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# Knowledge sources of entrepreneurship: Firm formation by academic, user and employee innovators<sup>☆</sup>

Rajshree Agarwal<sup>a,\*</sup>, Sonali K. Shah<sup>b</sup>

<sup>a</sup> Robert H. Smith School of Business, University of Maryland, 4512 Van Munching Hall, College Park, MD 20742, United States

<sup>b</sup> Foster School of Business, University of Washington, Box 353200, Seattle, WA 98195, United States

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## ABSTRACT

Innovative new ventures are at the heart of economic development, particularly when these startups are created by employee, academic, and user innovators. We synthesize across literature streams examining each phenomena to document distinctions between firms originating from different “knowledge contexts.” We then integrate the knowledge context into Teece’s (1986) theoretical framework identifying factors that impact a firm’s ability to profit from innovation. Doing so allows us to develop stylized facts and predictive propositions pertaining to differences in the innovative contributions, roles played in shaping industrial dynamics and evolution, and performance outcomes for startups stemming from the three entrepreneurial origins. These propositions provide unique insights into the causes of patterns of industry evolution, contribute to theory in the areas of entrepreneurship and industry evolution, and yield important policy and managerial implications.

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## 1. Introduction

Across economics, sociology, psychology, policy, and management, differential knowledge resources has been identified as a central factor that gives rise to and shapes innovative new ventures. This focus dates back to Schumpeter (1934) and Hayek (1945), who suggested that information asymmetries arising from differences in knowledge are at the heart of why some individuals identify and exploit entrepreneurial opportunities before others (Kirzner, 1997). “Knowledge corridors” allow some aspiring entrepreneurs to create innovations, as well as to amass the necessary resources and complementary assets required to transform innovative ideas into viable commercial products and services through the formation of firms (Venkataraman, 1997).

Consistent with this notion, significant scholarly attention has recently been devoted to understanding three sources of innovative new ventures: employee entrepreneurship, academic

entrepreneurship, and user entrepreneurship. Each of these bodies of work has developed independently, but they share a common underpinning: each focuses on a “knowledge context” in which an individual develops informational advantages that serve as the basis for the creation of a new firm. Production in existing firms is the knowledge context for employee entrepreneurship, where individuals employed by existing organizations in the focal industry venture out to capitalize on knowledge gained through employment (Agarwal et al., 2004; Klepper, 2001; Phillips, 2002). Research in academic institutions serves as the knowledge context for academic entrepreneurship, when firms are founded by scientists who innovate in the context of universities, national labs, or institutions that undertake basic research (Audretsch and Feldman, 1996; Feldman et al., 2005; Lockett et al., 2005; Mowery, 2005; Zucker et al., 1998). Finally, user entrepreneurship is the founding of firms by individuals who innovate in the knowledge context of using the focal product or service (Baldwin et al., 2006; Shah, 2005; Shah and Tripsas, 2007). These three knowledge contexts reflect the institutional backdrops that appear to seed the majority of innovations. Taken together, these three contexts span the focal industry and also upstream “science push” and downstream “demand pull” knowledge sources (Dosi, 1988; Nelson, 1959; Scherer, 1982).

Comparing and contrasting new ventures originating from different contexts permits us to expose the systematic differences between these firms along numerous strategic dimensions, thereby illustrating that the knowledge context from which a firm originates does indeed matter. Our objectives in this paper are two-fold.

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\* Corresponding author.

E-mail addresses: [rajshree@umd.edu](mailto:rajshree@umd.edu) (R. Agarwal), [skshah@u.washington.edu](mailto:skshah@u.washington.edu) (S.K. Shah).

First, we provide a review and synthesis of extant literature on employee, academic, and user entrepreneurship to identify systematic patterns pertaining to the characteristics of the innovative knowledge exploited, access to complementary assets, intellectual property protection, entry timing, performance outcomes; and relationships with established firms. Second, we integrate the knowledge context into Teece's (1986) framework for profiting from innovation. We build and present theoretical arguments that serve to explain and extend empirically observed patterns, as well as highlight the differential contributions of firms from each of the three knowledge contexts to innovation and to industrial development and evolution.

Our primary contributions are to the innovation and industry evolution literatures. By adding the *knowledge context* as a fourth factor in the Teece framework, we deepen predictive insights regarding which firms will profit from innovation and the factors that will enable them to do so. Our refinement of Teece's framework also theorizes that the strength and importance of appropriability regimes increase as industries evolve, by drawing on empirical support from existing studies. By combining the novel insights that (a) the knowledge context shapes an innovative new venture's capabilities and (b) appropriability regimes tend to increase in strength over the industry life cycle with established wisdom that the importance of complementary assets increases over the industry life cycle, we provide explanations for several patterns in industry evolution.

We also contribute to the entrepreneurship literature through the systematic comparison of new ventures originating across the three distinct knowledge contexts. Entrepreneurial innovation occurs when startup firms introduce innovations into the commercial marketplace, becoming important sources of technological and industrial progress (Baumol, 2002; Scherer, 1980). We focus on a "first principles" approach to entrepreneurial innovation: we highlight the underlying seedbeds—i.e. the knowledge contexts—from which innovative new ventures arise, distinguish among the contributions of each type of innovative new venture, and identify the manner in which various factors differentially shape each type of entrepreneurial entry and their post entry activities. By integrating insights across literature streams that have largely developed in isolation to each other, our theoretical framework provides a parsimonious rationale for how the knowledge context shapes formation and modes of value capture by new ventures, and how and when each type of entrepreneurial venture is likely to contribute to an industry's growth and evolution. In doing so, we show how heterogeneity in entrepreneurial innovations arise and provide policy-makers, practitioners, and investors with a nuanced basis from which to make decisions regarding how to promote entrepreneurial innovation.

## 2. The knowledge context and entrepreneurship

Scholarship in entrepreneurship, innovation and strategy has made significant strides recently in examining how the macro knowledge context relates to the micro-underpinnings of new firm formation and performance. Since start-ups benefit from the pre-entry experience and knowledge embodied in their founders, independent literature streams have examined how individuals gain knowledge related to the production and marketing of the focal products and services (employee entrepreneurship), in the process of scientific discovery in academic institutions (academic entrepreneurship), and in the use of these products and services (user entrepreneurship). We synthesize across these literature streams by formally defining them, discussing the industries and sampling frames used as an empirical context, and reporting on the known prevalence of each type of

entrepreneurship. We then document patterns along the following dimensions: the type of knowledge and innovation exploited through firm formation; the relevance of the three factors highlighted by Teece (1986)—complementary assets, appropriability regimes and industry life cycle<sup>1</sup>; new ventures' relationship with established firms; and finally, their performance subsequent to entry.

We impose the following boundary conditions on our review. First, we note that the three knowledge contexts are neither mutually exclusive nor exhaustive. For example, industrial scientists may work on basic research in corporate labs, such as Xerox PARC or Bell Labs, where industry and academic science norms converge (Chesbrough and Rosenbloom, 2002; Holbrook et al., 2000). Also, individual entrepreneurs may possess varied career histories that provide them with knowledge from multiple contexts (Mosey and Wright, 2007; Wennberg et al., 2011). For example, employees of firms may be user innovators, resulting in a hybrid of user and employee entrepreneurship (Fontana and Malerba, 2010; Shah et al., 2012). Further, firms may be formed by entrepreneurial teams composed of members from various knowledge contexts: whether this leads to "super" firms endowed with a great array of knowledge and/or firms plagued by conflict is an empirical question that has yet to be investigated.<sup>2</sup> For simplicity, we limit our examination to the three "pure" entrepreneurial contexts, but note exceptions as they arise. Also, while not exhaustive, the three knowledge contexts span the focal industry, as well as upstream "science push" and downstream "demand pull" knowledge sources (Dosi, 1988; Nelson, 1959; Scherer, 1982). That said, other important knowledge contexts include industries that are otherwise related to the focal industry context, including complementary or supplier products and services. We do not discuss these contexts, given lack of systematic literature streams on these origins.

Second, we limit attention to *entrepreneurial firm formation*, and not the broader literature on academic, employee and user *innovation*. We assume that the innovation being commercialized has already been developed, and focus on situations where the calculus across alternative options (licensing technology, free dissemination, etc.) has resulted in firm formation, to provide products or services for the end consumer or other firms in the ecosystem. Finally, we employ an inductive approach, focusing on identifying empirical patterns prior to creating a theoretical framework. According, our review focuses only on papers that have an empirical context and findings.<sup>3</sup>

<sup>1</sup> Teece's (1986) framework identified complementary assets, appropriability regimes, and industry life cycle stages as critical factors that influence a firm's ability to profit from innovation. Complementary assets required for the development, manufacture or distribution of an innovative product or service may consist of physical capital, brand equity, organizational knowledge, and tacit human capital of other employees. Appropriability regimes are "environmental factors, excluding firm and market structure, that govern an innovator's ability to capture the profits generated by an innovation," which depend on the technology and the efficacy of property rights protection offered through legal mechanisms. Finally, while Teece distinguished between pre and post dominant design based on Abernathy and Utterback's (1978), scholars have differentiated between early, growth and mature periods of the industry life cycle due to transformations in the underlying market structure (Agarwal et al., 2002; Gort and Klepper, 1982).

<sup>2</sup> For example, Franklin et al. (2001) show that when university policies permit use of "surrogate" entrepreneurs in launching academic founded firms, there are more venture launches.

<sup>3</sup> We used the following process to identify relevant work: First, we selected leading papers based on citations in Google Scholar. Our search terms included the breadth represented in each stream (e.g. in employee entrepreneurship, we searched on this term, and terms such as *spinouts*, *spawn*s, and *intra-industry spinoffs*). We then conducted forward and backward citation searches, and appended to the literature review based on our own expertise and knowledge of relevant work. While we do not claim to have reviewed every paper in each literature stream, our methodology captures the most cited research, and works they draw upon and generate.

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