; 2017), Ewens and Farre-Mensa (2020). No consensus has been reached on the cause of this decline, suggesting room for future research in this area.

on the labor outcomes of failed entrepreneurs. In the management literature, new studies have emerged that explore the effect of entrepreneurial experience on labor market outcomes (Campbell 2013; Botelho and Marx 2025; Botelho and Chang 2023; Botelho, Fehder, and Miric 2023). Economic work on this topic, however, is lacking. Similarly, our understanding of the impact of prior entrepreneurial experience on future attempts at IDE (i.e., serial IDE founders) is lacking. Given that the vast majority of innovation-driven ventures fail, these topics are of first order importance.

Given that key theoretical models of entrepreneurship involve the relationship between the human capital investments of its founders and the performance of their ventures (e.g., Lazear 2004; 2005), an additional challenge with standard databases is the lack of information about founder characteristics and identities. Typically, the researcher cannot discern the specific role of an individual (e.g., founder versus early employee, manager versus engineer) or gain an understanding of team composition. It is similarly difficult to identify founder race and gender. Many open questions remain regarding how individual-level differences in founder characteristics, preferences and personality impact decision making and performance in IDE (Åstebro et al. 2014; Kerr, Kerr, and Dalton 2019).

As an example, as discussed in the previous section of this review, the literature paints a stark picture of bias and gaps along race and gender dimensions. Research that goes beyond documenting bias and focuses on possible policy levers to reduce such biases and improve outcomes would be desirable, but requires data that is not available in standard databases. Many other important questions as to how founder characteristics affect their observed outcomes also remain unanswered. Behavioral parameters, such as risk tolerance and overconfidence, have been connected theoretically to entrepreneurial activity (Kihlstrom and Laffont 1979; Camerer and Lovallo 1999), but have not been explored empirically in IDE specifically. Empirical work has begun to document the heterogeneity in and effect of personality traits for various aspects of IDE activity (Kerr, Kerr, and Dalton 2019; Fehder et al. 2021; Fehder, Prasad, and Wakslak 2021), yet more is needed to complete our understanding.[18] Generating the data required for such studies, however, will require looking outside of the standard commercial and census databases.

One approach to circumventing the data limitations that have impacted the breadth of topics studied in IDE is through the generation of new data via the execution of field studies and experiments. In addition to generating data on otherwise opaque elements of the IDE phenomenon,

[18] For a review of personality traits and entrepreneurship writ large see Kerr, Kerr, and Xu (2018).

randomized controlled trials (RCTs) in particular may serve to increase our understanding of IDE through three channels: evaluation of interventions and policies that are prevalent in entrepreneurial communities, more precise measurement of effect magnitudes, and construction and validation of more nuanced models of entrepreneurial choices (Harrison and List 2004).

More broadly, field experiments can help unpack individual and environmental factors which lead to entry and better performance in IDE. For example, recent field experiments attempt to understand how investors perceive and rank opportunities (Brooks et al. 2014; Bernstein, Korteweg, and Laws 2017; Bapna 2017); how entrepreneurs value and prioritize external resources and stakeholder interactions (Fehder, Hochberg, and Lee 2019); and how training programs affect IDE startup survival and performance (Bailey et al. 2024). As field experiments continue to grow in importance in the study of entrepreneurship, however, is as important that researchers explicitly recognize the differences between different types of entrepreneurship and between the different entrepreneurial populations they are studying.

A growing set of RCTs in mainstream and managerial economics have attempted to explore the possibility of influencing the entrepreneurial process. These studies each utilize dramatically different study populations and training types, with a variety of findings that we do not view as contradictory given the differences in populations and training types. Outside of IDE, Fairlie, Karlan, and Zinman (2015) offer small business training to under-employed and under-educated individuals for whom entrepreneurship or self-employment might provide an avenue out of unemployment, with limited effect on entry or performance. Chatterji et al. (2019) offers peer advice on operations and management styles to IDE founders in India, finding that those that receive peer training from peers who have a more structured approach to management perform better. Camuffo et al. (2020) offer training on the scientific method of experimentation to high human capital individuals with an intent to pursue both non-IDE and IDE businesses and find that treated individuals are more likely to pivot to pursuing business ideas that are different than their originals. Bailey et al. (2024) offers IDE-specific training of the type offered by business school entrepreneurship executive education programs to already-operating early-stage IDE startups, finding that treated startups shut down their ventures faster than the non-treated, but are also more likely to raise VC funding and raise more capital than control ventures, both unconditionally and conditional on survival, suggesting that training helps founders better understand when to optimally quit and improves the ventures that survive. Careful consideration of population choice during experimental design and in presentation

of conclusions can allow for deeper understanding of external validity of the results and how results generalize to a specific type of entrepreneurship.

Finally, we note that much of the research we discuss in this review takes a US perspective, given US centrality to IDE historically. Because the institutional details, policies, and ecosystems of different countries can have a large impact on their ability to foster and sustain IDE (Lerner 2009), understanding the causal impact of these differences is key to understanding how the global distribution of entrepreneurial activity may shift going forward. The fast-changing landscape of global IDE, however, means that any emerging agenda in international study of IDE must remain responsive to changes in the phenomena on the ground. The growth in IDE activity and financing globally has arisen in parallel to the reduction in geopolitical barriers and the opening of global markets to outside activity (Lane and Milesi-Ferretti 2008). This, combined with the rapid adoption of mobile and internet globally, has resulted in startups that address global markets from the outset (Hochberg 2017). Future research will need to look to the breadth of the global economy to capture these nuances.

We began this review by suggesting that individuals that enter entrepreneurship with the ex ante intention to innovate are conceptually distinct from other entrepreneurs, and that this conceptual difference has implications for both the generalizability of existing research findings and the prioritization of future research. For example, research into such fundamental questions as the returns to entrepreneurship may have fundamentally different answers when the question is examined for each type of entrepreneur, rather than pursued in a comingled fashion. As the risks and returns for entrepreneurship may vary between IDE, traditional business entrepreneurship, the self-employed, and subsistence entrepreneurs, we should expect the individuals entering these vastly different types of entrepreneurship to vary, as will the fundamental challenges they face. While there is growing evidence of differences between these types of entrepreneurs, further understanding these differences and sharpening their distinction in economic research will help contribute both to more insightful economic theory and better policy recommendations. Broadly, economic theory has argued that the introduction of new ideas is the engine of economic growth, and the rate of their introduction determines substantially the long run path of growth (Romer 1990; Aghion and Howitt 1992). While this provides a key motivation for studying IDE, we argue that more attention to the processes of IDE would provide economic researchers with an exciting context to explore several active areas of economic theory including, but not limited to, directed search, rational inattention, and the role of

innovation in the evolution of market power. We believe that critical engagement between theorists and entrepreneurship researchers on these and other topics are likely to enrich both sides.

Relatedly, we believe that a crisper theoretical understanding of the fundamental problems facing different stakeholders in IDE may allow economists to take a more active role in improving the institutions, policies and programs which enable IDE. A growing number of prominent scholars have suggested that a more action-oriented engagement with real-world problems improves economics and makes it more valuable (Roth 2002; Duflo 2017). The substantial changes to the landscape of IDE over the past few decades suggest that there may be a number of barriers and frictions which could be substantially relieved through the creative and careful work of economic research.

Finally, we hope that this article will serve as a useful study guide to key issues and findings in the IDE literature. While not encyclopedic, our goal is to provide a useful overview to researchers interested in understanding more about this particular type of entrepreneurial activity.[19]

[19] For those interested, we have provided a more supplemental reading list that spans multiple disciplines of study in our Online Appendix.

References

Adam, Klaus. 2001. "Learning While Searching for the Best Alternative." *Journal of Economic Theory* 101 (1): 252–80.

Admati, Anat R., and Paul Pfleiderer. 1994. "Robust Financial Contracting and the Role of Venture Capitalists." *The Journal of Finance* 49 (2): 371–402.

Agarwal, R., R. Echambadi, A. M. Franco, and M. Sarkar. 2004. "Knowledge Transfer Through Inheritance: Spin-out Generation, Development, and Survival." *Academy of Management Journal* 47 (4): 501–22.

Agarwal, Rajshree, Martin Ganco, and Joseph Raffiee. 2022. "Immigrant Entrepreneurship: The Effect of Early Career Immigration Constraints on New Venture Formation." *Organization Science* 33 (4): 1372–95.

Aghion, Philippe, and Patrick Bolton. 1992. "An Incomplete Contracts Approach to Financial Contracting." *The Review of Economic Studies* 59 (3): 473–94.

Aghion, Philippe, and Peter Howitt. 1992. "A Model of Growth through Creative Destruction." *Econometrica* 60 (2): 323–51.

Aghion, Philippe, and Jean Tirole. 1994. "The Management of Innovation." *The Quarterly Journal of Economics* 109 (4): 1185–1209.

Agrawal, Ajay, Joshua S. Gans, and Scott Stern. 2021. "Enabling Entrepreneurial Choice." *Management Science* 67 (9): 5510–24.

Akcigit, Ufuk, Sina T. Ates, Josh Lerner, Richard R. Townsend, and Yulia Zhestkova. 2024. "Fencing Off Silicon Valley: Cross-Border Venture Capital and Technology Spillovers." *Journal of Monetary Economics* 141: 14–39.

Alchian, Armen A., and Harold Demsetz. 1972. "Production, Information Costs, and Economic Organization." *American Economic Review* 62 (5): 777–95.

Aldrich, Howard E., and Catherine Zimmer. 1986. "Entrepreneurship through Social Networks." *The Art and Science of Entrepreneurship. Ballinger, Cambridge, MA*, 3–23.

Appel, Ian, Joan Farre-Mensa, and Elena Simintzi. 2019. "Patent Trolls and Startup Employment." *Journal of Financial Economics* 133 (3): 708–25.

Arora, Ashish, Andrea Fosfuri, and Alfonso Gambardella. 2001. *Markets for Technology: The Economics of Innovation and Corporate Strategy*. MIT press.

Arzaghi, Mohammad, and J. Vernon Henderson. 2008. "Networking off Madison Avenue." *The Review of Economic Studies* 75 (4): 1011–38.

Åstebro, Thomas, Holger Herz, Ramana Nanda, and Roberto A. Weber. 2014. "Seeking the Roots of Entrepreneurship: Insights from Behavioral Economics." *Journal of Economic Perspectives* 28 (3): 49–70.

Åstebro, Thomas, Scott A. Jeffrey, and Gordon K. Adomdza. 2007. "Inventor Perseverance after Being Told to Quit: The Role of Cognitive Biases." *Journal of Behavioral Decision Making* 20 (3): 253–72.

Åstebro, Thomas, and Carlos J. Serrano. 2015. "Business Partners: Complementary Assets, Financing, and Invention Commercialization." *Journal of Economics & Management Strategy* 24 (2): 228–52.

Åstebro, Thomas, and Peter Thompson. 2011. "Entrepreneurs, Jacks of All Trades or Hobos?" *Research Policy* 40 (5): 637–49.

Aulet, Bill, and Fiona Murray. 2013. "A Tale of Two Entrepreneurs: Understanding Differences in the Types of Entrepreneurship in the Economy." MIT Sloan Working Paper.

Azoulay, Pierre, Benjamin F. Jones, J. Daniel Kim, and Javier Miranda. 2020. "Age and High-Growth Entrepreneurship." *American Economic Review: Insights* 2 (1): 65–82.

———. 2022. "Immigration and Entrepreneurship in the United States." *American Economic Review: Insights* 4 (1): 71–88.

Babina, Tania. 2020. "Destructive Creation at Work: How Financial Distress Spurs Entrepreneurship." *The Review of Financial Studies* 33 (9): 4061–4101.

Babina, Tania, Alex Xi He, Sabrina T Howell, Elisabeth Ruth Perlman, and Joseph Staudt. 2023. "Cutting the Innovation Engine: How Federal Funding Shocks Affect University Patenting, Entrepreneurship, and Publications." *The Quarterly Journal of Economics* 138 (2): 895–954.

Babina, Tania, and Sabrina T. Howell. 2024. "Entrepreneurial Spillovers from Corporate R&D." *Journal of Labor Economics* 42 (2): 469–509.

Bailey, Yael Hochberg, Daniel C. Fehder, Eric Floyd, and Daniel J Lee. 2024. "Evaluating the Effectiveness of Entrepreneurship Training for Innovation-Driven Startups: Evidence from a Large-Scale Field Experiment." *SSRN*.

Bajari, Patrick, C. Lanier Benkard, and Jonathan Levin. 2007. "Estimating Dynamic Models of Imperfect Competition." *Econometrica* 75 (5): 1331–70.

Bapna, Sofia. 2017. "Complementarity of Signals in Early-Stage Equity Investment Decisions: Evidence from a Randomized Field Experiment." *Management Science* 65 (2): 933–52.

Barrios, John M., Yael Hochberg, and Daniele Macciocchi. 2024. "Rugged Entrepreneurs: Individualism and the Geographic Distribution of New Business Formation." *SSRN*.

Barrios, John M., Yael Hochberg, and Hanyi Yi. 2022. "Launching with a Parachute: The Gig Economy and New Business Formation." *Journal of Financial Economics* 144 (1): 22–43.

Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, and Matthew D. Shapiro. 1997. "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study." *The Quarterly Journal of Economics* 112 (2): 537–79.

Becker, Sascha O., and Hans K. Hvide. 2022. "Do Entrepreneurs Matter?" *Review of Finance* 26 (1): 163–85.

Belenzon, Sharon, and Mark Schankerman. 2009. "University Knowledge Transfer: Private Ownership, Incentives, and Local Development Objectives." *The Journal of Law and Economics* 52 (1): 111–44.

Bell, Alex, Raj Chetty, Xavier Jaravel, Neviana Petkova, and John Van Reenen. 2019. "Who Becomes an Inventor in America? The Importance of Exposure to Innovation*." *The Quarterly Journal of Economics* 134 (2): 647–713.

Bennett, Victor M., and David T. Robinson. 2024. "Why Aren't There More Minority Entrepreneurs?" w33229. National Bureau of Economic Research.

Benson, David, and Rosemarie H. Ziedonis. 2010. "Corporate Venture Capital and the Returns to Acquiring Portfolio Companies." *Journal of Financial Economics* 98 (3): 478–99.

Benz, Matthias, and Bruno S. Frey. 2008. "The Value of Doing What You like: Evidence from the Self-Employed in 23 Countries." *Journal of Economic Behavior & Organization* 68 (3): 445–55.

Bergemann, Dirk, and Ulrich Hege. 2005. "The Financing of Innovation: Learning and Stopping." *The RAND Journal of Economics* 36 (4): 719–52.

Bernanke, Ben, and Mark Gertler. 1989. "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79 (1): 14–31.

Bernardo, Antonio E., and Ivo Welch. 2001. "On the Evolution of Overconfidence and Entrepreneurs." *Journal of Economics & Management Strategy* 10 (3): 301–30.

Bernstein, Shai, Emanuele Colonnelli, Davide Malacrino, and Tim McQuade. 2022. "Who Creates New Firms When Local Opportunities Arise?" *Journal of Financial Economics* 143 (1): 107–30.

Bernstein, Shai, Rebecca Diamond, Timothy McQuade, and Beatriz Pousada. 2022. "The Contribution of High-Skilled Immigrants to Innovation in the United States." w30797. National Bureau of Economic Research.

Bernstein, Shai, Xavier Giroud, and Richard R. Townsend. 2016. "The Impact of Venture Capital Monitoring." *The Journal of Finance* 71 (4): 1591–1622.

Bernstein, Shai, Arthur Korteweg, and Kevin Laws. 2017. "Attracting Early-Stage Investors: Evidence from a Randomized Field Experiment." *The Journal of Finance* 72 (2): 509–38.

Bernstein, Shai, Kunal Mehta, Richard R. Townsend, and Ting Xu. 2022. "Do Startups Benefit from Their Investors' Reputation? Evidence from a Randomized Field Experiment." w29847. National Bureau of Economic Research.

Bloom, Nicholas, Mark Schankerman, and John Van Reenen. 2013. "Identifying Technology Spillovers and Product Market Rivalry." *Econometrica* 81 (4): 1347–93.

Botelho, Tristan L., and Melody Chang. 2023. "The Evaluation of Founder Failure and Success by Hiring Firms: A Field Experiment." *Organization Science* 34 (1): 1–508.

Botelho, Tristan L., Daniel C. Fehder, and Milan Miric. 2023. "Moving Forward or Falling Back: Gender Differences in Career Advancement for Former Entrepreneurs Re-Entering the Workforce." *Working Paper*.

Botelho, Tristan L., Ranjay Gulati, and Olav Sorenson. 2024. "The Sociology of Entrepreneurship Revisited." *Annual Review of Sociology*, April.

Botelho, Tristan L., Sora Jun, Demetrius Humes, and Katherine A. DeCelles. 2025. "Scale Dchotomization Reduces Customer Racial Discrimination and Income Inequality." *Nature*.

Botelho, Tristan L., and Matt Marx. 2025. "Beyond Blame: Evaluative Stigma, Attribution, and Employee Careers after Employer Failure." *Administrative Science Quarterly*.

Bottazzi, Laura, Marco Da Rin, and Thomas Hellmann. 2008. "Who Are the Active Investors?: Evidence from Venture Capital." *Journal of Financial Economics* 89 (3): 488–512.

Bravo-Biosca, Albert, Chiara Criscuolo, and Carlo Menon. 2016. "What Drives the Dynamics of Business Growth?" *Economic Policy* 31 (88): 703–42.

Bresnahan, Timothy. 2010. "General Purpose Technologies." In *Handbook of the Economics of Innovation*, edited by Bronwyn H. Hall and Nathan Rosenberg, 2:761–91. Handbook of the Economics of Innovation, Volume 2. North-Holland.

Bresnahan, Timothy, Alfonso Gambardella, and Annalee Saxenian. 2001. "'Old Economy'Inputs for 'New Economy'Outcomes: Cluster Formation in the New Silicon Valleys." *Industrial and Corporate Change* 10 (4): 835–60.

Brooks, Alison Wood, Laura Huang, Sarah Wood Kearney, and Fiona E. Murray. 2014. "Investors Prefer Entrepreneurial Ventures Pitched by Attractive Men." *Proceedings of the National Academy of Sciences* 111 (12): 4427–31.

Burton, M. Diane, Jesper B. Sørensen, and Christine M. Beckman. 2002. "7. Coming from Good Stock: Career Histories and New Venture Formation." *Research in the Sociology of Organizations* 19 (July): 229–62.

Cagetti, Marco, and Mariacristina De Nardi. 2006. "Entrepreneurship, Frictions, and Wealth." *Journal of Political Economy* 114 (5): 835–70.

Calder-Wang, Sophie, and Paul A. Gompers. 2021. "And the Children Shall Lead: Gender Diversity and Performance in Venture Capital." *Journal of Financial Economics* 142 (1): 1–22.

Callander, Steven, and Niko Matouschek. 2022. “The Novelty of Innovation: Competition, Disruption, and Antitrust Policy.” *Management Science* 68 (1): 37–51.
Camerer, Colin, and Dan Lovallo. 1999. “Overconfidence and Excess Entry: An Experimental Approach.” *American Economic Review* 89 (1): 306–18.
Campbell, Benjamin A. 2013. “Earnings Effects of Entrepreneurial Experience: Evidence from the Semiconductor Industry.” *Management Science* 59 (2): 286–304.
Carlino, Gerald, and William R. Kerr. 2015. “Agglomeration and Innovation.” In *Handbook of Regional and Urban Economics*, edited by Gilles Duranton, J. Vernon Henderson, and William C. Strange, 5:349–404. Handbook of Regional and Urban Economics. Elsevier.
Chatterji, Aaron K., and Kira R. Fabrizio. 2016. “Does the Market for Ideas Influence the Rate and Direction of Innovative Activity? Evidence from the Medical Device Industry.” *Strategic Management Journal* 37 (3): 447–65.
Chatterji, Aaron K., Edward L. Glaeser, and William R. Kerr. 2014. “Clusters of Entrepreneurship and Innovation.” *Innovation Policy and the Economy* 14 (1): 129–66.
Chavda, Ankur, Joshua S. Gans, and Scott Stern. 2024. “Theory-Based Entrepreneurial Search.” *Strategy Science* 9 (4): 397–415.
Chemmanur, Thomas J., Elena Loutskina, and Xuan Tian. 2014. “Corporate Venture Capital, Value Creation, and Innovation.” *Review of Financial Studies* 27 (8): 2434–73.
Chen, Henry, Paul A. Gompers, Anna Kovner, and Josh Lerner. 2010. “Buy Local? The Geography of Venture Capital.” *Journal of Urban Economics* 67 (1): 90–102.
Chernenko, Sergey, Josh Lerner, and Yao Zeng. 2021. “Mutual Funds as Venture Capitalists? Evidence From Unicorns.” *Review of Financial Studies* 34 (5): 2362–2410.
Chetty, Raj, Gaia Dossi, Matthew Smith, John Van Reenen, Owen Zidar, and Erick Zwick. 2024. “America’s Missing Entrepreneurs:The Determinants of and Returns to Entrepreneurship.” Working Paper.
Choi, Joonkyu, Nathan Goldschlag, John Haltiwanger, and J. Daniel Kim. 2023. “Early Joiners and Startup Performance.” *Review of Economics and Statistics* Forthcoming.
Cohen, Susan, Daniel C. Fehder, Yael V. Hochberg, and Fiona Murray. 2019. “The Design of Startup Accelerators.” *Research Policy* 48 (7): 1781–97.
Conti, Annamaria, Jorge Guzman, and Ron Rabi. 2020. “Herding in the Market for Startup Acquisitions.” *SSRN Electronic Journal*.
Conti, Annamaria, Marie Thursby, and Frank T. Rothaermel. 2013. “Show Me the Right Stuff: Signals for High-Tech Startups.” *Journal of Economics & Management Strategy* 22 (2): 341–64.
Cook, Lisa D., Matt Marx, and Emmanuel Yimfor. 2022. “Funding Black High-Growth Startups.” w30682. National Bureau of Economic Research.
Cooper, Arnold C., Carolyn Y. Woo, and William C. Dunkelberg. 1988. “Entrepreneurs’ Perceived Chances for Success.” *Journal of Business Venturing* 3 (2): 97–108.
Cornelli, Francesca, and Oved Yosha. 2003. “Stage Financing and the Role of Convertible Securities.” *The Review of Economic Studies* 70 (1): 1–32.
Cramer, Jan S., Joop Hartog, Nicole Jonker, and C. Mirjam Van Praag. 2002. “Low Risk Aversion Encourages the Choice for Entrepreneurship: An Empirical Test of a Truism.” *Journal of Economic Behavior & Organization* 48 (1): 29–36.
Cunningham, Colleen, Florian Ederer, and Song Ma. 2020. “Killer Acquisitions.” *Journal of Political Economy*, November, 000–000.
Da Rin, Marco, Thomas Hellmann, and Manju Puri. 2013. “A Survey of Venture Capital Research.” In *Handbook of the Economics of Finance*, 2:573–648. Elsevier.

D'Acunto, Francesco, Geoffrey A. Tate, and Liu Yang. 2020. "Entrepreneurial Teams: Diversity of Skills and Early-Stage Growth." SSRN Scholarly Paper. Rochester, NY.

Davis, Steven J., and John Haltiwanger. 1992. "Gross Job Creation, Gross Job Destruction, and Employment Reallocation." *The Quarterly Journal of Economics* 107 (3): 819–63.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh. 1998. *Job Creation and Destruction*. *MIT Press Books*. Vol. 1. The MIT Press.

Decker, Ryan A., John Haltiwanger, Ron Jarmin, and Javier Miranda. 2014. "The Role of Entrepreneurship in US Job Creation and Economic Dynamism." *Journal of Economic Perspectives* 28 (3): 3–24.

Decker, Ryan A., John Haltiwanger, Ron S. Jarmin, and Javier Miranda. 2016. "Declining Business Dynamism: What We Know and the Way Forward." *American Economic Review* 106 (5): 203–7.

Delgado, Mercedes, Michael E. Porter, and Scott Stern. 2010. "Clusters and Entrepreneurship." *Journal of Economic Geography* 10 (4): 495–518.

Denes, Matthew R., Sabrina T. Howell, Filippo Mezzanotti, Xinxin Wang, and Ting Xu. 2023. "Investor Tax Credits and Entrepreneurship: Evidence from U.S. States." *The Journal of Finance* 78 (5): 2621–71.

Dessein, Wouter. 2002. "Authority and Communication in Organizations." *The Review of Economic Studies* 69 (4): 811–38.

———. 2005. "Information and Control in Ventures and Alliances." *The Journal of Finance* 60 (5): 2513–49.

Dewatripont, Mathias, and Jean Tirole. 1994. "A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence." *The Quarterly Journal of Economics* 109 (4): 1027–54.

Diamond, Douglas W. 1984. "Financial Intermediation and Delegated Monitoring." *The Review of Economic Studies* 51 (3): 393–414.

———. 1991. "Debt Maturity Structure and Liquidity Risk." *The Quarterly Journal of Economics* 106 (3): 709–37.

Doidge, Craig, G. Andrew Karolyi, and René M. Stulz. 2013. "The US Left behind? Financial Globalization and the Rise of IPOs Outside the US." *Journal of Financial Economics* 110 (3): 546–73.

———. 2017. "The US Listing Gap." *Journal of Financial Economics* 123 (3): 464–87.

Duflo, Esther. 2017. "The Economist as Plumber." *American Economic Review* 107 (5): 1–26.

Duranton, Gilles, and Diego Puga. 2004. "Micro-Foundations of Urban Agglomeration Economies." In *Handbook of Regional and Urban Economics*, 4:2063–2117. Elsevier.

Eesley, Charles E., David H. Hsu, and Edward B. Roberts. 2014. "The Contingent Effects of Top Management Teams on Venture Performance: Aligning Founding Team Composition with Innovation Strategy and Commercialization Environment." *Strategic Management Journal* 35 (12): 1798–1817.

Elfenbein, Daniel W., Barton H. Hamilton, and Todd R. Zenger. 2010. "The Small Firm Effect and the Entrepreneurial Spawning of Scientists and Engineers." *Management Science* 56 (4): 659–81.

Evans, David S., and Boyan Jovanovic. 1989. "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints." *Journal of Political Economy* 97 (4): 808–27.

Evans, David S., and Linda S. Leighton. 1989. "Some Empirical Aspects of Entrepreneurship." *American Economic Review* 79 (3): 519–35.

Ewens, Michael, and Joan Farre-Mensa. 2020. "The Deregulation of the Private Equity Markets and the Decline in IPOs." *The Review of Financial Studies* 33 (12): 5463–5509.
Ewens, Michael, Alexander S Gorbenko, and Arthur Korteweg. 2022. "Venture Capital Contracts." *Journal of Financial Economics* 143 (1): 131–58.
Ewens, Michael, and Matt Marx. 2018. "Founder Replacement and Startup Performance." *The Review of Financial Studies* 31 (4): 1532–65.
Ewens, Michael, Ramana Nanda, and Matthew Rhodes-Kropf. 2018. "Cost of Experimentation and the Evolution of Venture Capital." *Journal of Financial Economics* 128 (3): 422–42.
Ewens, Michael, Ramana Nanda, and Christopher T. Stanton. 2024. "Founder-CEO Compensation and Selection into Venture Capital-Backed Entrepreneurship." *Journal of Finance* 79 (5): 3361–3405.
Ewens, Michael, and Richard R. Townsend. 2020. "Are Early Stage Investors Biased against Women?" *Journal of Financial Economics* 135 (3): 653–77.
Fairlie, Robert, Alicia Robb, and David T. Robinson. 2022. "Black and White: Access to Capital Among Minority-Owned Start-Ups." *Management Science* 68 (4): 2377–2400.
Fairlie, Robert W., Dean Karlan, and Jonathan Zinman. 2015. "Behind the GATE Experiment: Evidence on Effects of and Rationales for Subsidized Entrepreneurship Training." *American Economic Journal: Economic Policy* 7 (2): 125–61.
Fairlie, Robert W., Zachary Kroff, Javier Miranda, and Nikolas Zolas. 2023. *The Promise and Peril of Entrepreneurship: Job Creation and Survival among US Startups*. Cambridge, MA: MIT Press.
Farre-Mensa, Joan, Deepak Hegde, and Alexander Ljungqvist. 2020. "What Is a Patent Worth? Evidence from the U.S. Patent 'Lottery.'" *The Journal of Finance* 75 (2): 639–82.
Fehder, Daniel C. 2024. "Coming from a Good Pond: The Influence of a New Venture's Founding Ecosystem on Accelerator Performance." *Administrative Science Quarterly* 69 (1): 1–38.
Fehder, Daniel C, Naomi Hausman, and Yael Hochberg. 2024. "Innovation and Capital: Evidence from the Bayh-Dole Act of 1980." *Journal of Financial Economics* Forthcoming.
Fehder, Daniel C., and Yael Hochberg. 2024. "Accelerators and the Regional Supply of Venture Capital Investment." *Available at SSRN*.
Fehder, Daniel C., Yael Hochberg, Esther Bailey, Eric Floyd, and Daniel Lee. 2021. "The Impact of the COVID-19 Crisis on the Risk Tolerance of Innovation-Driven Entrepreneurs."
Fehder, Daniel C., Yael Hochberg, and Daniel J Lee. 2019. "What Resources Garner Managerial Attention in Startups? Evidence from a Randomized Controlled Trial," July, 45.
Fehder, Daniel C., Smrithi Prasad, and Cheryl Wakslak. 2021. "Angel Investor Personality and Judgement under Uncertainty."
Gans, Joshua S., David H. Hsu, and Scott Stern. 2008. "The Impact of Uncertain Intellectual Property Rights on the Market for Ideas: Evidence from Patent Grant Delays." *Management Science* 54 (5): 982–97.
Gans, Joshua S., D.H. Hsu, and Scott Stern. 2002. "When Does Start-up Innovation Spur the Gale of Creative Destruction?" *The RAND Journal of Economics* 33 (4): 571–86.
Gans, Joshua S., and Scott Stern. 2000. "Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction." *Journal of Economics & Management Strategy* 9 (4): 485–511.
———. 2003. "The Product Market and the Market for 'Ideas': Commercialization Strategies for Technology Entrepreneurs." *Research Policy* 32 (2): 333–50.
Gans, Joshua S., Scott Stern, and Jane Wu. 2019. "Foundations of Entrepreneurial Strategy." *Strategic Management Journal* 40 (5): 736–56.

Gao, Xiaohui, Jay R. Ritter, and Zhongyan Zhu. 2013. "Where Have All the IPOs Gone?" *Journal of Financial and Quantitative Analysis* 48 (6): 1663–92.
Gennaioli, Nicola, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2013. "Human Capital and Regional Development." *The Quarterly Journal of Economics* 128 (1): 105–64.
Gervais, Simon, and Itay Goldstein. 2007. "The Positive Effects of Biased Self-Perceptions in Firms." *Review of Finance* 11 (3): 453–96.
Glaeser, Edward L. 2010. *Agglomeration Economics*. University of Chicago Press.
Gofman, Michael, and Zhao Jin. 2024. "Artificial Intelligence, Education, and Entrepreneurship." *Journal of Finance* 79 (1): 631–67.
Gompers, Paul A. 1994. "The Rise and Fall of Venture Capital." *Business and Economic History*, 1–26.
———. 1995. "Optimal Investment, Monitoring, and the Staging of Venture Capital." *The Journal of Finance* 50 (5): 1461–89.
Gompers, Paul A., and Sophie Calder-Wang. 2017. "Diversity in Innovation." w23082. Cambridge, MA: National Bureau of Economic Research.
Gompers, Paul A., Will Gornall, Steven N. Kaplan, and Ilya A. Strebulaev. 2020. "How Do Venture Capitalists Make Decisions?" *Journal of Financial Economics* 135 (1): 169–90.
Gompers, Paul A., Kevin Huang, and Sophie Q. Wang. 2017. "Homophily in Entrepreneurial Team Formation." Working Paper. Working Paper Series. National Bureau of Economic Research.
Gompers, Paul A., and Josh Lerner. 2000. "Money Chasing Deals? The Impact of Fund Inflows on Private Equity Valuations." *Journal of Financial Economics* 55 (2): 281–325.
Gompers, Paul A., Josh Lerner, and David Scharfstein. 2005. "Entrepreneurial Spawning: Public Corporations and the Genesis of New Ventures, 1986 to 1999." *The Journal of Finance* 60 (2): 577–614.
Gorman, Michael, and William A. Sahlman. 1989. "What Do Venture Capitalists Do?" *Journal of Business Venturing* 4 (4): 231–48.
Gornall, Will, and Ilya A. Strebulaev. 2021. "The Economic Impact of Venture Capital: Evidence from Public Companies." SSRN Scholarly Paper. Rochester, NY.
Gottlieb, Joshua D, Richard R Townsend, and Ting Xu. 2022. "Does Career Risk Deter Potential Entrepreneurs?" *The Review of Financial Studies* 35 (9): 3973–4015.
Graham, Stuart JH, Robert P. Merges, Pam Samuelson, and Ted Sichelman. 2009. "High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey." *Berkeley Technology Law Journal*, 1255–1327.
Greenberg, Jason, and Ethan Mollick. 2018. "Sole Survivors: Solo Ventures Versus Founding Teams." SSRN ID 3107898.
Greve, Henrich R. 2003. "A Behavioral Theory of R&D Expenditures and Innovations: Evidence from Shipbuilding." *The Academy of Management Journal* 46 (6): 685–702.
Griliches, Z. 1992. "The Search for R&D Spillovers." *Scandinavian Journal of Economics* 94: S29-47.
Grossman, Gene M., and Elhanan Helpman. 1991. "Quality Ladders in the Theory of Growth." *The Review of Economic Studies* 58 (1): 43–61.
Grossman, Sanford J., and Oliver D. Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94 (4): 691–719.
Guzman, Jorge. 2024. "Go West Young Firm: Agglomeration and Embeddedness in Startup Migrations to Silicon Valley." *Management Science* 70 (7): 4824–46.
Guzman, Jorge, and Scott Stern. 2015. "Where Is Silicon Valley?" *Science* 347 (6222): 606–9.

———. 2020. “The State of American Entrepreneurship: New Estimates of the Quantity and Quality of Entrepreneurship for 32 US States, 1988–2014.” *American Economic Journal: Economic Policy* 12 (4): 212–43.
Habib, Michel A., Ulrich Hege, and Pierre Mella-Barral. 2013. “Entrepreneurial Spawning and Firm Characteristics.” *Management Science* 59 (12): 2790–2804.
Hall, Bronwyn H., and Josh Lerner. 2010. “The Financing of R&D and Innovation.” *Handbook of the Economics of Innovation*, Handbook of The Economics of Innovation, Vol. 1, 1 (January): 609–39.
Hall, Robert E, and Susan E Woodward. 2010. “The Burden of the Nondiversifiable Risk of Entrepreneurship.” *American Economic Review* 100 (3): 1163–94.
Haltiwanger, John, Henry R. Hyatt, Erika McEntarfer, and Liliana D. Sousa. 2012. “Business Dynamics Statistics Briefing: Job Creation, Worker Churning, and Wages at Young Businesses.” *SSRN Electronic Journal*.
Haltiwanger, John, Ron S. Jarmin, and Javier Miranda. 2012. “Who Creates Jobs? Small versus Large versus Young.” *The Review of Economics and Statistics* 95 (2): 347–61.
Hamilton, Barton H. 2000. “Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-Employment.” *Journal of Political Economy* 108 (3): 604–31.
Harris, Milton, and Artur Raviv. 1979. “Optimal Incentive Contracts with Imperfect Information.” *Journal of Economic Theory* 20 (2): 231–59.
Harris, Robert S., Tim Jenkinson, Steven N. Kaplan, and Rüdiger Stucke. 2023. “Has Persistence Persisted in Private Equity? Evidence from Buyout and Venture Capital Funds.” *Journal of Corporate Finance* 81.
Harrison, Glenn W., and John A. List. 2004. “Field Experiments.” *Journal of Economic Literature* 42 (4): 1009–55.
Hart, Oliver, and John Moore. 1990. “Property Rights and the Nature of the Firm.” *Journal of Political Economy* 98 (6): 1119–58.
———. 1994. “A Theory of Debt Based on the Inalienability of Human Capital.” *The Quarterly Journal of Economics* 109 (4): 841–79.
———. 1998. “Default and Renegotiation: A Dynamic Model of Debt.” *The Quarterly Journal of Economics* 113 (1): 1–41.
Hathaway, Ian, and Robert E. Litan. 2014. “What’s Driving the Decline in the Firm Formation Rate? A Partial Explanation.” *The Brookings Institution*.
Hegde, Deepak, Alexander Ljungqvist, and Manav Raj. 2022. “Quick or Broad Patents? Evidence from US Startups.” *The Review of Financial Studies* 35 (6): 2705–42.
Hellmann, Thomas. 1998. “The Allocation of Control Rights in Venture Capital Contracts.” *The RAND Journal of Economics* 29 (1): 57–76.
Hellmann, Thomas, and Manju Puri. 2000. “The Interaction between Product Market and Financing Strategy: The Role of Venture Capital.” *The Review of Financial Studies* 13 (4): 959–84.
———. 2002. “Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence.” *The Journal of Finance* 57 (1): 169–97.
Hellmann, Thomas, and Veikko Thiele. 2015. “Friends or Foes? The Interrelationship between Angel and Venture Capital Markets.” *Journal of Financial Economics* 115 (3): 639–53.
Hellmann, Thomas, and Noam Wasserman. 2017. “The First Deal: The Division of Founder Equity in New Ventures.” *Management Science* 63 (8): 2647–66.
Henderson, Rebecca, Adam B. Jaffe, and Manuel Trajtenberg. 1998. “Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965–1988.” *The Review of Economics and Statistics* 80 (1): 119–27.

Hochberg, Yael. 2012. “Venture Capital and Corporate Governance in the Newly Public Firm.” *Review of Finance* 16 (2): 429–80.
———. 2016. “Accelerating Entrepreneurs and Ecosystems: The Seed Accelerator Model.” *Innovation Policy and the Economy* 16 (1): 25–51.
———. 2017. “The Changing Face of Early Stage Investing.” Landmark Partners. 2017.
Hochberg, Yael, Laura A. Lindsey, and Mark M. Westerfield. 2015. “Resource Accumulation through Economic Ties: Evidence from Venture Capital.” *Journal of Financial Economics* 118 (2): 245–67.
Hochberg, Yael, Alexander Ljungqvist, and Yang Lu. 2007. “Whom You Know Matters: Venture Capital Networks and Investment Performance.” *The Journal of Finance* 62 (1): 251–301.
———. 2010. “Networking as a Barrier to Entry and the Competitive Supply of Venture Capital.” *The Journal of Finance* 65 (3): 829–59.
Hochberg, Yael, Alexander Ljungqvist, and Annette Vissing-Jørgensen. 2013. “Informational Holdup and Performance Persistence in Venture Capital.” *The Review of Financial Studies* 27 (1): 102–52.
Hochberg, Yael, Michael J. Mazzeo, and Ryan C. McDevitt. 2015. “Specialization and Competition in the Venture Capital Industry.” *Review of Industrial Organization* 46 (4): 323–47.
Hochberg, Yael, Carlos J. Serrano, and Rosemarie H. Ziedonis. 2018. “Patent Collateral, Investor Commitment, and the Market for Venture Lending.” *Journal of Financial Economics* 130 (1): 74–94.
Hochberg, Yael V., and Joshua D. Rauh. 2013. “Local Overweighting and Underperformance: Evidence from Limited Partner Private Equity Investments.” *The Review of Financial Studies* 26 (2): 403–51.
Hochberg, Yael, and Mark Westerfield. 2010. “The Size and Specialization of Direct Investment Portfolios.” *SSRN Electronic Journal*.
Holm, Hakan J., Sonja Opper, and Victor Nee. 2013. “Entrepreneurs under Uncertainty: An Economic Experiment in China.” *Management Science* 59 (7): 1671–87.
Holmström, Bengt. 1979. “Moral Hazard and Observability.” *The Bell Journal of Economics* 10 (1): 74–91.
———. 1982. “Moral Hazard in Teams.” *The Bell Journal of Economics* 13 (2): 324–40.
Holmström, Bengt, and Jean Tirole. 1997. “Financial Intermediation, Loanable Funds, and The Real Sector.” *The Quarterly Journal of Economics* 112 (3): 663–91.
Howell, Sabrina T. 2017. “Financing Innovation: Evidence from R&D Grants.” *American Economic Review* 107 (4): 1136–64.
———. 2020. “Reducing Information Frictions in Venture Capital: The Role of New Venture Competitions.” *Journal of Financial Economics* 136 (3): 676–94.
———. 2021. “Learning from Feedback: Evidence from New Ventures.” *Review of Finance* 25 (3): 595–627.
Howell, Sabrina T, and Ramana Nanda. 2024. “Networking Frictions in Venture Capital, and the Gender Gap in Entrepreneurship.” *Journal of Financial and Quantitative Analysis* 59 (6): 2733–61.
Hsu, David H. 2004. “What Do Entrepreneurs Pay for Venture Capital Affiliation?” *The Journal of Finance* 59 (4): 1805–44.
Huang, Rongbing, Jay R. Ritter, and Donghang Zhang. 2023. “IPOs and SPACs: Recent Developments.” *Annual Review of Financial Economics* 15: 595–615.
Hunt, Jennifer. 2011. “Which Immigrants Are Most Innovative and Entrepreneurial? Distinctions by Entry Visa.” *Journal of Labor Economics* 29 (3): 417–57.

Hurst, Erik G., and Benjamin Wild Pugsley. 2011. "What Do Small Businesses Do?" *Brookings Papers on Economic Activity*, May, 73–142.
Hvide, Hans K., and Benjamin F. Jones. 2018. "University Innovation and the Professor's Privilege." *American Economic Review* 108 (7): 1860–98.
Hvide, Hans K, and Paul Oyer. 2018. "Dinner Table Human Capital and Entrepreneurship." Working Paper 24198. National Bureau of Economic Research.
Hvide, Hans K., and Georgios A. Panos. 2014. "Risk Tolerance and Entrepreneurship." *Journal of Financial Economics* 111 (1): 200–223.
Ibrahim, Darian M. 2010. "Debt as Venture Capital." *University of Illinois Law Review* 4: 1169–1210.
Jaffe, Adam B., Manuel Trajtenberg, and Rebecca Henderson. 1993. "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations." *The Quarterly Journal of Economics* 108 (3): 577–98.
Jeffers, Jessica. 2024. "The Impact of Restricting Labor Mobility on Corporate Investment and Entrepreneurship." *Review of Financial Studies* 37 (1): 1–44.
Jones, Charles I. 2023. "Recipes and Economic Growth: A Combinatorial March Down an Exponential Tail." *Journal of Political Economy* 131 (8): 1994–2031.
Jovanovic, Boyan, and Glenn M. MacDonald. 1994. "The Life Cycle of a Competitive Industry." *Journal of Political Economy* 102 (2): 322–47.
Kanze, Dana, Mark A. Conley, Tyler G. Okimoto, Damon J. Phillips, and Jennifer Merluzzi. 2020. "Evidence That Investors Penalize Female Founders for Lack of Industry Fit." *Science Advances* 6 (48): eabd7664.
Kaplan, Steven N., and Josh Lerner. 2010. "It Ain't Broke: The Past, Present, and Future of Venture Capital." *Journal of Applied Corporate Finance* 22 (2): 36–47.
Kaplan, Steven N., and Antoinette Schoar. 2005. "Private Equity Performance: Returns, Persistence, and Capital Flows." *The Journal of Finance* 60 (4): 1791–1823.
Kaplan, Steven N., Berk A. Sensoy, and Per Strömberg. 2009. "Should Investors Bet on the Jockey or the Horse? Evidence from the Evolution of Firms from Early Business Plans to Public Companies." *The Journal of Finance* 64 (1): 75–115.
Kaplan, Steven N., and Per Strömberg. 2003. "Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts." *The Review of Economic Studies* 70 (2): 281–315.
———. 2004. "Characteristics, Contracts, and Actions: Evidence from Venture Capitalist Analyses." *The Journal of Finance* 59 (5): 2177–2210.
Kerr, Sari P., and William Kerr. 2020. "Immigrant Entrepreneurship in America: Evidence from the Survey of Business Owners 2007 & 2012." *Research Policy* 49 (3): 103918.
Kerr, Sari Pekkala, and William R. Kerr. 2021. "Immigration Policy Levers for Us Innovation and Startups." In *Innovation and Public Policy*, 85–108. National Bureau of Economic Research Conference Reports. Chicago: University of Chicago Press.
Kerr, William R. 2010. "Breakthrough Inventions and Migrating Clusters of Innovation." *Journal of Urban Economics*, Special Issue: Cities and Entrepreneurship, 67 (1): 46–60.
Kerr, William R., Sari P. Kerr, and Margaret Dalton. 2019. "Risk Attitudes and Personality Traits of Entrepreneurs and Venture Team Members." *Proceedings of the National Academy of Sciences* 116 (36): 17712–16.
Kerr, William R., Sari P. Kerr, and Tina Xu. 2018. "Personality Traits of Entrepreneurs: A Review of Recent Literature." *Foundations and Trends in Entrepreneurship* 14 (3): 279–356.

Kerr, William R., and Scott Duke Kominers. 2014. "Agglomerative Forces and Cluster Shapes." *The Review of Economics and Statistics* 97 (4): 877–99.
Kerr, William R., Josh Lerner, and Antoinette Schoar. 2014. "The Consequences of Entrepreneurial Finance: Evidence from Angel Financings." *The Review of Financial Studies* 27 (1): 20–55.
Kerr, William R., Ramana Nanda, and Matthew Rhodes-Kropf. 2014. "Entrepreneurship as Experimentation." *Journal of Economic Perspectives* 28 (3): 25–48.
Kerr, William R., and Frederic Robert-Nicoud. 2020. "Tech Clusters." *Journal of Economic Perspectives* 34 (3): 50–76.
Khosla, Pooja. 2018. "Wait Time for Permanent Residency and the Retention of Immigrant Doctoral Recipients in the US." *Economic Analysis and Policy* 57: 33–43.
Kihlstrom, Richard E., and Jean-Jacques Laffont. 1979. "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion." *Journal of Political Economy* 87 (4): 719–7488.
Kim, J. Daniel. 2022. "Startup Acquisitions, Relocation, and Employee Entrepreneurship." *Strategic Management Journal* 43 (11): 2189–2216.
Kiyotaki, Nobuhiro, and John Moore. 1997. "Credit Cycles." *Journal of Political Economy* 105 (2): 211–48.
Klepper, Steven. 2010. "The Origin and Growth of Industry Clusters: The Making of Silicon Valley and Detroit." *Journal of Urban Economics* 67 (1): 15–32.
Klepper, Steven, and S. Sleeper. 2005. "Entry by Spinoffs." *Management Science* 51 (8): 1291–1306.
Klette, Tor Jakob, and Samuel Kortum. 2004. "Innovating Firms and Aggregate Innovation." *Journal of Political Economy* 112 (5): 986–1018.
Knight, Frank H. 1921. *Risk, Uncertainty and Profit*. Courier Corporation.
Kolev, Julian, Alexis Haughey, Fiona Murray, and Scott Stern. 2022. "Of Academics and Creative Destruction: Startup Advantage in the Process of Innovation." National Bureau of Economic Research.
Korteweg, Arthur, and Berk Sensoy. 2023. "How Unique Is VC's American History?" *Journal of Economic Literature* 61 (1): 274–94.
Koudstaal, Martin, Randolph Sloof, and Mirjam van Praag. 2016. "Risk, Uncertainty, and Entrepreneurship: Evidence from a Lab-in-the-Field Experiment." *Management Science* 62 (10): 2897–2915.
Krishnan, Karthik, and Pinshuo Wang. 2018. "The Cost of Financing Education: Can Student Debt Hinder Entrepreneurship?" *Management Science* 65 (10): 4522–54.
Kwon, Sungjoung, Michelle Lowry, and Yiming Qian. 2020. "Mutual Fund Investments in Private Firms." *Journal of Financial Economics* 136 (2): 407–43.
La Porta, Rafael, and Andrei Shleifer. 2014. "Informality and Development." *Journal of Economic Perspectives* 28 (3): 109–26.
Lach, Saul, and Mark Schankerman. 2008. "Incentives and Invention in Universities." *The RAND Journal of Economics* 39 (2): 403–33.
Lamoreaux, N.R., M. Levenstein, and K.L. Sokoloff. 2006. "Mobilizing Venture Capital during the Second Industrial Revolution: Cleveland, Ohio, 1870-1920." *Capitalism and Society* 1 (3): 1–61.
Landier, Augustin, and David Thesmar. 2009. "Financial Contracting with Optimistic Entrepreneurs." *The Review of Financial Studies* 22 (1): 117–50.
Lane, Philip R., and Gian Maria Milesi-Ferretti. 2008. "The Drivers of Financial Globalization." *American Economic Review* 98 (2): 327–32.

Lattanzio, Gabriele, Lubomir Litov, and William Megginson. 2023. "Capitalizing Entrepreneurship: The Rise of Growth Equity." *Journal of Applied Corporate Finance* 35 (2): 75–89.
Lazear, Edward P. 1986. "Salaries and Piece Rates." *The Journal of Business* 59 (3): 405–31.
———. 2004. "Balanced Skills and Entrepreneurship." *American Economic Review* 94 (2): 208–11.
Lazear, Edward P. 2005. "Entrepreneurship." *Journal of Labor Economics* 23 (4): 649–80.
Lee, Samuel, and Petra Persson. 2016. "Financing from Family and Friends." *The Review of Financial Studies* 29 (9): 2341–86.
Leland, Hayne E., and David H. Pyle. 1977. "Informational Asymmetries, Financial Structure, and Financial Intermediation." *The Journal of Finance* 32 (2): 371–87.
Lerner, Josh. 1995. "Venture Capitalists and the Oversight of Private Firms." *The Journal of Finance* 50 (1): 301–18.
———. 1999. "The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program." *Journal of Business* 72 (3).
———. 2009. *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed--and What to Do About It*. Princeton University Press.
———. 2013. "The Boulevard of Broken Dreams: Innovation Policy and Entrepreneurship." *Innovation Policy and the Economy* 13 (1): 61–82.
———. 2021. "Government Incentives for Entrepreneurship." In *Innovation and Public Policy*. National Bureau of Economic Research Conference Reports. Chicago: University of Chicago Press.
Lerner, Josh, and Ulrike Malmendier. 2013. "With a Little Help from My (Random) Friends: Success and Failure in Post-Business School Entrepreneurship." *The Review of Financial Studies* 26 (10): 2411–52.
Lerner, Josh, Henry J. Manley, Carolyn Stein, and Heidi L. Williams. 2024. "The Wandering Scholars: Understanding the Heterogeneity of University Commercialization." w32069. National Bureau of Economic Research.
Lerner, Josh, and Ramana Nanda. 2020. "Venture Capital's Role in Financing Innovation: What We Know and How Much We Still Need to Learn." *Journal of Economic Perspectives* 34 (3): 237–61.
Lerner, Josh, Antoinette Schoar, Stanislav Sokolinski, and Karen Wilson. 2018. "The Globalization of Angel Investments: Evidence Across Countries." *Journal of Financial Economics* 127 (1): 1–20.
Levine, Ross, and Yona Rubinstein. 2017. "Smart and Illicit: Who Becomes an Entrepreneur and Do They Earn More?" *The Quarterly Journal of Economics* 132 (2): 963–1018.
———. 2018. "Selection into Entrepreneurship and Self-Employment." Working Paper Series. National Bureau of Economic Research.
Liang, James, Hui Wang, and Edward P. Lazear. 2018. "Demographics and Entrepreneurship." *Journal of Political Economy* 126 (S1): S140–96.
Lindquist, Matthew J., Joeri Sol, and Mirjam Van Praag. 2015. "Why Do Entrepreneurial Parents Have Entrepreneurial Children?" *Journal of Labor Economics* 33 (2): 269–96.
Lindsey, Laura. 2008. "Blurring Firm Boundaries: The Role of Venture Capital in Strategic Alliances." *The Journal of Finance* 63 (3): 1137–68.
Lindsey, Laura, and Luke C. D. Stein. 2019. "Angels, Entrepreneurship, and Employment Dynamics: Evidence from Investor Accreditation Rules." SSRN.
Ljungqvist, Alexander, and Matthew Richardson. 2003. "The Cash Flow, Return and Risk Characteristics of Private Equity." w9454. National Bureau of Economic Research.

Lucas, Robert E. 1978. “On the Size Distribution of Business Firms.” *The Bell Journal of Economics* 9 (2): 508–23.
Luttmer, Erzo G. J. 2011. “On the Mechanics of Firm Growth.” *The Review of Economic Studies* 78 (3): 1042–68.
Manso, Gustavo. 2016. “Experimentation and the Returns to Entrepreneurship.” *The Review of Financial Studies* 29 (9): 2319–40.
Marx, Matt, Deborah Strumsky, and Lee Fleming. 2009. “Mobility, Skills, and the Michigan Non-Compete Experiment.” *Management Science* 55 (6): 875–89.
Masulis, Ronald W., and Rajarishi Nahata. 2009. “Financial Contracting with Strategic Investors: Evidence from Corporate Venture Capital Backed IPOs.” *Journal of Financial Intermediation* 18 (4): 599–631.
McKenzie, David. 2017. “Identifying and Spurring High-Growth Entrepreneurship: Experimental Evidence from a Business Plan Competition.” *American Economic Review* 107 (8): 2278–2307.
Meza, David de, Christopher Dawson, Andrew Henley, and G. Reza Arabsheibani. 2019. “Curb Your Enthusiasm: Optimistic Entrepreneurs Earn Less.” *European Economic Review* 111 (January): 53–69.
Meza, David de, and David C. Webb. 1987. “Too Much Investment: A Problem of Asymmetric Information.” *The Quarterly Journal of Economics* 102 (2): 281–92.
Michelacci, Claudio, and Olmo Silva. 2007. “Why So Many Local Entrepreneurs?” *Review of Economics and Statistics* 89 (4): 615–33.
Milgrom, Paul, and John Roberts. 1995. “Complementarities and Fit Strategy, Structure, and Organizational Change in Manufacturing.” *Journal of Accounting and Economics* 19 (2): 179–208.
Moretti, Enrico. 2021. “The Effect of High-Tech Clusters on the Productivity of Top Inventors.” *American Economic Review* 111 (10): 3328–75.
Moretti, Enrico, and Per Thulin. 2013. “Local Multipliers and Human Capital in the United States and Sweden.” *Industrial and Corporate Change* 22 (1): 339–62.
Moser, Petra, Alessandra Voena, and Fabian Waldinger. 2014. “German Jewish Émigrés and US Invention.” *American Economic Review* 104 (10): 3222–55.
Moskowitz, Tobias J., and Annette Vissing-Jørgensen. 2002. “The Returns to Entrepreneurial Investment: A Private Equity Premium Puzzle?” *American Economic Review* 92 (4): 745–78.
Myers, Kyle R., and Lauren Lanahan. 2022. “Estimating Spillovers from Publicly Funded R&D: Evidence from the US Department of Energy.” *American Economic Review* 112 (7): 2393–2423.
Myers, Stewart. 1984. “The Capital Structure Puzzle.” *Journal of Finance* 39 (3): 575–92.
Myers, Stewart C., and Nicholas S. Majluf. 1984. “Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have.” *Journal of Financial Economics* 13 (2): 187–221.
Nachman, David C., and Thomas H. Noe. 1994. “Optimal Design of Securities under Asymmetric Information.” *The Review of Financial Studies* 7 (1): 1–44.
Nanda, Ramana, and Matthew Rhodes-Kropf. 2016. “Financing Entrepreneurial Experimentation.” *Innovation Policy and the Economy* 16 (1): 1–23.
———. 2017. “Financing Risk and Innovation.” *Management Science* 63 (4): 901–18.
Nanda, Ramana, and Jesper B. Sørensen. 2010. “Workplace Peers and Entrepreneurship.” *Management Science* 56 (7): 1116–26.
NCVA. 2020. “NVCA Yearbook.”

Nicholas, Tom. 2019. *VC: An American History*. Cambridge, MA: Harvard University Press.
Nishimura, Kiyohiko G., and Hiroyuki Ozaki. 2004. "Search and Knightian Uncertainty." *Journal of Economic Theory* 119 (2): 299–333.
Parker, Simon C. 2004. *The Economics of Self-Employment and Entrepreneurship*. Cambridge: Cambridge University press.
Prendergast, Canice. 2002. "The Tenuous Trade-off between Risk and Incentives." *Journal of Political Economy* 110 (5): 1071–1102.
Puri, Manju, and David T. Robinson. 2007. "Optimism and Economic Choice." *Journal of Financial Economics* 86 (1): 71–99.
———. 2013. "The Economic Psychology of Entrepreneurship and Family Business." *Journal of Economics & Management Strategy* 22 (2): 423–44.
Puri, Manju, and Rebecca Zarutskie. 2012. "On the Life Cycle Dynamics of Venture-Capital- and Non-Venture-Capital-Financed Firms." *The Journal of Finance* 67 (6): 2247–93.
Queiró, Francisco. 2022. "Entrepreneurial Human Capital and Firm Dynamics." *The Review of Economic Studies* 89 (4): 2061–2100.
Rajan, Raghuram G. 2012a. "Presidential Address: The Corporation in Finance." *The Journal of Finance* 67 (4): 1173–1217.
———. 2012b. "Presidential Address: The Corporation in Finance." *The Journal of Finance* 67 (4): 1173–1217.
Roach, Michael, and Henry Sauermann. 2015. "Founder or Joiner? The Role of Preferences and Context in Shaping Different Entrepreneurial Interests." *Management Science* 61 (9): 2160–84.
Robb, Alicia M., and David T. Robinson. 2014. "The Capital Structure Decisions of New Firms." *The Review of Financial Studies* 27 (1): 153–79.
Roberts, Edward B. 1991. *Entrepreneurs in High Technology: Lessons from MIT and Beyond*. Oxford University Press.
Romer, Paul M. 1990. "Endogenous Technological Change." *Journal of Political Economy* 98 (5, Part 2): S71–102.
Rosenberg, Nathan, and W. Edward Steinmueller. 2013. "Engineering Knowledge." *Industrial and Corporate Change* 22 (5): 1129–58.
Rosenthal, Stuart S., and William C. Strange. 2004. "Evidence on the Nature and Sources of Agglomeration Economies." In *Handbook of Regional and Urban Economics*, edited by J. Vernon Henderson and Jacques-François Thisse, 4:2119–71. Cities and Geography. Elsevier.
Ross, Stephen A. 1977. "The Determination of Financial Structure: The Incentive-Signalling Approach." *The Bell Journal of Economics*, 23–40.
Roth, Alvin E. 2002. "The Economist as Engineer: Game Theory, Experimentation, and Computation as Tools for Design Economics." *Econometrica* 70 (4): 1341–78.
Rotter, Julian B. 1954. *Social Learning and Clinical Psychology.* Englewood Cliffs, NJ: Prentice Hall.
Ruef, Martin, Howard E. Aldrich, and Nancy M. Carter. 2003. "The Structure of Founding Teams: Homophily, Strong Ties, and Isolation among U.S. Entrepreneurs." *American Sociological Review* 68 (2): 195–222.
Sahlman, William A. 1990. "The Structure and Governance of Venture-Capital Organizations." *Journal of Financial Economics* 27 (2): 473–521.
Samila, Sampsa, and Olav Sorenson. 2010. "Venture Capital, Entrepreneurship, and Economic Growth." *The Review of Economics and Statistics* 93 (1): 338–49.

Sampat, Bhaven N., David C. Mowery, and Arvids A. Ziedonis. 2003. "Changes in University Patent Quality after the Bayh–Dole Act: A Re-Examination." *The Economics of Intellectual Property at Universities* 21 (9): 1371–90.
Schoar, Antoinette. 2010. "The Divide between Subsistence and Transformational Entrepreneurship." *Innovation Policy and the Economy* 10 (1): 57–81.
Schumpeter, Joseph A. 1942. *Capitalism, Socialism and Democracy*. New York: Routledge.
Scott, Erin L., Pian Shu, and Roman M. Lubynsky. 2019. "Entrepreneurial Uncertainty and Expert Evaluation: An Empirical Analysis." *Management Science*, July, mnsc.2018.3244.
Serrano, Carlos J., and Rosemarie H. Ziedonis. 2024. "Do Patent Assets Have a Second Life When Startups Fail? An Analysis of the Redeployment Likelihood and Mode of Transfer." *Strategic Management Journal*, July, smj.3644.
Shane, Scott. 2000. "Prior Knowledge and the Discovery of Entrepreneurial Opportunities." *Organization Science*, 448–69.
Sørensen, Jesper B., and Magali A. Fassiotto. 2011. "Organizations as Fonts of Entrepreneurship." *Organization Science* 22 (5): 1322–31.
Sørensen, Morten. 2007. "How Smart Is Smart Money? A Two-Sided Matching Model of Venture Capital." *The Journal of Finance* 62 (6): 2725–62.
Sorenson, Olav, Michael S. Dahl, Rodrigo Canales, and M. Diane Burton. 2021. "Do Startup Employees Earn More in the Long Run?" *Organization Science*, January.
Startup Genome. 2019. "Startup Genome." Startup Genome. 2019.
Stiglitz, Joseph E., and Andrew Weiss. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71 (3): 393–410.
Stuart, Toby, Ha Hoang, and Ralph C. Hybels. 1999. "Interorganizational Endorsements and the Performance of Entrepreneurial Ventures." *Administrative Science Quarterly* 44 (2): 315–49.
Stuart, Toby, and Olav Sorenson. 2003. "The Geography of Opportunity: Spatial Heterogeneity in Founding Rates and the Performance of Biotechnology Firms." *Research Policy* 32 (2): 229–53.
Stuart, Toby E., and Waverly W. Ding. 2006. "When Do Scientists Become Entrepreneurs? The Social Structural Antecedents of Commercial Activity in the Academic Life Sciences." *American Journal of Sociology* 112 (1): 97–144.
Townsend, Robert M. 1979. "Optimal Contracts and Competitive Markets with Costly State Verification." *Journal of Economic Theory* 21 (2): 265–93.
Van den Steen, Eric. 2005. "Organizational Beliefs and Managerial Vision." *Journal of Law, Economics, and Organization* 21 (1): 256–83.
Wallskog, Melanie. 2024. "Entrepreneurial Spillovers across Coworkers." Working paper, Duke University.
Weitzman, Martin L. 1998. "Recombinant Growth." *The Quarterly Journal of Economics* 113 (2): 331–60.
Zucker, Lynne G., Michael R. Darby, and Marilynn B. Brewer. 1998. "Intellectual Human Capital and the Birth of U.S. Biotechnology Enterprises." *American Economic Review* 88 (1): 290–306.

Tables

TABLE 1
Entry Into Innovation-Driven Entrepreneurship

Summary of Reviewed Studies	The theoretical and empirical literature on entry has focused on three key issues the: (i) preferences which increase the likelihood of entering entrepreneurship (ii) human capital required to enter, and (iii) resource constraints that limit entry. Because the distribution of reward, risk and uncertainty is substantially different for IDE, the degree to which each of these channels shapes IDE entry compared to other forms of entrepreneurship will differ. The degree to which empirical studies have addressed these issues for IDE varies. Although there is substantial work on the role of human and social capital in IDE, there is less on resource constraints and few studies on preferences.
Subsections	**Relevant Studies**
Preferences	*Theory* Knight (1921); Kihlstrom and Laffont (1979); Landier and Thesmar (2009) *Descriptive* Cooper, Woo, and Dunkelberg (1988)*; Hamilton (2000)*; Cramer et al. (2002)*; Moskowitz and Vissing-Jørgensen (2002)*; Åstebro, Jeffrey, and Adomza (2007); Puri and Robinson (2007)*; Benz and Frey (2008)*; Hall and Woodward (2010); Hurst and Pugsley (2011); Puri and Robinson (2013)*; Hvide and Panos (2014)*; Levine and Rubinstein (2017)*; Kerr, Kerr, and Xu (2018)*; de Meza et al. (2019)*; Barrios, Hochberg, and Macciocchi (2024); Ewens, Nanda, and Stanton (2024) *Causal* Camerer and Lovallo (1999)*; Holm, Opper, and Nee (2013)*; Koudstaal, Sloof, and van Praag (2016)*; Bailey et al. (2024)
Human Capital	*Theory* Schumpeter (1942); Lucas (1978); Kihlstrom and Laffont (1979); Evans and Jovanovic (1989); Lazear (2004); Lazear (2005); Habib, Hege, and Mella-Barral (2013); Levine and Rubinstein (2018) *Descriptive* Burton, Sørensen, and Beckman (2002); Stuart and Sorenson (2003); Agarwal et al. (2004); Gompers, Lerner, and Scharfstein (2005); Klepper and Sleeper (2005); Stuart and Ding (2006); Elfenbein, Hamilton, and Zenger (2010); Nanda and Sørensen (2010)*; Åstebro and Thompson (2011); Sørensen and Fassiotto (2011)*; Gennaioli et al. (2013); Rosenberg and Steinmueller (2013); Levine and Rubinstein (2017)*; Hvide and Oyer (2018)*; Liang, Wang, and Lazear (2018)*; Bell et al. (2019); Azoulay et al. (2020); Babina (2020)*; Kolev et al. (2022); Queiró (2022)*; Chetty et al. (2024)*; Gofman and Jin (2024); Lerner et al. (2024); Wallskog (2024)* *Causal* Lerner and Malmendier (2013); Lindquist, Sol, and Van Praag (2015)*; Bernstein, Colonnelli, et al. (2022)*; Babina and Howell (2024)
Resource Constraints	*Theory* Bernanke and Gertler (1989); Evans and Jovanovic (1989); Kiyotaki and Moore (1997); Cagetti and De Nardi (2006); Bajari, Benkard, and Levin (2007) *Descriptive* Guzman and Stern (2020); Chetty et al. (2024)*; Ewens, Nanda, and Stanton (2024) *Causal*

	Ewens, Nanda, and Rhodes-Kropf (2018); Krishnan and Wang (2018)*; Barrios, Hochberg, and Yi (2022); Gottlieb, Townsend, and Xu (2022)*

Notes: Papers whose primary contribution to our survey provide descriptive statistics or correlative patterns are categorized under *Descriptive*, even if the authors discuss their results in a manner that suggests causality or attempt to rule out other explanations. Such papers may contain illustrative conceptual models, but we view their main contribution as the descriptive empirical patterns they document. The *Causal* category consists of papers that make a substantive attempt to estimate a causal relationship. *Theory* contains papers whose main contribution for the purposes of our survey is the theoretical model, even if they measure some descriptive statistics within. Note that the main contribution of the paper that we highlight for our survey purposes may not be the main contribution emphasized by the authors. Empirical papers are denoted with an asterisk* if they are based on a sample of entrepreneurs that combine innovation-driven and non-innovation-driven ventures and do not have results that speak to IDE specifically.

TABLE 2

Founding Teams and Organization

Summary of Reviewed Studies	The choice between solo founders and co-founders significantly impacts innovation-driven ventures. While many small businesses in the US are sole proprietorships, innovation-driven ventures typically require a team to bring diverse skills essential for innovation. Founding teams increase the likelihood of commercialization and higher revenue compared to solo founders. Challenges include optimal team composition, incentivization, and succession planning. Founders often face replacement as ventures grow, especially after securing venture capital. The dynamics of founding teams play a crucial role in the venture's success or failure. Given the endogeneity of team formation, there is limited causal research on the effect of founding team composition on venture formation and outcomes.

Subsections	**Relevant Studies**
Founding Teams	*Theory* Alchian and Demsetz (1972); Holmström (1982); Lazear (2004); Van den Steen (2005); Gervais and Goldstein (2007) *Descriptive* Ruef, Aldrich, and Carter (2003)*; Eesley, Hsu, and Roberts (2014); Åstebro and Serrano (2015); Roach and Sauermann (2015); Hellmann and Wasserman (2017); Greenberg and Mollick (2018)*; D'Acunto, Tate, and Yang (2020)*; Gompers et al. (2020); Botelho and Marx (2021); Sorenson et al. (2021)*; Botelho, Fehder, and Miric (2023); Ewens, Nanda, and Stanton (2024) *Causal* Camerer and Lovallo (1999)*; Bernstein, Korteweg, and Laws (2017); Gompers, Huang, and Wang (2017); Botelho and Chang (2023); Bailey et al. (2024)
Succession and Evolution	*Descriptive* Hellmann and Puri (2002); Kaplan, Sensoy, and Strömberg (2009) *Causal* Ewens and Marx (2018); Becker and Hvide (2022)*; Choi et al. (2023)

Notes: Papers whose primary contribution to our survey provide descriptive statistics or correlative patterns are categorized under *Descriptive*, even if the authors discuss their results in a manner that suggests causality or attempt to rule out other explanations. Such papers may contain illustrative conceptual models, but we view their main contribution as the descriptive empirical patterns they document. The *Causal* category consists of papers that make a substantive attempt to estimate a causal relationship. *Theory* contains papers whose main contribution for the purposes of our survey is the theoretical model, even if they measure some descriptive statistics within. Note that the main contribution of the paper that we highlight for our survey purposes may not be the main contribution emphasized by the authors. Empirical papers are denoted with an asterisk* if they are based on a sample of entrepreneurs that combine innovation-driven and non-innovation-driven ventures and do not have results that speak to IDE specifically.

TABLE 3
Financing

Summary of Reviewed Studies	The venture capital (VC) industry is the primary source of funding for innovation-driven ventures. VCs are equity investors who typically specialize by geography, industry, and stage, investing in a staged manner that preserves the real option to abandon low-performing ventures. They exhibit wide variation in performance, suggesting the presence of skill. VCs provide not only funding, but also value-added services that improve the performance of their portfolio companies. To do so, they maintain large networks with other VCs, potential customers, former portfolio companies, and other stakeholders that can provide valuable assistance to portfolio company investments, with implications for performance of both the VC funds and their investments. These networks also act as barrier to entry by new investors, with implications for division of value between investors and entrepreneurs and for who can most easily partake in IDE activity. VC contract terms structures and investment appear to align with the importance of agency and hold-up problems but are inconsistent with theories of optimal risk-sharing between investors and entrepreneurs. Many of the descriptive studies in this category specifically aim to determine whether empirical patterns match the predictions of theory.
Subsections	**Relevant Studies**
Venture Capital	*Theory* Ross (1977); Harris and Raviv (1979); Holmström (1979); Lazear (1986); Grossman and Hart (1986); Hart and Moore (1990); Diamond (1991); Aghion and Bolton (1992); Admati and Pfleiderer (1994); Aghion and Tirole (1994); Dewatripont and Tirole (1994); Hart and Moore (1994); Hart and Moore (1998); Hellmann (1998); Dessein (2002); Prendergast (2002); Cornelli and Yosha (2003); Bergemann and Hege (2005); Dessein (2005); Hochberg and Westerfield (2010); Hochberg, Ljungqvist and Vissing-Jørgensen (2013); Nanda and Rhodes-Kropf (2016); Nanda and Rhodes-Kropf (2017) *Descriptive* Gorman and Sahlman (1989); Sahlman (1990); Gompers (1995); Lerner (1995); Stuart, Hoang, and Hybels (1999); Hellmann and Puri (2000); Kaplan and Strömberg (2003); Kaplan and Strömberg (2004); Kaplan and Schoar (2005); Kaplan and Lerner (2010); Harris et al. (2023) *Causal* Hellmann and Puri (2002); Hsu (2004); Hochberg, Ljungqvist and Lu (2007); Sørensen (2007); Bottazzi, Da Rin, and Hellmann (2008); Lindsey (2008); Hochberg, Ljungqvist, and Lu (2010); Hochberg (2012); Hochberg, Lindsey and Westerfield (2015); Hochberg, Mazzeo, and McDevitt (2015); Bernstein, Giroud, and Townsend (2016); Ewens, Nanda and Rhodes-Kropf (2018); Gornall and Strebulaev (2021); Bernstein, Mehta, et al. (2022); Ewens, Gorbenko, and Korteweg (2022)
Other Entrepreneurial Financing	*Theory* Holmström and Tirole (1997); Hellmann and Thiele (2015); Lee and Persson (2016) *Descriptive* Ibrahim (2010), Robb and Robinson (2014)*; Chernenko, Lerner and Zheng (2021); Lattanzio, Litov, and Megginson (2023) *Causal* Kerr, Lerner and Schoar (2014); Bernstein, Korteweg and Laws (2017); Hochberg, Serrano, and Ziedonis (2018); Lerner et al. (2018); Ewens and Farre-Mensa (2020); Kwon, Lowry, and Quian (2020)

Notes: Papers whose primary contribution to our survey provide descriptive statistics or correlative patterns are categorized under *Descriptive*, even if the authors discuss their results in a manner that suggests causality or attempt to rule out other explanations. Such papers may contain illustrative conceptual models, but we view their main contribution as the descriptive empirical patterns they document. The *Causal* category consists of papers that make a substantive attempt to estimate a causal relationship. *Theory* contains papers whose main contribution for the purposes of our survey is the theoretical model, even if they measure some descriptive statistics within. Note that the main contribution of the paper that we highlight for our survey purposes may not be the main contribution emphasized by the authors. Empirical papers are denoted with an asterisk* if they are based on a sample of entrepreneurs that combine innovation-driven and non-innovation-driven ventures and do not have results that speak to IDE specifically.

TABLE 4
Strategic Choices

Summary of Reviewed Studies	Innovation-driven ventures face multiplicity of paths to commercialize their idea and therefore a broad array of interconnected choices with greater uncertainty about the impact of a strategy on firm value. IDE founders must adopt a process for choosing among multiple, uncertain alternatives. The interplay between uncertainty and learning leads to an endogenous gap between optimization and choice, and as a result, choice, rather than the strategic environment, is considered the foundation of IDE strategy. IDE startups often compete not only in the product market but also in the market for ideas. Cooperation with incumbents can be an optimal strategy when incumbents can easily duplicate the innovation of an entrant; alternatively, the right to exclude incumbents provides bargaining power. As a result, investments in intellectual property have significant value for IDE, and for investors, patents serve as certification of startup quality. Finally, choice of location is important, as clusters concentrate specialized human capital and information transfer.
Subsections	**Relevant Studies**
Types of Choices	*Theory* Kihlstrom and Laffont (1979); Evans and Jovanovic (1989); Griliches (1992); Gans and Stern (2000); Arora, Fosfuri, and Gambardella (2001); Gans and Stern (2003); Bloom, Schankerman, and Van Reenen (2013); Conti, Thursby, and Rothaermel (2013); Kerr and Kominers (2014); Gans, Stern, and Wu (2019); Agrawal, Gans, and Stern (2021); Callander and Matouschek (2022) *Descriptive* Zucker, Darby, and Brewer (1998); Shane (2000); Gans and Stern (2003); Gans, Hsu, Stern (2002); Arzaghi and Henderson (2008); Graham et al. (2009); Guzman and Stern (2015); Glaeser (2010)*; Moretti and Thulin (2013)*; Chatterji, Glaeser, and Kerr (2014); Carlino and Kerr (2015); Botelho and Marx (2021) *Causal* Michelacci and Silva (2007)*; Gans, Hsu, Stern (2008); Chatterji and Fabrizio (2016); Farre-Mensa, Hegde, Ljungqvist (2020); Moretti (2021); Guzman (2024)
Search and Commitment	*Theory* Evans and Jovanovic (1989); Milgrom and Roberts (1995); Adam (2001); Nishimura and Ozaki (2004); Bergemann and Hege (2005); Gans, Stern, and Wu (2019); Agrawal, Gans, and Stern (2021); Chavda, Gans, and Stern (2024) *Descriptive* Scott, Shu and Lubynsky (2019) *Causal* Ewens, Nanda and Rhodes-Kropf (2018); Howell (2020); Howell (2021); Bailey et al. (2024)

Notes: Papers whose primary contribution to our survey provide descriptive statistics or correlative patterns are categorized under *Descriptive*, even if the authors discuss their results in a manner that suggests causality or attempt to rule out other explanations. Such papers may contain illustrative conceptual models, but we view their main contribution as the descriptive empirical patterns they document. The *Causal* category consists of papers that make a substantive attempt to estimate a causal relationship. *Theory* contains papers whose main contribution for the purposes of our survey is the theoretical model, even if they measure some descriptive statistics within. Note that the main contribution of the paper that we highlight for our survey purposes may not be the main contribution emphasized by the authors. Empirical papers are denoted with an asterisk* if they are based on a sample of entrepreneurs that combine innovation-driven and non-innovation-driven ventures and do not have results that speak to IDE specifically.

TABLE 5
Policy and Programs

Summary of Reviewed Studies	Because IDE is tied to economic growth, policy makers have invested substantially in programs and policies to encourage IDE entry and support the growth firm growth. Theoretical and empirical research examining the impact of policy and program choices on IDE have focused on four issues: (i) human capital, (ii) intellectual property rights, (iii) financing, and (iv) support programs. Policies ranging from non-compete enforcement choices to immigration have been shown to causally impact the supply of human capital appropriate for IDE. Similarly, a robust set of causal findings support the idea that strong formal intellectual property rights, especially patent policies, facilitate IDE entry and subsequent growth. The evidence on programs meant to facilitate capital flows to IDE is more mixed: while government grant programs and policies that support commercialization of technology that is attractive to private capital investors has been shown to be efficacious, programs to create government-backed VC funds have generally not been effective. Lastly, a growing body of work provides causal evidence that startup support programs such as entrepreneurship education programs, pitch competitions and accelerators can increase IDE performance by providing valuable feedback about the quality of an entrepreneur's company and/or by relieving funding constraints.

Subsections	**Relevant Studies**
Human Capital	*Descriptive* Jaffe, Trajtenberg, and Henderson (1993); Zucker, Darby, and Brewer (1998); Bernardo and Welch (2001); Bresnahan, Gambardella, and Saxenian (2001); Gompers, Lerner and Scharfstein (2005); Lamoreaux, Levenstein, and Sokoloff (2006); Marx, Strumsky, and Fleming (2009); Delgado, Porter, and Stern (2010)*; Kerr (2010); Klepper (2010); Hunt (2011); Khosla (2018); Kerr and Kerr (2020); Kerr and Kerr (2021); Azoulay et al. (2022); Agarwal, Ganco, and Raffiee (2022); Akcigit et al. (2024) *Causal* Moser, Voena, and Waldinger (2014); Bernstein, Diamond, et al. (2022); Babina and Howell (2024); Jeffers (2024)
Intellectual Property	*Theory* Jones (2023) *Descriptive* Henderson, Jaffe, and Trajtenberg (1998); Sampat, Mowery, and Ziedonis (2003); Lach and Schankerman (2008); Belenzon and Schankerman (2009); Serrano and Ziedonis (2024) *Causal* Gans, Hsu, and Stern (2008); Hochberg, Serrano, and Ziedonis (2018); Hvide and Jones (2018); Appel, Farre-Mensa, and Simintzi (2019); Farre-Mensa, Hegde, and Ljungqvist (2020); Hegde, Ljungqvist, and Raj (2022); Babina et al. (2023); Fehder, Hausman, and Hochberg (2024)
Financing	*Descriptive* Lerner (1999); Lerner (2009); Chen et al. (2010); Hochberg and Rauh (2013); Lerner (2021) *Causal*

	Bernstein, Giroud, and Townsend (2016); Howell (2017); Lindsey and Stein (2019); Myers and Lanahan (2022); Denes et al (2023)
Support Programs	*Descriptive* Hochberg (2016); Cohen et al. (2019)
	Causal McKenzie (2017); Howell (2020); Howell (2021); Bailey et. al (2024); Fehder (2024); Fehder and Hochberg (2024)
Gender. Race, and Socioeconomic Gaps	*Descriptive* Gompers and Calder-Wang (2017); Bell et al. (2019); Ewens and Townsend (2020); Fairlie, Robb, and Robinson (2022)*; Howell and Nanda (2024); Bennett and Robinson (2024)*
	Causal Brooks et al. (2014); Kanze et al. (2020); Calder-Wang and Gompers (2021); Cook, Marx, and Yimfor (2022); Chetty et al. (2024); Botelho et al. (2025)*

Notes: Papers whose primary contribution to our survey provide descriptive statistics or correlative patterns are categorized under *Descriptive*, even if the authors discuss their results in a manner that suggests causality or attempt to rule out other explanations. Such papers may contain illustrative conceptual models, but we view their main contribution as the descriptive empirical patterns they document. The *Causal* category consists of papers that make a substantive attempt to estimate a causal relationship. *Theory* contains papers whose main contribution for the purposes of our survey is the theoretical model, even if they measure some descriptive statistics within. Note that the main contribution of the paper that we highlight for our survey purposes may not be the main contribution emphasized by the authors. Empirical papers are denoted with an asterisk* if they are based on a sample of entrepreneurs that combine innovation-driven and non-innovation-driven ventures and do not have results that speak to IDE specifically.

TABLE 6

Funding Resources for IDE: Dollar Volume and Development Stage

Funding Source	**Funds allocated in 2022 ($ Billion)**	**Typical Development Stages of Company**	**Data Source**
Equity Crowdfunding	$ 0.47	Idea to Entry	Crowdwise
SBIR	$ 4.39	Idea to Entry	SBIR.gov
Angel & Seed	$ 22.50	Idea to Entry	NVCA Yearbook 2023
Initial Coin Offering	--	Idea to Entry	--
Reward Crowdfunding	--	Idea to Entry	--
Venture Debt	$ 30.00	Development to Growth	Pitchbook
Early-Stage VC	$ 66.30	Entry to Development	NVCA Yearbook 2023
Late-Stage VC	$ 94.69	Growth	NVCA Yearbook 2023
Growth Equity	$ 128.40	Growth to Maturity	NVCA Yearbook 2023

Notes: This table lists primary categories of funding sources for innovation-driven ventures. For each category, the table displays an estimate of total funds allocated in 2022 ($ billions), and the typical stage of startup that accesses this funding source. Sources for the estimates are presented in the final column. No credible estimates of Initial Coin Offerings or Rewards-Based Crowdfunding currently exist.