

WHAT DRIVES EMPLOYEES TO START NEW BUSINESSES?
THREE ESSAYS ON EMPLOYEE ENTREPRENEURSHIP

By
Sepideh Yeganegi

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Department of Business Administration, Asper School of Business
University of Manitoba
Winnipeg

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Abstract

As the most prevalent form of entrepreneurial entry, employee entrepreneurship is worthy of careful consideration—especially since independent businesses created by employees frequently out-perform inexperienced start-ups. Employee entrepreneurship is emerging as a new area of research, receiving increasing attention from a broad spectrum of scholars in entrepreneurship, strategy, and industrial economics. This three-essay dissertation addresses four major gaps in the literature on employee entrepreneurship: the first gap refers to the fragmented state of the research literature (addressed in the first essay); the second is the dearth of empirical research on the moderating effects of institutions (addressed in the second essay); the third gap is the lack of empirical studies investigating whether related or unrelated experiences lead employees to pursue entrepreneurial ventures (also addressed in the second essay); and the fourth is the lack of empirical studies investigating the nature of the knowledge that employees acquire from their parent firms. The first essay in the dissertation is a conceptual paper that reviews the literature, develops a multi-level integrated framework, and suggests avenues for future research. The second essay investigates how employees' experiences with activities related/unrelated to the core technologies of their employers' firms and institutional factors (i.e., intellectual property rights and venture capital availability) affect the likelihood of new business creation by employees. This essay also studies the moderating effects of institutional factors on the relationship between technology relatedness and the likelihood of employee entrepreneurship. The third essay examines the effects of employees' prior ambidexterity experiences, which include both exploration and exploitation experiences in their employers' firms, on the likelihood of employees becoming entrepreneurs. Together, the three essays help to advance the literature by exploring previously neglected areas of research.

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Contributions of Authors

Essay One of this dissertation is co-authored with Dr. Dass and Dr. Laplume. Essay Two is co-authored with Dr. Laplume, Dr. Dass, and Dr. Huynh, and was recently published in *Research Policy*. Essay Three is co-authored with Dr. Dass, Dr. Laplume, and Dr. Greidanus; it has been accepted for publication at the *Journal of Small Business Management*. In all cases, I, as first author, developed the key ideas, reviewed the literature, drafted the manuscripts, obtained the required data, conducted data analyses, and interpreted the results. Dr. Dass supervised development of works and completed critical revisions of the papers. Dr. Laplume supervised research methodology (content analysis) of Essay One. He also helped in theory development of Essay Two and Essay Three. Dr. Huynh supervised the research methodology (multilevel analysis) of Essay Two. Dr. Greidanus helped to evaluate and edit Essay Three.

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CHAPTER 1: INTRODUCTION

In this introduction, I explain the importance of studying employee entrepreneurship, the overall research question that I seek to answer, and the major gaps in the literature addressed with this three-essay dissertation. At the end of the introduction, I present the conceptual and empirical model that I test as my main contribution to the literature.

Motivation and Research Questions

One of the most prevalent forms of entrepreneurial entry is transition to entrepreneurship from employment in incumbent firms (Bhide, 2000; Sorensen and Fassiotta, 2011). Employee entrepreneurship refers to the *founding of a new independent business by a current or former employee of an established firm*. This is different from when employees are involved in creating new businesses for their employers (e.g., corporate entrepreneurship, corporate spinoffs and internal corporate ventures), where the parent firms own the new entity in whole or in part.

Research shows that at least 9 out of 10 entrepreneurs were employees before starting their own ventures (Sorensen and Fassiotta, 2011). For example, at least 93% of Silicon Valley start-ups in Burton, Sørensen, and Beckman's (2002) study and 90% of venture-backed start-ups in Gompers, Lerner, and Scharfstein's (2005) study were started by individuals who were employed prior to launching their ventures. Muendler, Rauch, and Tocoian (2012) show that between 1995 and 2001, one-third of new entrants in Brazil's private sector were founded by ex-employees.

Arguably, businesses created by employees deserve more consideration than other start-ups because they survive longer and perform better (Buenstorf and Klepper, 2009; Eriksson and Kuhn, 2006). They are also more effective at attracting venture capital (Chatterji, 2009). In his study of U.S. disk drive firms between 1976 and 1989, Christensen (1993) shows that while 16

out of 40 start-ups that spun out from established firms survived until 1989, only three out of 28 of other types of entrants were still operating by 1989. He also shows that firms spun out by employees of incumbents were responsible for 99.4% of the total cumulative revenues produced by start-ups. The superior performance of start-ups created by employees has been associated with the resources, knowledge, and routines that their founders gained from their work experiences at their parent firms (Argyres and Mostafa, 2016; Chatterji, 2009; Klepper and Sleeper, 2005).

Industrial economists highlight the role of employee entrepreneurship in the formation and growth of industrial clusters (Boschma, 2015). These researchers argue that the primary forces underlying Detroit's automobile cluster (Buenstorf and Klepper, 2010; Klepper, 2007, 2011), Akron's tyre cluster (Buenstorf and Klepper, 2009), and Silicon Valley's cluster (Klepper, 2010, 2011) are start-ups created by employees from the early leading firms in the region. This view, known as Klepper's spin-off theory¹ (Boschma, 2015), challenges the view that geographic advantages (Marshall, 1920) are the primary forces of industry agglomeration.

Moreover, employee entrepreneurs play a key role in pursuing new ideas and technologies that incumbents often avoid (Christensen and Bower, 1996; Garvin, 1983). Highlighting the importance of employee entrepreneurship in pursuing new ideas, Bhide (1994, 2000) found that 71 percent of the fastest-growing ventures listed in the Inc. 500 have founders that go to market with product ideas created by a previous employer (Stieglitz and Heine, 2007). This finding indicates that incumbents are not able to exploit all of the ideas that they develop, and leave opportunities to develop and exploit new knowledge to those employees who leave to create their own firms. In this way, new ventures created by employees exploit opportunities that are "stuck"

¹. In Klepper's works, a "spin-off" describes an employee start-up.

inside parent organizations, where they may conflict with parent firm strategies (Cassiman and Ueda, 2006; Hellmann, 2007; Pakes and Nitzan, 1983). Incumbents have limited resources and are not able to develop all their potential innovations; therefore, they only exploit those that fit best with their existing activities. Many companies (e.g., Intel, Chevrolet) exist today because an employee (or group of employees) took risks and left an established firm to exploit innovations that were rejected by the previous employer.

Through creative construction—that is “a process wherein entrants benefit from new knowledge created by incumbent organizations that may otherwise be left unexploited, but where such knowledge spillovers do not necessarily result in the destruction of incumbents”—employee entrepreneurship contributes to economic growth at micro and macro levels (Agarwal, Audretsch, and Sarkar, 2007, p. 264). For example, start-ups created by employees are key players in the knowledge spillover processes that lead to economic growth (Agarwal, Ganco, and Ziedonis, 2009; Agarwal et al., 2007; Thornton and Thompson, 2001).

However, not all scholars perceive employee start-ups as contributors. There are some studies showing that firms may be harmed by the exit of employees who start competing ventures (Campbell, Ganco, Franco, and Agarwal, 2012). Yet according to the knowledge spillover theory of entrepreneurship, employee entrepreneurship creates more value than the competitiveness lost by incumbents who have their knowledge “spill out” (Bloom, Schankerman, and Van Reenen, 2013).

In this three-essay dissertation I seek to answer a central question: *what drives employees to become entrepreneurs?* In the following sections I outline the major gaps in the literature that are addressed by the essays of this dissertation.

Gaps in the Literature

Gap One: Fragmented Literature. Employee entrepreneurship is attracting increasing attention from scholars in a wide range of organizational studies, including industrial economics, strategic management, organizational theory, and entrepreneurship. The broad scope of interest in employee entrepreneurship has provided a rich foundation to understand the phenomenon, but has also resulted in a *highly fragmented body of research on the subject*. For instance, industrial economics scholars study employee entrepreneurship at the macro level to explain industry agglomeration, arguing that clusters emerge and grow because start-ups created by employees co-locate with their parent organizations and outperform other types of start-ups thanks to inherited knowledge and capabilities (Boschma, 2015); strategic management scholars study employee entrepreneurship mainly at the firm level to investigate the effect of employee start-ups on parent firm performance (Agarwal, Gambardella, and Olson, 2014; Mawdsley and Somaya, 2016); entrepreneurship scholars study how work experiences in incumbent firms influence employee entrepreneurship (Sorensen and Fassiotto, 2011). Thus, we need a comprehensive conceptual framework to consolidate the literature and drive future research.

Gap Two: Lack of Empirical Research on the Moderating Effects of Institutions. Various streams of research examine the antecedents and consequences of employee entrepreneurship at different levels of analysis, but rarely at the same time. Most empirical research at the firm and individual levels ignores the institutional environment entirely. In fact, the majority of empirical studies have been conducted in a single industry (e.g., the U.S. auto industry) or in a single country (e.g., Denmark). In both cases, all the participants (firms and individuals) of these studies are operating in the same institutional contexts; therefore, it is difficult to determine how certain institutional contexts may encourage/discourage employee entrepreneurship.

Some studies make assumptions about institutional factors (e.g., intellectual property rights) in order to make conclusions. For example, Franco and Filson (2006) assume that when intellectual property rights are weak, employees can readily learn their employers' know-how and use it in their new ventures. However, institutional influences such as intellectual property rights and covenants not to compete (hereafter: non-competes) are important factors that can interact with employee characteristics to prevent new business creation by employees (Franco and Mitchell, 2006, 2008; Hellmann, 2007; Marx, Strumsky, and Fleming, 2009; Rauch, 2016). Most of the existing empirical studies on employee entrepreneurship ignore the fact that variables at different levels can interact with each other to influence outcomes. Accordingly, there is a need for more multilevel empirical studies that consider both institutional and individual antecedents of employee entrepreneurship at the same time.

Gap Three: Lack of Empirical Research on Whether Related or Unrelated Experiences Lead to Employee Entrepreneurship. There is disagreement about whether employee start-ups come from employees working on related or unrelated technologies. Klepper (2009) argues that new ventures created by employees produce the same products as their parent firms and, therefore, are more likely to be created by employees who are working on activities related to the core technology of their parent firms. In contrast, some researchers argue that employee start-ups are more likely to come from areas unrelated to the core technology of parent firms; Cassiman and Ueda (2006) and Hellmann (2007) propose that firms with limited resources will not commercialize ideas that are unrelated to their core technology. This disagreement requires an answer: do employee entrepreneurship comes from related or unrelated experiences?

Gap Four: Lack of Empirical Research on the Nature of the Knowledge Employees Acquire in Their Parent Firms. Researchers also disagree about the type of knowledge that employees

gain from their parent firms. While the majority of studies emphasize technical knowledge as the primary source of employee start-ups' advantage over other entrants (Klepper and Sleeper, 2005), there are studies that assert the prime importance of other types of knowledge, such as exploratory knowledge, marketing knowledge, and regulatory knowledge (Chatterji, 2009). Agarwal, Echambadi, Franco, and Sarkar (2004) argue that incumbents that are at the cutting edge of both marketing and technical knowledge are less likely to encourage employee entrepreneurship because these firms are able to both generate new breakthroughs and commercialize them. What is not clear, however, is whether employees with explorative knowledge or exploitative knowledge are the most likely to "spin out" their ideas.

Overview and Organization of the Dissertation

Contributions of Essay One. This essay, entitled "A Multilevel Conceptual Model of the Employee Entrepreneurship Literature and Agenda for Future Research," addresses the fragmented state of the research literature on employee entrepreneurship. While some prior reviews have covered fragments of the literature on employee entrepreneurship (Agarwal et al., 2014; Mawdsley and Somaya, 2016; Sorensen and Fassiotto, 2011), there are no current systematic reviews sufficient to motivate future research. In this essay, I conduct a critical review of the literature on employee entrepreneurship, propose an integrated conceptual model consolidating the literature, and develop an agenda for future research.

Contributions of Essay Two. I concentrate on the dearth of empirical research on the moderating effects of institutions with an essay entitled "Which employees become entrepreneurs? The Role of Technology Relatedness and Institutional Context." In this essay, I investigate the effects of institutional factors (e.g., intellectual property rights and venture capital availability) on employee entrepreneurship. I develop hypotheses for both the main and

interactive effects of institutional factors by using multilevel analyses, which provide a more accurate picture of the underlying mechanisms of employee entrepreneurship.

Essay Two also addresses the lack of empirical studies investigating whether related or unrelated experiences lead to employee entrepreneurship. Using Global Entrepreneurship Monitor (GEM) data, along with other data sets to test my hypotheses, I examine how experiences in activities related/unrelated to the core technology of a firm can influence an employee's decision to spin out a new venture. My participation in the GEM data-gathering process during my master's education makes me uniquely qualified to conduct the empirical analyses.

Contributions of Essay Three. Essay Three addresses the lack of empirical research on the nature of the knowledge that employees acquire in their parent firms. In this paper, entitled "Individual-Level Ambidexterity and Entrepreneurial Entry," I consider the effects of employees' exploration, exploitation, and ambidexterity experiences on the likelihood of entrepreneurial entry. Table 1-1 presents an overview of the three essays that comprise the dissertation.

Table 1-1. Overview of the Three Essays

	Essay One	Essay Two	Essay Three
Overall research question	What drives employees to become entrepreneurs?		
Research question	What do we know about employee entrepreneurship so far? What are the gaps in the research on employee entrepreneurship?	Is employee entrepreneurship more likely to emerge from employee experiences in activities that are related or unrelated to the core technology of the firm? Do the strength of the intellectual property rights regimes and the availability of venture capital in a country encourage or discourage employee entrepreneurship, especially by employees experienced in activities related to the core technology of the firm?	Are employees who have had ambidexterity experiences while working in organizations more likely to become entrepreneurs than those who have only exploration or exploitation experience, or neither experience?
Main theory	Several theories reviewed (e.g., industry evolution, learning, lack of fit, disagreement)	- Institutional theory - Strategic fit	- Ambidexterity/ learning theory
Key constructs	Several constructs identified (e.g., firm size, age, parent performance, survival rate)	- Technology relatedness - Intellectual property rights - Venture capital availability	- Ambidexterity experience - Exploration experience - Exploitation experience
Data sources	Academic journal articles on employee entrepreneurship	- Global Entrepreneurship Monitor - World Economic Forum	- Global Entrepreneurship Monitor - World Economic Forum
Sample	127 academic journal articles	2,748 observations from 29 countries	44,839 observations from 52 countries
Analyses	Systematic content analysis	Multilevel logistic regression with a random intercept	Multilevel logistic regression with a random intercept

Theoretical Foundations

Scholars have used various theories to explain employee entrepreneurship. Major theories used in prior research include strategic disagreement (e.g., Klepper and Thompson, 2010; Klepper, 2007), lack of fit (e.g., Cassiman and Ueda, 2006; Hellmann, 2007), learning and capabilities, including heritage (e.g., Franco and Filson, 2006; Klepper and Sleeper, 2005), and institutional factors (e.g., Rauch, 2016). I draw on theories involving strategic fit, institutional factors, and learning in the two empirical essays (Essays two and three) of this dissertation to explain employee entrepreneurship.

One of the theories used to explain employee entrepreneurship is strategic fit theory. The concept of strategic fit is well established in the strategy literature (Venkatraman, 1989), and also has roots in the resource-based view of the firm and the concept of mutually reinforcing resource bundles (Barney, 1991). To succeed and perform effectively, organizations must align their resources and strategies with their external environmental conditions. Because firms have limited resources to exploit new ideas that their employees develop internally, they allocate their resources to exploit profitable ideas that match their existing strategies and complementary assets (Cassiman and Ueda, 2006). Firms may reject new inventions and ideas that do not fit with their core activities and/or are costly for the firm to exploit (Hellmann, 2007; Pakes and Nitzan, 1983). Employees who work on their employers' core technologies are more likely to receive support to exploit their ideas internally. Therefore, when employees develop new ideas in peripheral areas, they may decide to exploit them in their own ventures outside their parent firms due to a lack of organizational support. All of these observations seem to suggest that employees in peripheral areas are more likely to become entrepreneurs.

The institutional setting in which entrepreneurs operate has a significant effect on their activities. Institutional factors in the external environment can enable or constrain entrepreneurial activities (Bruton, Ahlstrom, and Li, 2010). The central idea of institutional theory is that “there are enduring elements in social life—institutions—that have a profound effect on the thoughts, feelings, and behaviour of individual and collective actors” (Lawrence and Suddaby, 2006, p. 216). Scott (1995) defines three pillars of institutions: regulative, cognitive, and normative institutions. Researchers in entrepreneurship show that each of these pillars can influence the rate and type of entrepreneurial activities in a country (e.g., Stenholm, Acs, and Wuebker, 2013). Regulation and policies that govern the allocation of rewards determine the level of entrepreneurship in a society (Baumol, Litan, and Schramm, 2009). According to North (1990), “Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction” (p. 3). Institutions encourage/discourage various individual choices. As North argues, “Institutions structure incentives in human exchange, whether political, social, or economic” (p. 3). In other words, “institutions define and limit the set of choices of individuals” (p. 4).

Based on North’s arguments, institutions can influence employees’ decisions to become entrepreneurs. Regulatory institutions—especially, for instance, intellectual property rights and non-competes—can prevent employee entrepreneurship (Franco and Mitchell, 2008; Marx et al., 2009). From an institutional perspective, the strength of intellectual property rights may inhibit business creation by employees. However, research shows that intellectual property rights do not affect all employees in the same way. For example, Marx et al., (2009) find that non-compete agreements have a stronger negative effect on the mobility of employees with specialized knowledge and firm-specific capabilities. In this dissertation, I argue that employees who are

working on activities related to the core technology of their parent firm are more likely to be prevented from creating their own ventures by intellectual property rights.

Another institutional factor that has significant influence on developing entrepreneurial activities is the availability of venture capital (Bruton et al., 2010; Samila and Sorenson, 2011; Autio, Kenney, Mustar, Siegel, and Wright, 2014). Venture capitalists can provide financial support, advice, and legitimacy to new ventures (Lee, Lee, and Pennings, 2001). In this dissertation, I argue that availability of venture capital is specifically helpful to employees working on areas related to the core activities of their employer. Venture capitalists look for high-growth opportunities; new ventures founded by employees from the core areas of their parent firms create more impactful knowledge (Basu, Sahaym, Howard, and Boeker, 2015) that is more attractive to venture capitalists.

Learning is the most dominant explanation of employee entrepreneurship in the literature. A large body of empirical studies on employee entrepreneurship investigates employees' learning as the underlying mechanism of new business creation by employees. Klepper and Sleeper (2005) establish a learning model of employee entrepreneurship, using a sample from the U.S. laser industry. They argue that successful incumbents invest in research and development and marketing know-how to develop variants of their products. Employees who learn such knowledge recognize the opportunity and can spin out the idea under two conditions: (1) if the firm does not recognize the opportunity but the employee does, and (2) if the firm recognizes the opportunity but assesses the probability of employee entrepreneurship to be low. Franco and Filson (2006) develop a theory of employee entrepreneurship based on learning, suggesting that employees learn (imitate) the know-how of their employers and use it to create their own

ventures. They test their hypotheses using data from the disk drive industry, and show that employees from firms with greater technical know-how are more likely to become entrepreneurs.

Gompers et al. (2005) argue that younger venture capital-backed firms provide an entrepreneurial environment in which their employees learn how to be entrepreneurs. Similarly, Strohmeier and Leicht (2000) argue that small firms are breeding grounds for employee entrepreneurship because employees are able to gain entrepreneurial know-how from close contacts, daily exchanges, and observations of managerial behaviors and functions. Hyytinen and Maliranta (2008) notice that employees of smaller firms are more likely to venture out and contend that this effect is due to the superior learning environments of small firms, which allow employees to see the whole picture of how firms are run.

However, there is disagreement among scholars about the type of knowledge that employees learn from their employers. Some studies (e.g., Franco and Filson, 2006) find that employee start-ups perform better than other type of entrants because they inherit technological knowledge from their parent firms. At the same time, Chatterji (2009) shows that the superior performance of employee start-ups in the medical device industry is not driven by technical knowledge that employees learn from their former employers. Rather, employees inherit non-technical types of knowledge, such as regulatory, marketing, and exploratory (i.e., how to identify new opportunities in their field) knowledge.

In this dissertation, I draw on ambidexterity theory to argue that employees who learn both exploration and exploitation types of knowledge while working for employers are more likely to become entrepreneurs. The organizational literature distinguishes between two basic types of learning processes: exploration and exploitation (March, 1991). Exploration typically involves experimentation, search, and play, whereas exploitation involves refinement, efficiency,

implementation, and execution (Levinthal and March, 1993; March, 1991). Individual-level ambidexterity is an individual capability of undertaking both exploration and exploitation activities (Mom, Van Den Bosch, and Volberda, 2007, 2009). I hypothesize that ambidexterity experience is more important than experiencing only exploration or exploitation in predicting entry into entrepreneurship.

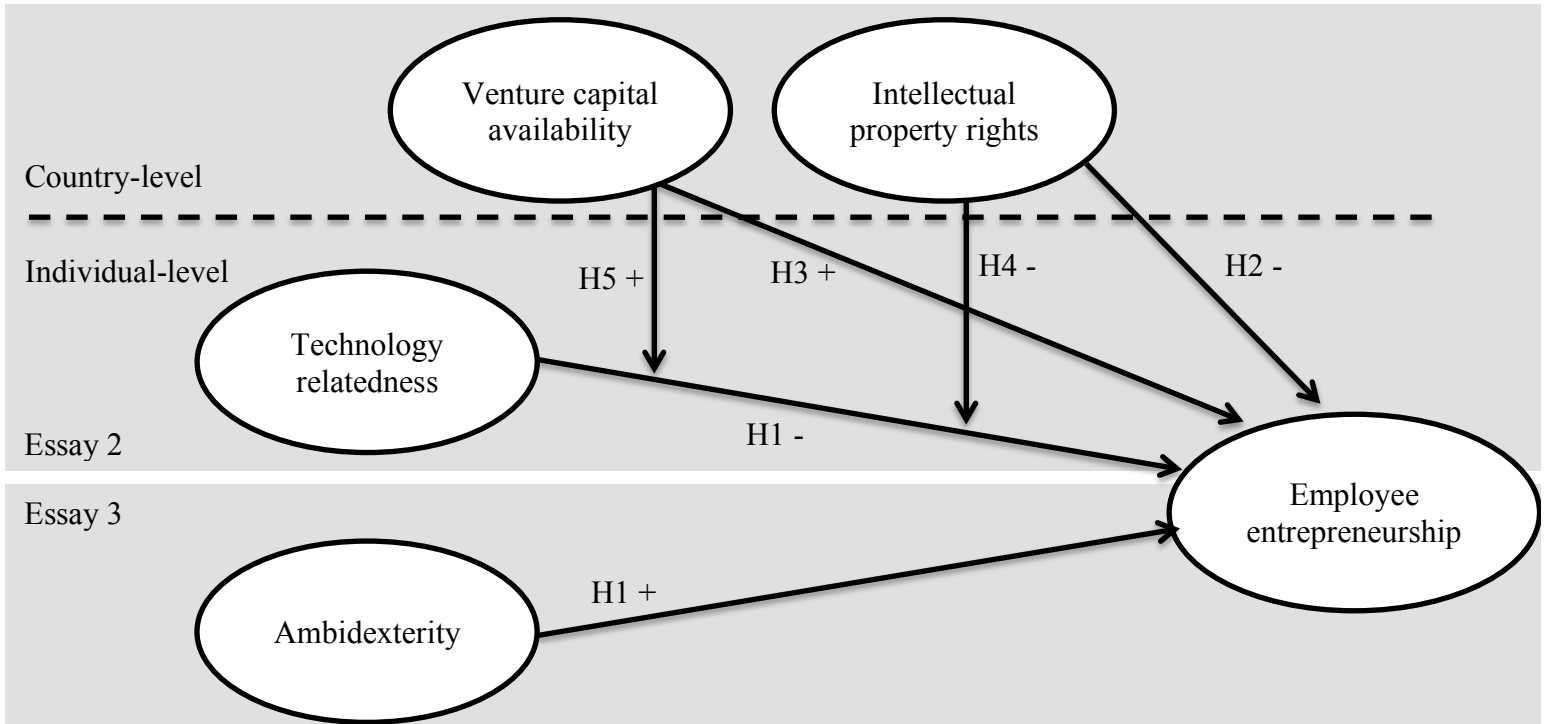
Model

I develop a conceptual framework of the employee entrepreneurship literature in Essay One, but the following model (Figure 1-1) describes the relationships tested in the following two empirical essays (Essays 2 and 3, respectively). I propose a model with two levels: country and individual. Country-level variables include intellectual property rights and venture capital availability. I test the effects of these two variables on employee entrepreneurship in Essay Two. Incumbents use intellectual property rights to protect their innovative ideas and to prevent new entry (Laplume, Pathak, and Xavier-Oliveira, 2014). Hellmann (2007) argues that when firms have weaker property rights, their employees are more likely to leave to exploit ideas in their own ventures. Therefore, I suggest that the strength of intellectual property rights in a country has a negative effect on the likelihood of employees become entrepreneurs. However, venture capital availability has the opposite effect on employee entrepreneurship. Start-ups that are able to attract venture capitalists to invest in their businesses not only gain financial resources, but also achieve the legitimacy that they need to attract other stakeholders (e.g., customers and suppliers) (Lee et al., 2001). Capital and legitimacy both serve to reduce uncertainty for stakeholders transacting with new ventures, which lowers entry costs. Hence, I argue that venture capital availability in a country positively influences the likelihood of employees becoming entrepreneurs.

I also test the moderating effects of these institutional variables on the relationship between technology relatedness and employee entrepreneurship in Essay Two. Technology relatedness is an individual-level variable measuring whether employees are working in areas that are related or unrelated to the core activities of their employers. As discussed, firms usually reject ideas that do not fit well with their core activities (Cassiman and Ueda, 2006; Hellmann, 2007)). Thus, I predict that employees working in areas related to the core activities of their employers are less likely to become entrepreneurs. However, the effects of institutional variables can moderate this relationship. Strong enforcement of intellectual property rights decreases the likelihood of entrepreneurial entry by employees active in areas related to the core activities of their employers. Conversely, venture capital availability increases the likelihood of entrepreneurial entry by employees active in areas related to the core activities of their employers. I test these relationships in the hypotheses (H1–H5) presented in Essay Two.

In Essay Three, I test just one important hypothesis (H1): employees with ambidexterity experience (i.e., those with both exploration and exploitation experience) are more likely to become entrepreneurs than those who have either exploitation or exploration experience alone, or neither type of experience. While involvement in exploration activities helps employees to develop exploratory knowledge (i.e., knowledge of how to explore new opportunities), engagement in exploitative activities may help employees acquire deep technical know-how and execution knowledge. Research shows that employee entrepreneurs can inherit both exploration and exploitation knowledge from their employers. I hypothesize that employees who become part of both the exploration and exploitation stages of organizational activities are more likely to become entrepreneurs.

Figure 1-1. Conceptual and empirical model



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CHAPTER 2: ESSAY 1

A multilevel conceptual model of the employee entrepreneurship literature and agenda for future research

Abstract

We review the conceptual and the empirical literature on employee entrepreneurship, which is emerging as an important area of research focusing on the intersection between organizational and entrepreneurial literatures. Employee entrepreneurship includes the creation of independent business by current and former employees, the outcome of which we refer to as spinouts. Research on spinouts is growing exponentially but has not yet been reviewed systematically. We identify 130 academic journal articles, mainly from the fields of strategic management, organizational theory, industrial economics, and entrepreneurship. We find five key themes covering how founders, parents, and external environments affect spinout creation, strategy, and performance, as well as how spinouts affect parent firms and their environments. We propose a multilevel conceptual model for spinouts that integrates the literature to highlight what we have learned so far and to provide directions for future research.

Introduction

Spinouts (i.e., new independent businesses created by current or former firm employees) is a growing area of research highlighting the important role employees play in new business creation and knowledge diffusion. Spinouts are relevant because they are a prevalent and successful form of entrepreneurial entry (Bhide, 2000; Sorensen and Fassiotto, 2011), and, more importantly, spinouts compare favourably with other types of entrants, both in terms of survival rates and financial performance (Buenstorf and Klepper 2009; Eriksson and Kuhn 2006; Argyres

and Mostafa 2016). Spinouts also play a key role in pursuing new technologies that parent firms avoid due to low margins or incompatibility with the parent firm's core business (Christensen and Bower, 1996; Garvin, 1983). Yet, institutions such as intellectual property rights and covenants not to compete tend to suppress spinouts related to their parent firms (Rauch, 2016; Yeganegi, Laplume, Dass, and Huynh, 2016).

We contend that the literature on spinouts is highly fragmented and needs to be considered more coherently. Spinouts have attracted a broad scope of interest in organizational studies at macro and micro levels, starting in the fields of industrial economics (mean article year 2008.92; n = 50) and strategic management and organizational theory (2009.40; n = 53), and then moving into entrepreneurship (2013.16; n = 18)². Each fragment of the literature provides foundations for thinking about different aspects of the spinout phenomenon, but there is also a tremendous amount of overlap. Fragmentation causes the literature to suffer from inconsistent terminology and definitional ambiguity, making it confusing to distinguish effects related to spinouts and those of other types of entry (e.g., corporate spin-offs). Each fragment of literature shows a different part of the spinout picture, but they do not reveal the whole story.

What is lacking is a big picture view of this important phenomenon and we endeavour to provide such a view in this paper—via a multi-level conceptual model that reveals what we have learned so far as well as the gaps in research on spinouts.

Interestingly, scholars in various fields of study view spinouts differently. For example, scholars in industrial economics examine spinouts in relation to industry agglomeration because clusters emerge and grow when spinouts stay close to their parents and perform well due to inherited competences (Boschma, 2015). Clusters are the center of interest in this stream of

². Six papers also emerged in other areas (e.g., in law, sociology and finance).

research. Spinouts are not always perceived as contributors; they are often seen as plunderers of their parents' innovations, to be treated with hostility (Klepper 2001; Walter et al. 2014). Strategic management scholars find that spinouts, along with other forms of employee mobility, affect parent firm performance. For example, knowledge spillovers by employees who leave can undercut a firm's attempts to preserve the competitiveness of its knowledge (Agarwal et al. 2014). Incumbents may be harmed by the exit of employees who spin out new competing ventures as these can cannibalize parent profits (Campbell et al. 2012). Yet, there is growing evidence that spinouts can be good for parent firms by signalling fitness, increasing strategic alignment, and facilitating knowledge spill-backs in the future (Ioannou 2014; McKendrick et al. 2009; Kim and Steensma 2017). The knowledge spillover theory of entrepreneurship suggests that there is more value in spinouts than the cost of the damage to previous employers (Bloom et al. 2013), thus, entrepreneurship scholars are increasingly interested in spinouts.

Sørensen and Fassiotto (2011) review literature on how existing organizations shape entrepreneurship by virtue of being fonts (i.e., fountains) of opportunities, knowledge and skills, values and beliefs, and social capital as part of a larger system of factors. Reviews of employee mobility literature (e.g., Agarwal et al., 2014; Mawdsley and Somaya, 2016) cover a few studies on spinouts. Klepper (2009) reviewed studies on spinouts mainly focusing on theories that explain the phenomenon. While some prior literature reviews cover fragments of the private sector spinout literature, or lump spinouts alongside other phenomena, there are no current systematic reviews sufficient to stimulate future research. Our goal is to fill this gap by conducting a critical review of the literature on private sector spinouts and propose an agenda for future research. We highlight the methods employed for the study, explain the major themes

emerging from our content analysis techniques, and summarize the main questions, findings, and future research avenues.

Methodology for Literature Review

Definition and boundary conditions

Owing to the plurality of fields with researchers studying them, there is no consensus on the definition of spinouts among researchers. Authors use different criteria and terminology to define and characterize spinouts (please see Table 2-1). The five main criteria that scholars use are:

1. *Previous employment status of founders.* Scholars tend to agree that spinouts are entrepreneurial ventures by former employees of an incumbent firm (Agarwal, Echambadi, Franco, and Sarkar, 2004; Franco and Filson, 2006; Klepper and Sleeper, 2005; Thompson and Chen, 2011). Hence, spinouts may exclude ventures started by individuals who never worked in an organization.

2. *Industry relatedness.* Research on spinouts accelerated when Klepper and coauthors (Klepper, 2001, 2002; Klepper and Thompson, 2005) examined start-ups by employees in the automobile industry and Silicon Valley. However, there is less agreement about whether spinouts need to be in the same industry as their parents. Industry relatedness leads to different typologies of spinouts such as inter- and intra-industry spinouts. Likewise, Adams, Fontana, and Malerba (2016, 2017) use similar criteria to define focal spinouts and user-industry spinouts. Based on their definition, focal spinouts are created by ex-employees of incumbents in the same industry as their parent firm (i.e., intra-industry) while user-industry spinouts are created by ex-employees of the value chain's downstream companies (i.e., inter-industry).

3. *Ownership.* Another important criterion that has been used to define spinouts is ownership. There is a large and important difference between new businesses owned by employees versus

their incumbent organizations that must be considered. Most of the studies have clearly mentioned that the new ventures started by former employees were “completely independent” of the parent firm (Anton and Yao, 1995: p. 366) where parent company ownership is zero (Helfat and Lieberman, 2002: p. 731). Likewise, the ventures have “no equity relationships with any incumbent” (Agarwal et al., 2004: p. 501). In the studies conducted by Klepper and his co-authors, it is evident that the employees left their parent firms to start their independent businesses in the automobile and electronics industries. Thus, independent businesses started by former employees where parent firms have no ownership may be defined as spinouts, whereas those owned by the parent firms may be referred to as corporate spinoffs.

4. *Source of idea.* For a few scholars (e.g., Anton and Yao, 1995; Nikolowa, 2014; Woolley, 2017), spinouts occur when employees use an idea that they developed in their previous employment to start their ventures. Spinouts may license technologies from parent firms or they may use ideas that were not exploited within their parent organizations. However, most studies do not explicitly consider the source of the idea in their definitions of spinouts.

5. *Team size.* A few scholars define a start-up as a spinout that is created by a group of employees who were working for the same firm. However, each used a different threshold for the number of individuals to be engaged in the start-up. For instance, Andersson and Klepper (2013) included new firms with a majority of founders who were employees of the same parent firm, whereas Dahl and Reichstein (2007) required at least two members of the management team from the same parent firm. Likewise, Muendler, Rauch, and Tocoian (2012) and Fackler, Schnabel, and Schmucker (2016) used a more sophisticated computation of the workforce to categorize their start-ups as spinouts. However, most studies do not consider the number of founders from the same parent in their definition of spinouts.

Table 2-1. Spinout definitions

Authors	Terminology	Definition	Being an employee	Idea source	Industry	Ownership	Team size
Anton & Yao (1995)	Start-up	When due to weak IPRs, the employee can leave the firm and use their discovery in a start-up venture that is completely independent of the firm.	✓	✓		✓	
Klepper (2001; 2002; 2007)	Spinoff	When employees leave their employers to start firms in the same industry	✓		✓		
Helfat & Lieberman (2002)	Entrepreneurial spin-offs	Entrepreneurial spin-offs are stand-alone companies founded by employees of incumbent firms in the same industry. Parent company ownership is zero for entrepreneurial spin-off.	✓		✓	✓	
Agarwal et al. (2004)	Spin-out	Entrepreneurial ventures by ex-employees of an incumbent firm. Stand-alone entrepreneurial ventures compete in the same industry as the parent but have no equity relationships with any incumbent.	✓		✓	✓	
Gompers et al. (2005)	Spawn	A spawned entrepreneur is an employee who leaves a public company to start a venture capital backed firm	✓			✓	
Eriksson & Kuhn (2006); Fackler et al. (2016)	Spinoff	New firms with at least two initial employees in which at least 50 % of the initial workforce were employed together in the same parent firm, but only if this group of workers made up less than 50 % of the former workplace. It is not necessary that new firms to be in the same industry as the parent workplace.	✓				✓
Dahl & Reichstein, (2007)	spin-off	A spin-off in this study is defined as a start-up if at least two members of the management team were employed in the same firm active in the same six-digit industry classification the year before its founding.	✓		✓		✓
Chatterji (2009)	spawn	'spawning' is the process by which former employees of incumbent firms found entrepreneurial ventures [the spawn] in the same industry.	✓		✓		
Thompson & Chen (2011)	Employee spinoffs	New firms founded by former employees of incumbent firms in the same industry	✓		✓		
Muendler et al. (2012)	spinoff	a new firm of five or more employees, at least 25% of whom previously worked for the same existing firm.	✓		✓		✓
Andersson & Klepper, (2013)	spin-offs	new firms typically with a majority of initial employees that previously worked at the same establishment, which was denoted as their "parent"	✓				✓
Walter et al. (2014)	spin-outs	spin-outs are created by ex-employees without intention on the part of the incumbent. These organizational forms differ in start-up rationales and equity involvement of the parent.	✓			✓	
Gambardella et al. (2015)	Employee Entrepreneurship	Start-ups initiated by founders with relevant prior work experience but no financial or ownership links to their prior employer.	✓		✓	✓	
Adams et al. (2017)	Focal spinouts User-industry spinouts	Spinouts are defined as independent start-ups whose founders are ex-employees of incumbent firms in an industry. Focal spinouts: started by ex-employees of firms in the same industry. User-industry spinouts: started by ex-employees of firms in downstream industries.	✓		✓	✓	
Woolley (2017)	Corporate spinoff	The transfer of IP and knowledge from one organization and into a new one.		✓			

The boundary conditions that researchers use in their definition are very important to make it clear whether they are discussing employee spinouts, corporate internal ventures, corporate external spinoffs, or other types of start-ups. For example, Woolley (2017) defines spinoff as “firms with origins in another organization” and “focuses on the transfer of intellectual property and knowledge from one organization into a new one” (p. 66). From the above-mentioned criteria, she uses only ‘idea source’ to define spinoffs and compare corporate spinoffs with academic and government spinoffs. Based on the definition of spinoff in her paper, spinouts and corporate spinoffs are all categorized under one category “corporate spin-offs”. She listed Chatterji (2009) and Seward and Walsh (1996) as examples of research on corporate spin-offs. However, Chatterji (2009) examines intra-industry spinouts where parent firm has no ownership in new venture, whereas Seward and Walsh (1996) analyzes corporate spinoffs where the parent firm owns the new venture in whole or in part. It is important not to confuse spinouts with spinoffs because the former are often autonomous employee actions and may be viewed as subversive to the parent firm’s management, whereas spinoffs are deliberate corporate actions taken by parent firm managers. Mixing these two phenomena together may cloud important differences and lead researchers to make conclusions from study results that may only be valid for one or the other, or neither.

Given our goal, which is to survey the literature on private sector spinouts, we wanted to cast a sufficiently wide sampling net. We adopted a definition of spinouts that uses the two most prevalent criteria: previous employment status of the founder and lack of parent ownership. Thus we are left with *independent businesses created by employees*, a broad definition that includes both inter- and intra-industry spinouts, those by single and multiple employees, with ideas that originated in parent firms or outside, and in related or unrelated industries.

We include studies in our review that meet four limiting and differentiating criteria. They must 1) be published in academic journals; 2) investigate new businesses created by former/current employees; 3) analyze new businesses with no ownership by parent organizations; and 4) be limited to firms in the private sector. These criteria differentiate our study from those examining academic and public sector spinouts, corporate spinoffs, and internal corporate ventures, which have all been extensively studied and reviewed by others (e.g., Fryges and Wright, 2014; O'Shea, Chugh, and Allen, 2008; Djokovic and Souitaris, 2008).

Sampling

To identify relevant papers, we searched for the keywords ('spin-out', 'spinout', 'spin-off', 'spinoff', 'employee start-up', 'employee entrepreneurship', 'employee mobility', 'entrepreneurial spawning', and 'transition to entrepreneurship') in the ABI/INFORM database title and abstract search, yielding 912 scholarly journal articles. In addition, we consulted the reference lists of prominent papers to uncover additional candidate articles, including a handful referring to 'offspring' or 'spawn'. After excluding the papers on corporate spinoffs, non-profit and academic spinouts, and inter-firm mobility, we are left with 127 relevant articles (Appendix 2-A). The literature has grown exponentially—more than doubling each decade since the 1980s.

Coding and analysis

We code all the papers based on a formalized codebook (Appendix 2-B) and use content analysis methods (Krippendorff, 2004; Weber, 1990) to identify key themes and subthemes. The themes emerged after several rounds of coding refinement and inter-subjective reliability testing. The first author categorized the articles into the themes that emerged, then, the second and third authors categorized a random sample of the articles into the themes. Where there were

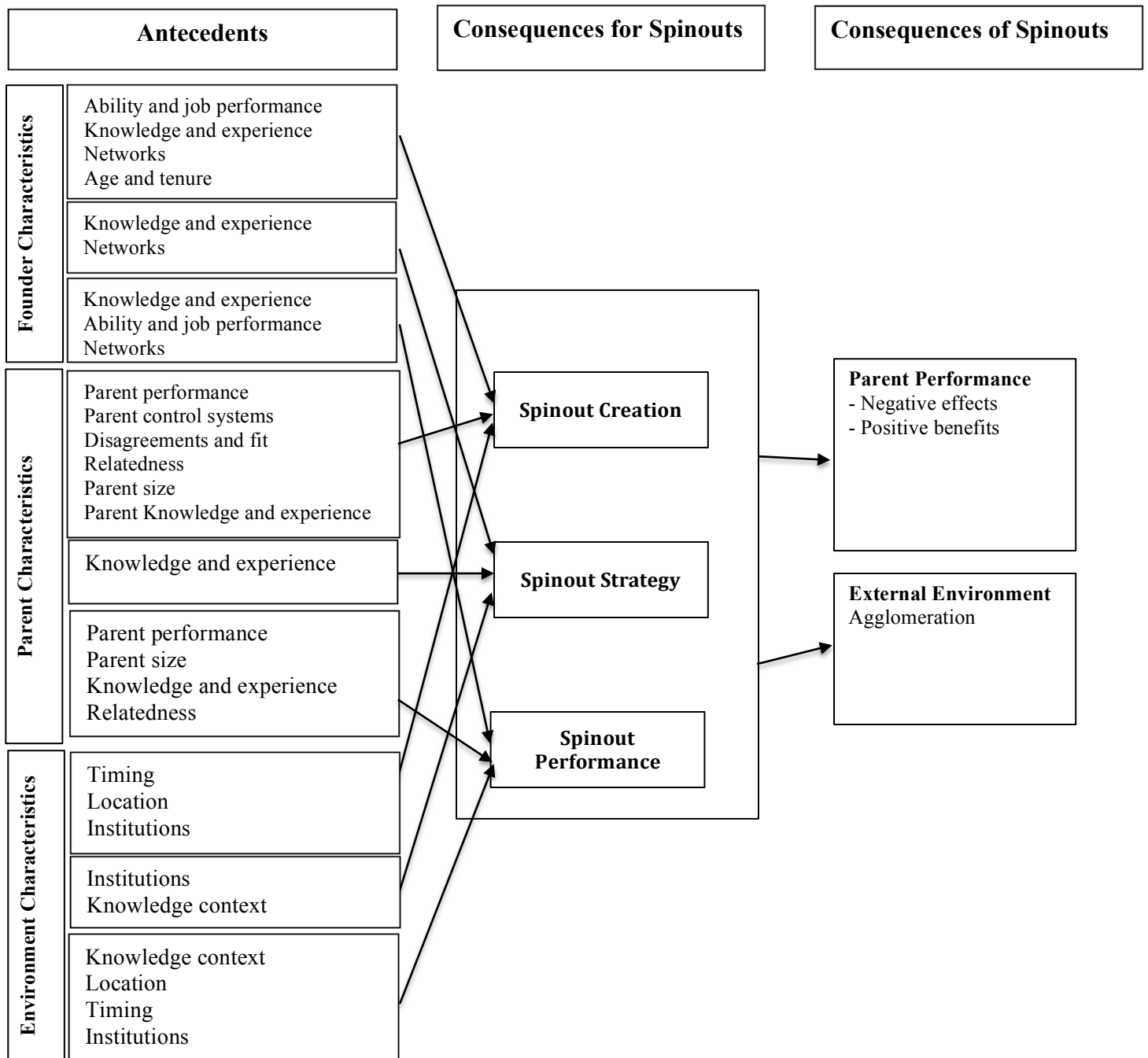
disagreements, the researches discussed the papers together until they came to a consensus about the appropriate coding. Disagreements often led us to refine the categories.

Major Themes

We organize the literature around five broad themes. Three of the themes are antecedents at the individual, organizational, and external environmental levels, whereas the other two are the consequences of spinouts for the parent firms and the external environment. Figure 1 provides a multilevel conceptual model of the literature on spinouts antecedents and consequences. It is important to note that in addition to the main effects, various individual, organizational, and environmental characteristics may not only moderate the effects of other factors at the same level but they may also interact with factors at other levels.

For the first three themes, we segmented the literature by antecedent and by consequence. The antecedents vary, but the main dependent variables include spinout creation, spinout strategies, and spinout performance. Constructs used for spinout creation include frequencies, that is, counting the number of spinouts by parents, transition to entrepreneurship, new venture creation, and entry rates. Constructs for spinout performance include survival analysis measuring exit hazard and firm survival, the number of years spinouts produce a product, funding success, regulatory approvals, return on assets, asset growth, patent counts to measure the innovation performance, and firm growth. While the majority of the studies examine spinout creation and spinout performance, some studies focus on dependent variables such as spinouts market choice, location choice, and organizational form. We categorize these papers under the spinouts strategy sub-theme. This broad theme captures any type of strategy (e.g., functional, business, corporate) and strategy implementation (structure, culture, control systems). The following sections are organized to mirror the vectors (arrows) in Figure 2-1.

Figure 2-1: An integrated conceptual framework of the spinout literature



Founder characteristics

In this theme, researchers theorize and empirically investigate founder characteristics that affect spinout creation, strategies, and performance. We coded 28 papers in this theme, 23 papers addressing creation, four papers on strategy, and nine papers on performance³. Several individual level characteristics stand out in this theme, including ability and job performance, knowledge and experience, networks, and age and tenure.

The top theories used in this theme are human capital theory and social capital theory. The human capital theory approaches look to the abilities, performance, knowledge, and experience of spinout founders. The social capital theory approaches look to the social networks of founders both inside and outside of their parent firms.

Table 2-2. Distribution of articles on founder characteristics (n=28)

Sub-theme (Outcomes)	Spinouts Creation (n=23)	Spinouts Strategy (n=4)	Spinouts Performance (n=9)
Antecedents			
Founder ability and job performance	6	0	3
Founder Knowledge and experience	11	2	5
Founder Networks	3	2	2
Founder age and tenure	3	0	0

Founder ability and job performance

Spinout Creation. Spinout founders are able to take risks that others are not comfortable with (Bankman and Gilson 1999). However, Raffiee and Feng (2014) show that risk-averse

³. Note that papers can be coded into more than one theme or sub-theme.

employees are more likely to choose a staged entrepreneurial entry process and keep their day-jobs until they are sure about the performance of their new venture.

More recent studies have suggested that higher performing employees and higher income earners are less likely to leave employment, but more likely to spin out new ventures when they do leave (Campbell et al. 2012; Carnahan et al. 2012). Higher earners are usually employees with better job performance and greater ability to replicate complementary assets and transfer resources and opportunities from the source firm. They choose to maximize their value creation through spinouts because their non-monetary motivations, such as need for autonomy, are greater than those of lower earners (Campbell et al. 2012). High performers receive higher payment for their firm-specific knowledge creation and going to work for competitors of their parent firms can diminish the value of their firm-specific human capital because routines do not necessarily transfer well to other established firms. However, transferring human capital (knowledge and routines) has a better payoff in new ventures compared to joining an existing firm with established routines (Campbell, Kryscynski, and Olson, 2017; Carnahan et al., 2012). High performers are better able to convince their co-workers to join them in their ventures. They have special access to their colleagues' knowledge and expertise and, therefore, are able to attract the right people to build their teams (Agarwal et al. 2016). Moving as a team specifically important when employees try to transfer complex socially-embedded knowledge to their new venture (Campbell et al. 2017).

Spinout Performance. Higher earning and superior performing employees are able to attract larger teams with greater tenure, which in turn may lead to higher survival rates for their spinouts (Agarwal et al. 2016). Muendler, Rauch, and Tocoian (2012) also argue that it is because spinout founders attract larger initial teams that they survive longer than other types of start-ups. Dahl

and Sorenson (2014) show that individual differences contribute to better performing spinouts, including recruiting abilities—that is, hiring experienced co-workers instead of family and friends.

Founder knowledge and experience

Spinout Creation. An individual's firm-specific human capital is tied to the areas of organizations in which they work. Employees with experiences unrelated to the core activities of their employers are more likely to found spinouts (Hellmann, 2007). Compared to those in peripheral areas, employees working in core areas may be more likely to compete with their employers when they create new ventures. Therefore, incumbents may use resources to suppress spinouts related to their core activities (Yeganegi et al., 2016). These findings are interesting because studies often focus on intra-industry spinouts or those that are producing the same set of products as their parent firms (Klepper, 2009), and some even exclude inter-industry spinouts entirely. Workers with firm-specific human capital are also more likely to be restricted by non-compete contracts (Marx et al. 2009; Starr et al. 2017).

Nikolowa (2014) theorizes that employees with greater managerial talent are more likely to be retained in the core activities of their employer and less likely to spin out. Similarly, Dahl and Sorenson (2014) show that spinout founders tend to have less managerial experience but more technical/functional experience than non-founders. By contrast, Cusmano, Morrison, and Pandolfo (2015) argue that most spinout founders are middle managers in market/customer facing roles, therefore, they have more market-related knowledge than technical knowledge. These authors contend that in mature industries, such as the tile industry, knowledge about market opportunities, niche markets, and resources is more important than technical knowledge, thus, sales people and senior managers who are more aware of their clients' needs, market trends,

and have better access to key information about resources, are more likely to spin out ventures. Work experiences also help employees to learn about their own skills and abilities. Through experimentation at work, employees learn about their own fitness for another job and as a result, they may join other firms or start their own business (Chatterji, De Figueiredo Jr., and Rawley, 2016).

Information asymmetry between an employee and her employer can lead to a spinout. When employees make inventions that require little start-up capital and property rights are weak, they are more likely to leave to start a spinout (Anton and Yao, 1995; Nikolowa, 2014). Similarly, when employees have superior knowledge about the high value of an innovation (as compared to the market), they are more likely to spin out rather than sell the idea at the undervalued market price (Chatterjee and Rossi-Hansberg 2012; Campbell et al., 2017). The complexity of the employees' knowledge also can influence their decision to become entrepreneurs. The more complex employees' knowledge, the more likely they exploit their knowledge in a new venture, since integrating complex knowledge into existing structures and activities of parent firms or competitors can be challenging (Ganco, 2013). It may be easier to start a new firm without the hang-ups of competing routines. Interestingly, Ganco (2013) finds that knowledge complexity increases the likelihood of team spinouts rather than individual spinout, perhaps because complex knowledge is usually embedded in the team and needs to move as a contiguous unit.

Spinout Strategy. Founders' previous experiences influence the strategies they pursue in their new ventures. For instance, Simons and Roberts (2008) show that the pre-entry experience of founders influences the organizational forms they select. In particular, founders with non-local wine industry experience are found to be more likely to adopt the locally novel non-kosher organizational form. Also, the experiences of higher performing employees allow them to recruit

superior start-up teams because of their private knowledge of co-workers' abilities (Agarwal et al., 2016).

Spinout Performance. The main underlying mechanism used to explain the higher performance of spinouts compared to other start-ups is the knowledge spinout founders inherit from their employers (e.g., Agarwal et al., 2004). However, not all employees are equally able to learn and transfer knowledge from their parent firms. Spinouts founded by employees from the core areas of parent firms create more impactful knowledge, whereas those in the peripheral technological domains are less likely to be able to recombine their parent firm's core technology to create impactful knowledge in their new ventures (Basu, Sahaym, Howard, and Boeker, 2015). Interestingly, founder knowledge breadth does not influence spinouts' knowledge impact (Basu et al., 2015), suggesting that jacks-of-all-trades may not be masters of spinouts. Having both local and non-local pre-founding experiences positively affects spinout performance (Simons and Roberts, 2008). Interestingly, spinout founders with business related education are relatively more likely to patent inventions quickly than those with technical education (Balconi and Fontana, 2011). Spinouts founded by research and development (R&D) employees have higher R&D productivity than their counterparts (Yang, Lin, and Li, 2010). In contrast to their expectation, Furlan (2016) finds that spinouts created by employees with low-rank positions in their parent firms survive longer than other start-ups, whereas spinouts created by employees with high-rank positions in their parent firms show the same survival rate as other start-ups. The authors attributed it to a low likelihood of a senior manager voluntarily choosing a spinout in their setting; however, it needs to be re-examined in other settings.

Founder networks

Spinout Creation. Employees' social networks and social capital influence their decisions to become entrepreneurs in several ways. Co-workers with previous entrepreneurship experience play an important role in defining the information and norms that individuals use to make their spinout decisions. Having access to co-workers who are former entrepreneurs can help employees learn about requisite skills and their acquisition, recognize attractive opportunities, and reduce the stigma of failure (Nanda and Sørensen, 2010). Similarly, employees with university peers that are entrepreneurs can access more information about opportunities and have reduced uncertainty about entrepreneurship (Kacperczyk 2013). High levels of on-the-job embeddedness (i.e., linkage density, fit, and job sacrifice) provide employees with extensive information about markets, customers, and technologies, helping them to sense and seize entrepreneurial opportunities (Mai and Zheng, 2013).

Spinout Strategy. Entrepreneurs' social networks and proximity to family and friends often determine where entrepreneurs locate their businesses (Dahl and Sorenson 2009). Moreover, employees' on-the-job embeddedness influences the industry that they choose to start their ventures. Employees with high on-the-job embeddedness are more likely to stay at the same industry as their employer. Remaining in a familiar industry reduces switching costs and uncertainty entailed in entering a new industry (Mai and Zheng 2013).

Spinout Performance. Founders' networking in the incubation and emergence phases prior to entry into entrepreneurship affects the performance of their spinouts (Furlan and Grandinetti, 2014). Mai and Zheng (2013) contend that on-the-job embeddedness helps spinout founders to acquire important resources such as financial, human, and social capital, thereby providing entrepreneurs with sustainable competitive advantage that leads to venture growth.

Founder age and tenure

Spinout Creation. While some studies show spinout founders tend to be older and have longer job tenure than other start-up founders (Balconi and Fontana, 2011; Eriksson and Kuhn, 2006), Andersson and Klepper (2013) find that employee age is negatively related to spinout creation and that longer tenure is associated with lower employee mobility in general.

Parent characteristics

In this theme, researchers examine the influences of spinout parent firms' organizational characteristics on spinout creation, strategy and performance. We coded 68 papers in this theme, 44 papers addressing creation, five on strategy, and 36 on performance. This is by far the most researched theme. Our review reveals several relevant factors including parent performance, parent control systems, disagreements and fit, relatedness, parent size, and parent knowledge and experience. The top theories used in this theme are inheritance theory, knowledge spillover theory, knowledge-based view, push mechanisms, strategic disagreement, lack of fit, and relatedness.

Table 2-3. Distribution of articles on parent firm characteristics (n= 68)

Sub-theme (Outcomes)	Spinouts Creation (n=44)	Spinouts Strategy (n=5)	Spinouts Performance (n=36)
Antecedents			
Parent performance	17	1	22
Parent control systems	6	0	0
Disagreements and fit	12	0	0
Relatedness	0	0	7
Parent size	10	0	5
Parent Knowledge and experience	0	4	8

Parent performance

Spinout Creation. One of the key firm attributes discussed as a trigger of spinouts in previous studies is higher parent firm performance. Klepper (2010, 2002a), Buenstorf and Klepper (2010), and Cusmano et al. (2015), among others, use industry studies to show that better performing firms, which are production leaders (e.g., Olds, Buick, Cadillac, and Ford in the automobile industry and Fairchild in the semiconductor industry), generate more spinouts through reproduction and heredity. These studies rely on an inheritance theory, which states that spinouts inherit knowledge, competencies, and organizational routines from their parents. Buenstorf (2007) also finds that longer-lived parents have better knowledge and are, therefore, more likely to generate spinouts.

Parents' knowledge investments coupled with the entrepreneurial actions of individuals embedded in their context generate new ventures (Agarwal et al, 2007). Successful and innovative firms invest more in research and development (R&D) and marketing, and thus, generate more valuable knowledge in these domains that can then spillover (Klepper and Sleeper 2005). Higher performing firms allow employees to acquire advanced technical and market know-how that, in turn, makes their entrepreneurial entry less risky (Klepper, 2002a, 2010; Klepper and Sleeper, 2005). Franco and Filson (2006), in a study of the disk drive industry, argue that starting a business requires a critical level of know-how, which increases as an industry matures. Employees working in firms that are technologically advanced have more chances to learn the firm's know-how in the depth required to start a business, thus, firms with superior technological know-how are more likely to generate spinouts.

By contrast, drawing on the knowledge based view of the firms, Agarwal et al. (2004) show that parent firms with high levels of both technological and market knowledge generate

fewer spinouts. They argue that these parents have ability to both explore and exploit new ideas and, therefore, there is less abundance of unexploited knowledge for employees to spin out. Descriptive research also shows that innovative firms with high R&D intensity produce fewer spinouts as a result of high opportunity cost of leaving (Andersson, Baltzopoulos, and Lööf, 2012) or protective tools such as tailored contracts and patents (Hyytinen and Maliranta, 2008). Similarly, Nikolowa (2014) finds that for firms with high returns in their core activities, it is more profitable to exploit new ideas internally and, therefore, these firms will create fewer spinouts.

While some studies suggest that successful firms generate more spinouts, there also exist studies showing that parents' poor performance triggers spinouts. Push mechanisms refer to unfavorable conditions in parent firms leading to spinouts, whereas pull mechanisms relate to spinouts due to perceived business opportunities (Eriksson and Kuhn, 2006). In their study of start-ups in Denmark, Eriksson and Kuhn (2006) show that weak sales growth of parent firms leads to more spinouts. They suggest that most spinouts are pushed out by parents' low performance rather than pulled out by opportunities. Using a similar logic, Dick, Hussinger, Blumberg, and Hagedoorn (2013) demonstrate that lower performing Finish firms (in terms of the sales growth and return on assets) have more spinouts. Buenstorf and Fornahl (2009) point to downsizing by parents as a key push mechanism leading to spinouts. Cordes, Richerson, and Schwesinger (2014) propose a model where as firms grow, they reach a point where their cooperative corporate culture collapses and, thus, stimulates entrepreneurially minded employees to spin out new ventures. In his study of technology-based spinouts, Dahlstrand (1997) finds that more than half of spinout founders have a defensive motive related to parent divestitures, acquisitions, or organizational crises.

Spinout Strategy. The prominence of their parent organizations can determine a spinout's initial strategies. Prominent parents secure spinouts with informational and reputational benefits, which leads to pursue innovative risky strategies by spinouts (Burton et al. 2002).

Spinout Performance. Spinouts tend to have a higher survival rate than new firms with founders that do not have industry experiences in parent firms (Boschma and Wenting, 2007; Furlan, 2016; Klepper, 2007; Wennberg, 2009; Wenting, 2008). Several researchers maintain that spinouts survive longer due to their heritage (Buenstorf and Klepper, 2009; Eriksson and Kuhn, 2006). Klepper (2007) posits that spinouts that build on the expertise of their parent firms survive longer than those that do not. One line of inquiry finds that higher performing or leading parent firms generate better performing spinouts (Boschma and Wenting, 2007; Dick et al., 2013; Klepper, 2002a, 2010). For instance, entrepreneurially prominent parents (firms with more prior spinouts that are thus more visible in their communities) have more innovative spinouts (Burton, Sørensen, and Beckman, 2002), and spinouts from parents with higher R&D investment survive longer (Andersson et al. 2012). Spinouts from parents with greater technological and marketing know-how are endowed with greater initial knowledge, leading to higher performance (Agarwal et al., 2004; Franco and Filson, 2006).

Inheritance may not be limited to singular parents. Wenting (2008) finds that spinouts from multiple parents and successful parents outperform other spinouts. However, Phillips (2002) finds that spinouts with multiple parents have lower survival chances and Frederiksen et al. (2016) find that Swedish spinout founders with multiple prior employee experiences do not seem to perform better. Spinouts from surviving parents show higher survival rate than those of exiting parents and other start-ups (Dahl and Reichstein, 2007; Furlan, 2016). Opportunity spinouts (i.e., when employees leave to pursue a seemingly promising opportunity by creating a new venture)

outperform both corporate spinoffs and necessity spinouts (i.e., when employees are pushed to start their own business due to conditions in their parent firms) in terms of revenue growth rates (Bruneel et al. 2013).

Ferriani and associates (2012) suggest spinouts initially benefit from parental imprints, but then “unlearn” some of their inherited practices to face new realities. Possibly, routines learned from failing parent also need to be unlearned, given that spinouts that are pushed out by parents’ poor performance do not survive as long as those that are pulled out to chase opportunities (Andersson and Klepper, 2013; Eriksson and Kuhn, 2006; Fackler, Schnabel, and Schmucker, 2016). Inherited industry knowledge is an important factor in new entrant performance, but non-spinout entrants can access industry knowledge by hiring experienced workers (Mostafa and Klepper 2017), thus perhaps we should not expect large performance differences.

Parent control systems

Spinout Creation. According to Hellmann (2007), when firms own the intellectual property around an innovation they are more likely to exploit it internally. Rauch (2014) observes that firms in developing countries with weak legal tools hire family members to prevent spinouts and keep the firm’s value inside the family. Carnahan et al. (2012) argue that firms can increase the opportunity cost of leaving by offering generous compensation packages, but doing so can also help employees to save up capital to start a new venture when they do leave. Sørensen and Sharkey (2014) assert that parent firms that pay higher and more equitable wages experience fewer employee spinouts. The value in the spinout can also be seen as equitable rewards for employees that usually accept lower wages when they join organizations—employees pay for the opportunity to learn from their parents by accepting lower wages than they could attain through entrepreneurship (Franco and Filson, 2006). Firms can provide their

employees with authority and promotion opportunities inside the firm in order to decrease the likelihood of spinouts (Campbell et al. 2017)

Disagreements and fit

Spinout Creation. Pakes and Nitzan (1983) assert that spinouts occur when employees develop new ideas that are unrelated to their parent firm's core business. Cassiman and Ueda (2006) claim that parents cannot exploit all of the opportunities they generate and choose those that fit best with their current resources, leading employees to spin out unexploited opportunities. Similarly, Hellmann (2007) hypothesizes that when parents reject innovations in non-core areas, employees may leave to exploit the innovation in their own start-ups. Gambardella, Ganco, and Honoré (2015) detect that spinouts are more common when parents fail to commercialize innovations rather than when parents undervalue employee innovations. Lack of fit leads to strategic disagreements between employees and employers, leading to spinouts (Klepper and Thompson, 2005, 2010; Thompson and Chen, 2011). Klepper (2007) purports that employees from more successful firms have better ideas that are difficult for managers to recognize, leading to more disagreements, and thus, more spinouts. Thompson and Chen (2011) argue that disagreements occur when either (1) parents want to stick with old technology, but employees want to adopt new technology, or (2) parents want to adopt new technology, but employees want to stick with the old technology they know. Both types of disagreements can spur employees to leave to start their own ventures. Spinouts can also be triggered by events such as CEO change or acquisition, which often creates internal turmoil within the organization that can increase disagreements (Eriksson and Kuhn, 2006; Klepper and Sleeper, 2005). Habib, Hege, and Mella-Barral (2013) propose that new ideas are less likely to fit in small firms because they have a narrower range of valuable resources. This lack of fit is expected to increase the likelihood of

spinouts. In contrast, Dick et al. (2013) contend that managers of large firms may be unable to recognize the potential of opportunities that are unrelated to their core businesses, leading these ideas to be spun out by frustrated employees. Stieglitz and Heine (2007) maintain that firms with narrower business strategies (that is, strategies built around a few critical resources) have fewer spinouts because they are able to constrain employee exploration in a way that discourages divergent ideas and encourages ideas that fit with the parent's web of existing complementary assets. Hvide and Kristiansen (2012) posit that when firms have the right complementary assets, employees are less likely to start new ventures and more likely to pursue their innovations as internal corporate ventures.

Relatedness

Spinout Performance. Production and technological knowledge relatedness between a parent firm and a spinout have curvilinear influence on spinout's sales growth (Sapienza, Parhankangas, and Autio, 2004). This suggests that spinouts with a partial overlap with parent firms' knowledge is best because too little overlap constrains local search and knowledge assimilation (i.e., exploitation), whereas too much overlap inhibits the creation of new knowledge combinations (i.e., exploration). Using a very similar logic, Basu et al. (2015) reveal an inverted-U shaped relationship between divergence from parent knowledge and spinouts' knowledge impacts. Similarly, Furlan (2016) discovers a curvilinear relationship between industry-specific experience and spinout survival. Interestingly, Ferriani et al. (2012) show that spinouts initially benefit from capabilities inherited from their parents but that this inheritance can also be constraining, and spinouts must subsequently unlearn some routines to differentiate themselves in the market. In summary, there is consistent evidence about the curvilinear influence of parent relatedness on spinout performance. Walter, Heinrichs, and Walter (2014)

report that parent hostility (disapproving attitudes toward a spinout within its ranks) reduces spinout performance in terms of time to break-even, but this negative effect is moderated (reduced) when spinouts form network ties to new industry partners. However, they fail to find a significant moderating effect for product differentiation, suggesting that parent firms may be equally hostile toward related and unrelated spinouts. A recent study shows that intra-industry spinouts survive longer than inter-industry spinouts because the former take relevant industry knowledge with them (Fackler et al. 2016). This is consistent with earlier evidence that spinouts from knowledge intensive business service firms are more likely to survive if they start in the same sector as their parents (Andersson et al. 2012).

Parent size

Spinout Creation. Kacperczyk (2012) suggests that larger, more mature firms have fewer spinouts because these firms have higher rates of intrapreneurship. However, large firms are less motivated to exploit new ideas internally when the probability of success is low, creating incentives for employees to take ownership of these unexploited ideas in their own ventures (Wiggins, 1995). Sørensen (2007) provides four reasons why bureaucratic firms (i.e., larger and older firms) have lower rates of spinouts. First, bureaucracy affects employee mindsets by defining rigid roles and routines that train employees to be timid and conformist. Second, employees in bureaucracies have a narrower scope of experience that prevents them from developing the broad skills needed for entrepreneurship. Third, employees in bureaucracies are more inwardly focused, thus have less exposure to the environment. Fourth, bureaucratic organizations provide more job security and internal advancement opportunities. Supporting his arguments, he discovers that individuals working in larger and older firms are less likely to spin out. By contrast, Dick et al. (2013) assert that large and bureaucratic firms may have higher

spawning rates because inflexible routines make it difficult to respond to radical technological change. Dobrev and Barnett (2005) argue age and size contribute to bureaucracy in firms both keeping employees from spinning out, and encouraging parent founders to leave to start new ventures as their charismatic leadership is substituted with rationalization and routinization. Dobrev and Barnett (2005) state that founders gain greater access to external networks and information as their firms grow, making them more likely to leave to exploit better opportunities as serial entrepreneurs.

An alternative perspective credits sorting processes as an explanation for the effect of parent size on spinout creation. The idea is that individuals may self-select into some types of organizations and not others, creating the illusion that types of organizations matter even though they may not. For instance, larger firms may attract more risk-averse employees because they offer more stable jobs and wages, whereas smaller firms attract more risk-tolerant employees because they offer more variable wages despite less certain employment. Parker (2007) develops an economic model that uses this self-selection logic to argue why smaller firms are more likely to spawn spinouts than are larger firms. Elfenbein, Hamilton, and Zenger (2010) find empirical support for the self-selection logic in a sample of U.S. scientists and entrepreneurs. They discover that scientists and entrepreneurs that have a preference for autonomy and risk-taking are more likely to become self-employed. They also reveal support for ability sorting, where higher ability employees choose to work in small firms because they can get more pay for higher performance. Interestingly, Sørensen's (2007) study of the Danish labour market does not support such sorting processes, proposing a bureaucracy logic instead.

Gompers, Lerner, and Scharfstein (2005) find that younger, venture capital-backed companies are more likely to spawn because they offer better environments for entrepreneurial

learning and networking with suppliers and customers. Similarly, using a Finish sample, Hyytinen and Maliranta (2008) notice that employees of smaller firms are more likely to spinout and contend that this effect is due to the better learning environment of small firms, which allow employees to see the whole picture of how firms are run. Elfenbein et al. (2010) also reveal support for this perspective, finding that smaller firms provide a better environment to acquire entrepreneurial human capital, such as access to networks and the acquisition of broad skills, thus increasing the chance that employees will spin out. Yet, interestingly, in Sweden, Dahlstrand (1997) finds that small firms are the main source of employee spinouts.

Spinout Performance. Interestingly, there is some disagreement in the literature about the role of parent size on spinout performance. Hvide (2009) finds that spinouts from larger firms have higher operating returns on assets and asset growth than those of smaller firms. The probability of exit also decreases with the size of parents in Germany (Fackler et al., 2016). In Sweden, large firms create more high-growth spinouts compared to smaller firms (Wennberg, Wiklund, and Wright, 2011). Yet, founders' prior experiences in small firms may increase spinout performance (Elfenbein et al., 2010). Similarly, Sorenson and Phillips (2011) show that spinout founders from small parents are more competent, committed, and outperform others.

Parent knowledge and experience

Spinout Strategy. Spinouts inherit human resource strategies from their parent, for instance, those from parents with female leaders are more likely to have female leaders (Phillips 2005). Argyres and Mostafa (2016) find that spinouts are more likely to vertical integrate key resources if their parent did. Pre-entry resources and capabilities of spinouts influence their market choice. Knowledge that they inherit from their parents about industry supplies and customer lead them to enter the same industry of their parents, or upstream or downstream industry (Helfat and

Lieberman, 2002). Knowledge inheritance can also affect the type of products that spinouts produce. Cheyre, Kowalski, and Veloso (2015) show that spinouts from semiconductor firms that produce Monolithic Integrated Circuits (MICs) are more likely to produce MICs. Examining the history of the auto industry, Argyres and Mostafa (2016) conclude that spinouts inheriting specialized knowledge that choose higher price segments survive longer on average than those that choose lower price segments because specialized knowledge increases the spinout's ability to defend its position. Pre-entry resources and capabilities of spinouts lead them to enter new segments of the same industry of their parents, and enter later than de novo start-ups (Helfat and Lieberman, 2002).

Spinout Performance. The type of knowledge that employees obtain from prior employers influences their spinout performance. Researchers argue that performance of spinouts increases with their parents' technical know-how (Klepper and Sleeper, 2005; Franco and Filson, 2006). However, other researchers show that rather than technical knowledge, non-technical knowledge (i.e., regulatory, strategic, and marketing knowledge) determines the superior performance of spinouts (Buenstorf, 2007; Chatterji, 2009). Spinouts are less structurally constrained because of their experience-based capabilities and skills (i.e., tacit knowledge, social ties to scarce resources, and self-confidence), boosting their survival chances (Dahl and Reichstein, 2007; Sorenson and Audia, 2000). Some parents have more complex knowledge than others, requiring more individuals to carry it away. There is evidence that spinouts are more successful when they are founded by former employees of the same firm and enter their parent's industry (Andersson and Klepper, 2013). Similarly, spinouts with a higher proportion of founders from one parent firm survive longer (Phillips 2002).

Other triggers

Spinout Creation. Spinouts can also be triggered by liquidity events such as initial public offerings and acquisitions which can put significant financial resources into the hands of employees that can use them to spinout new ventures (Buenstorf, 2007; Stuart and Sorenson, 2003a).

External environmental characteristics

In this theme, researchers analyze how external environments affect spinout creation, strategy, and performance. We found 41 papers in this theme, 25 papers addressing creation, three on strategy, and 22 on performance. The literature on external environmental influences focuses on the following mechanisms: timing, institutions, and location, and knowledge context. The top theories used in this theme include institutional, temporal, and geographic theories.

Table 2-4. Distribution of articles on external environmental characteristics (n=40)

Sub-theme (Outcomes)	Spinouts Creation (n=25)	Spinouts Strategy (n=3)	Spinouts Performance (n=22)
Antecedents			
Timing	4	0	5
Institutions	15	0	2
Location	6	2	9
Knowledge context	0	1	9

Timing

Spinout Creation. Garvin (1983) argues that more spinouts are created in the earlier part of the industry life cycle due to lower entry barriers, fast changing technology and rapidly growing demand. Similarly, Klepper and Sleeper (2005) reveal that spinout rates decline as product-

markets mature and physical capital replaces human capital, making the parent firm's knowledge less accessible for employees to take out of the firm. By contrast, Agarwal and Shah (2014) argue that as industries mature, strengthening complementary assets and appropriability regimes create barriers to entry, but that employee spinouts have superior operational knowledge allowing them to overcome these barriers as compared with academic and user spinouts⁴. Spinouts are also more common during economic downturns suggesting that a large portion of spinouts are pushed out by parent crisis rather than pulled out by market opportunity (Eriksson and Kuhn, 2006). In sum, the literature on the timing of spinout creation appears to depend on the influence of the mechanisms operating at various stages of the industry or business cycle.

Spinout Performance. Spinouts that enter industries early on tend to survive longer than later entrants (Klepper 2002b; Klepper 2002a; Klepper 2007). Early entry in the life cycle is associated with a lower risk of exit (Boschma and Wenting 2007). By contrast, Buenstorf (2007) finds no evidence of first-mover advantages among German laser spinouts. However, the majority of evidence points to early entry advantages.

Institutions

Spinout Creation. When intellectual property rights (IPRs) are weak, whoever has the knowledge about a new discovery/invention can exploit it and capture the value, which is a type of agency problem. In this situation neither the parent firm nor the employee has the legal means to prevent the other from exploiting the opportunity (Anton and Yao, 1995). Thus, the prevalence and strength of IPRs reduce the likelihood of spinouts by providing parents with legal mechanisms to suppress them, particularly when employees are working in the core areas of their

⁴ User spinouts refer to innovations created by downstream users, initially for their own use, but later sold to others (Shah & Tripsas, 2007).

parent firms (Yeganegi et al., 2016). According to Hvide and Kristiansen (2012) firms without complementary assets must pursue litigation against spinouts in order to obtain their share of profits, and that although strong firm property rights reduce spinouts, they may also have the unwanted side-effect of reducing worker initiative. While the strength of intellectual property rights are a barrier to spinouts in general, such barriers are weaker for employee and academic entrepreneurs (as compared with user entrepreneurs) because they tend to have deeper knowledge allowing them to prove the non-obviousness of their inventions and to circumvent patents with their tacit knowledge (Agarwal and Shah, 2014).

Marx and associates (2009) demonstrate that when non-compete covenants in the state of Michigan were weaker, the rate of spinouts was higher, thus suggesting that non-competes stifle spinouts. Similarly, according to Stuart and Sorenson (2003a), the positive effect of initial public offerings and acquisitions on the prevalence of spinouts is weaker where non-competes are enforced. However, non-competes may be most effective at reducing spinouts for moderately profitable innovations, but not for unprofitable and highly profitable areas (Franco and Mitchell, 2006). Presumably, highly profitable spinouts may overcome non-competes with larger initial investments. Franco and Mitchell (2008) argue that enforcement of non-compete covenants leads to more unrelated spinouts. Similarly, Starr, Balasubramanian, and Sakakibara (2017) discover that non-competes lead to fewer spinouts in general, but relatively fewer intra-industry spinouts compared with inter-industry spinouts. Rauch (2016) finds that non-competes reduce spinouts by employees that are financially constrained because they cannot afford to buy out the contracts. He also claims that if non-competes are not enforced, it deters parents from investing in new areas because they think their investment will spin out. Bishara and Starr (2016) argue that areas covered by non-competes are attractive but difficult to get into, citing a ‘chilling effect’ that

prevents spinouts even if the non-competes are not enforceable. They also argue that spinouts make it harder for founders to hire employees from their parents, even if they themselves are able to leave.

Venture capital availability is generally expected to increase spinout rates (Hellmann, 2007). Bankman and Gilson (1999) argue that when firms fail to bid on employee innovations, and venture capitalists are interested in the project, then spinouts are more likely to occur. Venture capital boosts spinouts by increasing founders' perceptions that they can reasonably obtain capital, through demonstration effects (presence of other VC funded exemplars), and training of future entrepreneurs (Samila and Sorenson, 2011). Yeganegi et al. (2016) show that venture capital has a stronger positive effect on the creation of spinouts by founders with experience in core areas of their parent firms. They argue that such spinouts are more attractive to venture capitalists because they tend to have more advanced knowledge, and because they need more capital to overcome potential parent hostility.

Spinout Performance. Starr et al. (2017) reveal that non-competes suppress intra-industry spinouts and lead to more inter-industry spinouts. However, if intra-industry spinouts occur, they perform better than others. Franco and Mitchell (2008) argue that inter-industry spinouts spurred by non-competes are more profitable because they do not compete directly with parent firms.

Location

Spinout Creation. Sorenson and Audia (2000) argue that denser local concentrations of firms produce large pools of potential entrepreneurs leading to more spinouts. Stuart and Sorenson (2003b) suggest that dense clusters can also provide spinout founders with the specialized resources (e.g., technical experts) they need to start their ventures. The evidence seems to support these ideas. Firms located in clusters such as the Detroit automotive cluster, and

the Sassuolo district have higher spinoff rates (Cusmano et al., 2015; Klepper, 2002; 2007). Likewise, Baltzopoulos, Braunerhjelm, and Tikoudis (2016) report that industrial diversity of related local businesses increases spinout rates whereas unrelated diversity has a negative influence.

Spinout Strategy. Adams et al. (2017) suggest that spinouts will locate differently based on their location in the supply chain (upstream or downstream) and the product market strategies they pursue. Spinouts tended to locate close to their parents especially if they pursue advanced technology and their parent's location is agglomerated. This location choice helps spinouts to take advantage of spill-ins and their existing networks in the region (Berchicci et al., 2011).

Spinout Performance. Locating in a cluster has no significant effect on performance (Cheyre, Kowalski, et al., 2015). Studies find that the survival rate of firms located within a dense cluster is not significantly different from that of other firms (Wenting, 2008). Buenstorf and Klepper (2009) argue that among the firms in tire cluster in Akron, only spinouts show superior performance due to their larger size at entry (and other characteristics) and not because of their location in the cluster. Similarly, Heebels and Boschma (2011) show that the positive effect of location on the survival rate of firms in the cluster, diminish after controlling for the prior experience of the founders. Spinouts in dense clusters may actually perform worse than those in less concentrated areas (Stuart and Sorenson, 2003b). However, De Figueiredo, Meyer-Doyle, and Rawley (2013) find that spinouts with founders from firms located in established clusters of firms related to the spinout perform better due to inherited agglomeration effects such as exposure to advanced ideas and knowledge. Finally, firms in regions with many related activities as opposed to densely populated locations, have higher survival rates, but suffer from stiff rivalry (Boschma and Wenting, 2007). Dahl and Sorenson (2009) suggest that spinouts tend

to locate away from their parents in favor of areas with lower exit rates, perhaps because industry experience allows for superior location selection. Around half of spinouts stay close to their parents but may not have greater success (Berchicci et al, 2011). Cusmano et al. (2015) find that spinouts locating in their parents' clusters do not perform better than other start-ups.

Knowledge context

Spinout Strategy. Adams et al (2016) argue that knowledge context can influence spinouts market choice. They show that spinouts from downstream user-industries are more likely to enter in market-specific product categories than other start-ups, including focal spinouts.

Spinout Performance. The macro context in which spinouts' founders develop their experience and knowledge can influence the performance of their ventures. There is agreement among scholars that both inter- and intra-industry spinouts survive longer than inexperienced start-ups (Adams et al., 2013, 2016; Buenstorf and Klepper, 2009; Fontana and Malerba, 2010; Klepper, 2002a), whereas intra-industry spinouts secure venture financing more quickly and have higher valuations than inexperienced start-ups (Chatterji, 2009). However, there is less agreement about whether inter-industry spinouts outperform intra-industry spinouts or vice versa. Fontana et al. (2015) in their study of new entrants in telecommunication industry show that spinouts by founders from upstream industries (inter-industry) survive longer than those by founders from the focal industry (intra-industry spinouts). They also find that the founders from completely unrelated industries (e.g., banking, finance, and university) show no significant difference in terms of survival as compared to intra-industry spinouts. Fontana and Malerba (2010) examine the survival rate among new entrants in the semiconductor industry and reveal that intra-industry spinouts and user-industry spinouts indicate no statistical difference in survival rates. Adams, Fontana, and Malerba (2013) describe entrepreneurial entry in the

semiconductor industry and conclude that user-industry spinouts survive longer than and innovate as much as focal spinouts and other start-ups. User-industry spinouts that enter into niche products (as opposed to generic products) show a lower exit hazard than focal spinouts (Adams et al. 2016). Private sector spinouts outperform university spinouts in terms of survival as well as sales growth (Wennberg, Wiklund, and Wright, 2011). Private sector spinouts also outperform internal corporate ventures and corporate spin-off (Cassiman and Ueda, 2006; Bruneel et al., 2013)

Spinouts' influences on parents' performance

How do spinouts affect parent firm performance? We found just 9 articles addressing this theme, making it the least researched theme. The literature on spinouts' influence on parent performance can be grouped in terms of positive and negative influences. The top theories used in this theme are complementary asset theory, knowledge spillover theory, reputation theory, and strategic alignment theory.

Negative influences. Resource transfers between the parent and the progeny may decrease life chances for the parent firm (Phillips 2002). Campbell et al. (2012) show that spinouts by higher earning employees are more detrimental to parent firms than those by lower earning employees. Parents can be harmed when larger, more experienced teams of employees spin out new ventures, often led by higher earning founders (Agarwal et al., 2016). Similarly, Wezel, Cattani, and Pennings (2006) discover that parent firms are worse-off when groups of employees leave to form spinouts in the same geographic area than when individuals or groups leave to work for parents' competitors.

Positive influences. Spinouts can enhance parents' corporate coherence by removing unaligned businesses that may lower overall performance (Ioannou 2014). Spinouts also increase

parents' technological performance through positive reputation as incubators which helps them to attract and retain stakeholders (McKendrick et al. 2009). Ironically, perhaps, related spinouts cannibalize parents' core customers less than do internal corporate ventures (Cassiman and Ueda, 2006), suggesting that keeping them in can be worse than letting them move out. Parent firms may also benefit from spinouts due to the positive spiral created when knowledge spillovers promote munificent environments (Agarwal, Audretsch, and Sarkar, 2007), and from 'spillins' where spinout knowledge makes its way back to parents (Kim and Steensma 2017). Similarly, inventor mobility is found to disproportionately benefit new firms in Silicon Valley, but parents still benefit from spinouts because spinouts attract a greater variety of potential employees to the region or cluster, which parents can then hire (Cheyre, Klepper, and Veloso, 2015). Buenstorf and Fornahl (2009) verify that spinouts often follow different strategies targeting different customers, and offer products and services that are vertically and horizontally related rather than directly competing with parents—suggesting they can often create mutual benefits and partnerships. Interestingly, Dahlstrand (1997) finds that it is unusual for spinouts to become competitors of their former employer, so parents may have little to worry about. For instance, Microsoft spinouts entered new markets rather than competing with their parent (Mayer, 2013).

Spinouts' influences on the external environment

How do spinouts affect their external environments? We found 27 papers addressing this question. The main mechanism examined in this theme is how spinouts lead to agglomeration or industrial clustering. There are two competing theories to explain agglomeration: agglomeration economies and spinoff dynamics. Scholars in this theme try to investigate which of these views are more likely to be responsible for industry clustering.

There is evidence that local replication of routines through spinouts causes geographic clustering of industries (Buenstorf and Klepper, 2009, 2010; Camuffo and Grandinetti, 2011; Cordes et al., 2014; Cusmano et al., 2015; Klepper, 2010, 2011; Wenting, 2008). Clusters may form because spinouts survive longer than other types of firms (Buenstorf and Klepper, 2009). Klepper (2007) argues that strategic disagreements between parents and employees caused Detroit's automotive cluster, and Silicon Valley's technology cluster (Klepper, 2010). Spinouts contribute to the growth of industries by exploiting innovative discoveries and technological inventions by their parents. Spinouts exploit these opportunities by creating new firms and remaining close to their parents which lead to industry and region growth (Dorfman, 1983; Golman and Klepper, 2016).

This stream of research suggests that industry clustering is associated with spinouts by employees and their superior performance due to the knowledge legacy. However, there is other research that shows both spinouts and agglomeration economies play roles in shaping clusters. For instance, Boschma and Wenting (2007) find that both agglomeration economies and spinoff dynamics complement each other to influence the geographic clustering of the British automotive industry. Similarly, Cheyre, Kowalski, et al. (2015: 853) show "both heritage and clustering influence the establishment of SV [Silicon Valley], although the cluster shows weaker results". In their study of the ceramic tile cluster of Castellon in Spain, Hervas-Oliver, Lleo, and Cervello (2017) argue that knowledge inheritance by spinouts and agglomeration externalities has complementary roles in spatial concentration of an industry. They show that social structures reinforced by agglomeration provide learning mechanisms that affect new firm formation.

Sorenson (2017) argues from an organizational ecology perspective that regions with a large number of small firms and start-ups provide a better environment for entrepreneurship.

These regions legitimize entrepreneurship as a desired career choice; prepare potential entrepreneurs to start their own businesses, and provide a fertile environment by providing critical resources and adopting public policies that are entrepreneur-friendly.

Almost all the papers in this theme are on intra-industry spinouts and there is little information available on how inter-industry spinouts may influence industry clustering. In a recent study, Adams et al. (2017) investigate the location choice by different types of spinouts. They argue that location choice affects spinouts' exposure to potential knowledge. Therefore, depending on their pre-entry knowledge heritage and entry product strategy, spinouts may choose varying locations. Whether they enter generic or specific product markets, spinouts that enter downstream industries are more likely to locate in regions with a greater presence of parent industry firms to gain complementary knowledge. Intra-industry spinouts, on the other hand, locate close to parent industry firms when they enter generic product categories in order to gain reinforcing knowledge. However, when intra-industry spinouts enter market-specific products, regions with more downstream market activity are more attractive (Adams et al. 2017). Dahl and Sorenson (2009) find that Danish entrepreneurs' preferences to locate their venture near their social networks (family and friends) lead to cluster formation and persistence. However, spinouts that move farther away from their parents can diffuse clusters across geographies (Berchicci, King, and Tucci, 2011). Spinouts help to fill in heterogeneous or niche opportunities created by existing clusters (Christensen, 1993; Sorenson and Audia, 2000).

Mayer (2013) finds that the main effect of spinouts is to add new layers to the regional economy via diversification into related markets. Buenstorf and Fornahl (2009) find that even temporarily successful spinouts can have a lasting effect on regional development. Agarwal et al. (2007) credit knowledge spillovers via spinouts for the growth of industries, regions, and

economies. Spinouts also influence their environment by promoting inventor mobility (Cheyre, Klepper, et al. 2015). However, spinouts may cause parent firms to underinvest in their internal corporate ventures, which can lead to smaller scale entry and thus, higher prices for customers (Burke and To, 2001).

Discussion

The literature on private sector spinout has provided important insights. Scholars from different areas have highlighted an important phenomenon and have provided their conjectures based on their real-life knowledge of several industries. While prior studies provide a strong foundation for understanding the phenomenon, the result is a very fragmented literature. Our review provides an integrated conceptual framework that provides a comprehensive picture of extant literature on spinouts. We also make a contribution by exclusively reviewing private sector spinouts and differentiating them from other types of spinoffs (e.g., academic and corporate spinoffs). We show how inconsistent terminology and definitional ambiguity in the literature makes it confusing to distinguish effects related to private sector spinouts and other types of entry. We hope this review helps build consensus among researchers regarding the terminology and boundary conditions to define private sector spinouts and other types of spinoffs. Our review also reveals several research gaps that provide avenues for future research that are explained in detail in the following section.

Future Research

A review of the emerging literature on spinouts shows that it is a multilevel phenomenon (see Figure 2-1). Mechanisms operating at the individual, organizational, and external environmental levels influence spinout creation, strategy, and performance. However, most of the prior research has failed to examine constructs at multiple levels using multilevel methods.

Thus, the result has been a plethora of studies with inconsistent findings. Further, most studies have provided either anecdotal evidence or have interpreted correlations without controlling for confounding and interactive effects, thereby hampering the development of a systematic body of knowledge on spinouts. Such mechanisms may embody moderating or mediating influences of various factors at multiple levels. Thus, we call for future research on spinouts to isolate the effects of various mechanisms as well as test their interactive effects using the mechanisms directly. It will be helpful to use and develop appropriate theories in this process.

Spinout strategies and their antecedents receive the least attention (in this review only 12 papers across all levels study factors that influence spinout strategy). Researchers might consider the mediating role of spinout strategies. Rather than a direct path from founder, parent, and environmental characteristics to spinout performance, these antecedents may affect spinout strategies that, in turn, influence spinout performance. There may also exist partial mediation, where antecedents affect spinout strategies, but also directly affect spinout performance. Such models, though more complex, might be needed to tease out inconsistent results.

Future research suggestions by theme

Founder characteristics. Founders gain knowledge, learn skills, and develop their network during their education as well as when they gain experience in their jobs. Thus, there is evidence of knowledge and learning mechanisms (e.g., experiential learning theory, recombination theory, and human capital theory) at the individual level (Elfenbein et al. 2010; Gompers et al. 2005; Franco and Filson 2006). However, the spinout literature discusses the importance of founders' experience without examining the type of experience: exploration versus exploitation. While there are studies arguing that employees learn their parents' technical know-how (e.g., Franco and Filson, 2006; Klepper and Sleeper, 2005), Cusmano, Morrison, and Pandolfo (2015) argue

that most spinout founders are middle managers in market/customer facing roles, therefore, they have more market-related knowledge than technical knowledge. Ambidextrous firms generate fewer spinouts because they are better able to exploit their innovations internally (Agarwal et al., 2004). However, we don't know whether more exploratory roles (e.g., involvement in the creation for new business within parent firms) are more important than implementation roles (e.g., creating structures, culture, and control systems to profit from the innovation) in an individual's quest to found a spinout. One recent study suggests that employees with ambidextrous experiences are more likely to enter into entrepreneurship than either explorative or exploitative experiences (Yeganegi, Dass, Laplume, and Greidanus, 2017). Perhaps future studies might also look to contextual moderators and mediators. For example, entrepreneurs may need more ambidextrous experiences in weaker institutional environments where specialization may be hampered by lacking contract enforcement (North 1987).

There is a similar debate about what influence a founder's inherited knowledge types have on a spinout's performance. Chatterji (2009) shows that, contrary to findings that associate the superior performance of spinouts to inherited technical knowledge of their founders, other types of knowledge such as exploratory and regulatory knowledge lead to better spinout performance. Future researchers may investigate which type of knowledge—explorative, exploitative, or ambidextrous—predicts spinout performance, again, with attention to contextual moderators and mediators.

The types of knowledge and skills that employees acquire in their workplace may be affected by the structure of their employing firms. Organizations achieve ambidexterity through structural and/or contextual ambidexterity. With structural ambidexterity firms pursue exploration and exploitation in separate divisions and integration is done by top management.

Employees are assigned to either exploration or exploitations activities and the top management team integrates the created knowledge into the exploitation divisions (Tushman and O'Reilly 1996). In contrast, contextual ambidexterity encourages employees to do both exploration and exploitation (Gibson and Birkinshaw 2004). Employees who work in a firm that uses structural ambidexterity are more likely to acquire either explorative or exploitative knowledge, while employees in a firm with contextual ambidexterity are more likely to have ambidextrous experiences. Thus, the hypothesis that future research can test is: contextual ambidexterity at the firm level encourages spinouts at the individual level, whereas structural ambidexterity discourages spinouts by depriving employees of the preparatory experiences needed to spinout new ventures.

Another question needing future research is whether spinouts come from employees who work in core areas or peripheral areas in their parent firms. The majority of empirical studies focus on intra-industry spinouts and show that these spinouts usually produce similar products as their parent firms (Klepper 2009). This stream of research suggests that spinouts come from employees working on the core technology of their parent firms. In contrast, other researchers argue that employees with experiences in non-core areas are more likely to spinout (Hellmann 2007; Cassiman and Ueda 2006). These scholars argue that firms have limited resources and will exploit those ideas that fit with their core activities. Employees in core areas are more restricted by legal tools such as covenants not to compete (Marx, Strumsky and Fleming, 2009; Starr, Balasubramanian and Sakakibara, 2017). Yet, there is no empirical research showing that spinout creation is more likely among employees with experiences in non-core areas.

The existing results for the effect of founder's age and tenure on spinout creation are inconsistent. Perhaps future research could examine the interaction of employee role (i.e.,

managers versus lower level employees), and type of firm (e.g., narrow or broad strategy) to tease out these effects more comprehensively. Finally, researchers have largely neglected the role of personality variables (e.g., locus of control and need for achievement) (Rauch and Frese, 2007) that may influence spinout creation and performance in various contexts. Roach and Sauermann (2015) show that science and engineering Ph.D. candidates with a stronger preference for autonomy and risk tolerance are more likely to show interest in becoming a founder or a joiner (a start-up employee) than working for an established firm.

Parent characteristics. One conflict in the literature has to do with the effect of parent size on spinout frequency. For instance, Sorenson (2007) argues that the bureaucratic environments of large firms reduce spinout frequency, whereas Dick et al. (2013) find that larger parents have more spinouts, even when adjusted for relative asset size. Perhaps these differences could be resolved by looking at the interaction of parent size and parent performance on spinout frequency. Push and pull mechanisms may operate differently in large and small firms. In large firms, poor performance may push employees to spinout ventures because they may believe their future to be brighter in the market. By contrast, poor performance in small firms may drive employees to seek employment within larger, more stable firms. These effects might also be moderated by the life cycle of the industry in question, for instance, highly munificent environments may boost pull mechanisms in bureaucratic firms.

Another interesting inconsistency in the literature deals with the evidence on the effect of spinouts with multiple parents. Phillips (2002) argues that having multiple parents is likely to be beneficial to spinout performance if access to a variety of resources is more important, and detrimental if inherited routines are more important (because routines often conflict with each other). His study of the Silicon Valley law firms shows a negative but marginal effect for

multiple parentage. By contrast, Wenting (2008) reveals a positive spinout performance effect for multiple parents in the fashion industry, and concludes that exposure to multiple routines may be more important in creative industries. Together, these findings suggest the knowledge complexity of an industry may be a key moderator of the relationship between multiple parentage and spinout performance. This proposition can be tested with cross-industry studies.

Researchers have acknowledged inheritance as a prime mechanism at the organizational level for spinout creation and performance (e.g., Buenstorf, 2007; Cusmano et al., 2015; Klepper, 2001, 2002a, 2002b; Klepper and Sleeper, 2005). They propose that high performing and innovative organizations invest in R&D, organization development, and human resources to generate valuable knowledge in technology, marketing, beliefs, values, routines, and social capital, which in turn contribute to spinout creation and performance. However, it is not clear which specific mechanism (e.g., better technology, marketing knowledge, routines, networks, or reputation) is at play here because the studies are mostly based on the success stories of just a few spinouts from prominent parent firms. To complicate matters further, some studies also note the emergence of disagreements and conflicts at the parent organizations before the spinouts (Klepper and Thompson, 2005, 2010). Thus, systematic studies that can distinguish among various mechanisms will be immensely useful in the future in delineating the operation of various mechanisms. For instance, to test inheritance theory, researchers may compare routines in various spinouts and their parent organizations since routines have been proposed as the DNA—the genetic materials of organizations (Feldman and Pentland, 2003). An accurate understanding of these mechanisms is not only theoretically important but it has significant implications for the parent organizations, spinouts, as well as the economy and the society in general.

While much research finds that highly successful firms have more spinouts, Agarwal et al. (2004) and Andersson et al. (2012) find that firms with greater competencies in the technical and marketing areas yield fewer spinouts because they have the resources to capitalize on the opportunities themselves. They can also increase opportunity costs for their employees by providing better wages (Carnahan et al., 2012) or by using legal tools such as intellectual property rights (Hellmann, 2007; Hyytinen and Maliranta, 2008) for corporate ventures, thereby decreasing spinouts. Hence, one needs to look for moderators and mediators that may explain the discrepancies among the high versus low spinout frequencies of highly innovative firms. Other factors (e.g., industry type and parent strategy) may moderate or mediate the relationship and explain the inconsistent findings.

Finally, inheritance theory may be over-emphasized compared with other mechanisms, such as self-selection (Frederiksen et al., 2016) or selection bias, where high performing firms can afford to hire high quality human resources who may be more likely to spin out regardless of what they inherit from parents (e.g., Fortune 500 companies tend to hire from Ivey league universities).

Environmental factors. Several studies look at the effects of institutions on spinout creation but very few do so on institutions and spinout performance and strategy. For instance, as Starr et al. (2016) show non-competes prevent intra-industry spinouts; but if they occur, they perform better than others. This argument may also be relevant for intellectual property rights—they may filter out weaker ideas. This finding may be true for venture capital availability as well. Venture capital availability may attract spinouts but it does not necessarily imply that those spinouts that attract venture capital will perform better. Differentiating spinout creation and performance is important because more spinouts may not be better if they are lower performing.

Future research may investigate the role of other institutions such as polity, information freedom, corruption, and inequality as moderators of spinout founder's intentions and actions, and/or moderators of parent firms' influences.

Effect on parents and the environment. Since researchers find both positive and negative effects of spinouts on their parent firms, more research is needed to identify what the key moderators are. It seems that from an ecosystem stakeholder perspective, spinouts are good for the development of clusters, which may in turn be beneficial for parent firms and/or their stakeholders in the long run. From a short-run parent-centric perspective, spinouts can boost their reputation as incubators, suggesting that parents can have an important role in ecosystem development. Since most spinouts do not usually compete directly with their parents, there seem to be few cases when parent hostility would be justified. Unneeded hostility also may harm future relations between parents and spinouts, so parents would probably benefit from taking a broader, ecosystem level view of spinouts. An untapped avenue for future research lies in examining whether parents that are hostile toward their spinouts perform better than those that are friendly? Parents may squander valuable resources trying to prevent spinouts that might not harm them and may even benefit them. Hostility may also prevent the parent from benefiting from 'spillins' from spinouts because why and how employees leave likely matters for these kinds of transfers (Kim and Steensma 2017). There is also some anecdotal evidence that spinouts may be acquired by their parent firms, especially if they maintain good relations, but no studies have examined such reunions.

Spinout effects on the environment have yet to be examined in terms of their effects on dependent variables such as innovation pace, Merger and acquisition intensity, and indigenous start-ups activity (i.e., non-spinouts). More importantly, since spinouts challenge the notion that

employees owe their parent firms a duty of loyalty, it would be interesting to see if the presence of many spinouts changes the local entrepreneurial culture (Sorenson 2017). It seems especially important to the extent that spinout founder serve as exemplars for other employees considering exit from their parent firms via spinouts. As Sorenson (2017) points out, even when spinouts fail they may leave resources behind that increase the fertility of the environment for yet more entrepreneurship recombining idle components. These conjectures are yet to be empirically examined.

Conclusion

Spinouts have emerged as a new organizational form. Scholars from various disciplines such as industrial economics, organization theory, strategic management, and entrepreneurship have noticed its rise. Our review of the literature suggests that spinouts are products of individual, multi-organizational, and environmental influences. They have the potential to positively influence parent organizations and communities by exploiting opportunities that could have been bottled up inside of parent firms where they may not fit. Such results may call into question the design of intellectual property rights and employment covenants that can serve to suppress spinouts. However, since we do find conflicting evidence in nearly every theme, there is an urgent need for better conceptualization as well as testing, especially using control variables, moderators, and mediators in multilevel analyses. Our review indicates that the majority of studies (N = 68) investigate the effect of parent firms on spinouts and only few studies (N = 9) examine the effect of spinouts on parent firms, with mixed findings. Except for a few studies (e.g., Agarwal et al., 2016; Yeganegi et al., 2016), research on spinouts has been primarily focused on main effects of antecedents on outcomes. Further, the majority of empirical studies are at a single level of analysis, suggesting the need for more multilevel research. Finally,

researchers need to design studies to tease out various competing explanations (mechanisms) at multiple levels to develop a systematic body of knowledge that matches the level of significance spinouts have attained in the contemporary era. We hope the conceptual models proposed in this research will facilitate other researchers to make their significant contributions in the future.

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Appendix 2-A. Articles included in review

1	Adams et al. (2013)	66	Garvin (1983)
2	Adams et al. (2016)	67	Golman & Klepper (2016)
3	Adams et al. (2017)	68	Gompers et al. (2005)
4	Agarwal & Braguinsky (2015)	69	Habib et al. (2013)
5	Agarwal & Shah (2014)	70	Heebels & Boschma (2011)
6	Agarwal et al. (2004)	71	Helfat & Lieberman (2002)
7	Agarwal et al. (2007)	72	Hellmann (2007)
8	Agarwal et al. (2015)	73	Hervas-Oliver et al. (2017)
9	Andersson & Klepper (2013)	74	Hvide (2009)
10	Andersson et al. (2012)	75	Hvide & Kristiansen (2012)
11	Anton & Yao (1995)	76	Hyytinen & Maliranta (2008)
12	Argyres & Mostafa (2016)	77	Ioannou (2014)
13	Balconi & Fontana (2011)	78	Kacperczyk (2012)
14	Baltzopoulos et al. (2016)	79	Kacperczyk (2013)
15	Bankman & Gilson (1999)	80	Kim & Steensma (2017)
16	Basu et al. (2015)	81	Klepper (2001)
17	Berchicci et al. (2011)	82	Klepper (2002)
18	Boschma (2015)	83	Klepper (2002a)
19	Boschma & Wenting (2007)	84	Klepper (2007)
20	Bruneel et al. (2013)	85	Klepper (2009)
21	Buenstorf (2007)	86	Klepper (2010)
22	Buenstorf & Fornahl (2009)	87	Klepper (2011)
23	Buenstorf & Klepper (2009)	88	Klepper & Sleeper (2005)
24	Buenstorf & Klepper (2010)	89	Klepper & Thompson (2005)
25	Buenstorf et al. (2016)	90	Klepper & Thompson (2010)
26	Burke & To (2001)	91	Lowe et al. (2012)
27	Burton et al. (2002)	92	Mai & Zheng (2013)
28	Campbell et al. (2012)	93	Marx et al. (2009)
29	Campbell et al. (2017)	94	Mawdsley & Somaya (2016)
30	Camuffo & Grandinetti (2011)	95	Mayer (2013)
31	Carnahan et al. (2012)	96	McKendrick et al. (2009)
32	Cassiman & Ueda (2006)	97	Mostafa & Klepper (2017)
33	Chatterjee & Rossi-Hansberg (2012)	98	Muendler et al. (2012)
34	Chatterji (2009)	99	Nanda & Sørensen (2010)
35	Chatterji et al. (2016)	100	Nikolowa (2014)
36	Cheyre et al. (b) (2015)	101	Pakes & Nitzan (1983)

Appendix 2-A. (continued)

37	Cheyre, Klepper, & Veloso (2015)	102	Parker (2007)
38	Christensen (1993)	103	Phillips (2002)
39	Cordes et al. (2014)	104	Phillips (2005)
40	Cusmano et al. (2015)	105	Raffiee & Feng (2014)
41	Dahl & Reichstein (2007)	106	Rauch (2014)
42	Dahl & Sorenson (2009)	107	Rauch (2015)
43	Dahl & Sorenson (2014)	108	Samila & Sorenson (2011)
44	Dahlstrand (1997)	109	Sapienza et al. (2004)
45	Dahlstrand (2007)	110	Schulz et al. (2016)
46	Dick et al. (2013)	111	Simons & Roberts (2008)
47	Dobrev & Barnett (2005)	112	Sørensen & Fassiotto (2011)
48	Dorfman (1983)	113	Sørensen & Sharkey (2014)
49	Elfenbein et al. (2010)	114	Sorenson (2007)
50	Eriksson & Kuhn (2006)	115	Sorenson (2017)
51	Fackler et al. (2016)	116	Sorenson & Phillips (2011)
52	Ferriani et al. (2012)	117	Sorenson and Audia (2000)
53	Figueiredo et al. (2013)	118	Starr et al. (2017)
54	Folta et al. (2010)	119	Stieglitz & Heine (2007)
55	Fontana & Malerba (2010)	120	Stuart & Sorenson (2003 b)
56	Fontana et al. (2015)	121	Stuart & Sorenson (2003)
57	Franco & Filson (2006)	122	Thompson & Chen (2011)
58	Franco & Mitchell (2006)	123	Walter et al. (2014)
59	Franco & Mitchell (2008)	124	Wennberg (2009)
60	Frederiksen et al. (2016)	125	Wennberg et al. (2011)
61	Furlan (2016)	126	Wenting (2008)
62	Furlan & Grandinetti (2014)	127	Wezel et al. (2006)
63	Gambardella et al. (2015)	128	Wiggins (1995)
64	Ganco (2013)	129	Yang et al. (2010)
65	Garrett et al. (2017)	130	Yeganegi et al. (2016)

Appendix 2-B: Codebook for content analysis

Quantitative Variables Coded:

Code	Definition
Year:	The year of publication
Authors:	The list of authors
Article Title:	The title of the article
Journal:	The publication in which the article was published
Institution:	The institution of the first author
Type:	Theoretical, empirical, review
Theories Used:	Theories used in the article
Empirical Type:	Quantitative, qualitative, mixed methods
Data Source:	Survey, secondary data, experiment
Industry:	The industry from which the data were collected
Country:	The country from which the data were collected
Dependant Variables:	The dependant variable(s) used in the study
Independent Variables:	The independent variable(s) used in the study

Qualitative variables coded:

Stated Questions:	Research questions stated or implied in the article
Stated Results:	Empirical, qualitative and conceptual results
Stated Contributions:	Contributions explicitly stated in the article

CHAPTER 3: ESSAY 2

Which employees become entrepreneurs?

The role of technology relatedness and institutional context

Abstract

This paper conceptualizes and empirically examines organizational and institutional antecedents of employee entrepreneurship. We deploy multi-level logistic regression modeling methods on a sub-sample of the Global Entrepreneurship Monitor's 2011 survey covering 29 countries. The results reveal that employees who have experience with activities unrelated to the core technology of their organizations are more likely to spin out entrepreneurial ventures, whereas those with experiences related to the core technology are less likely to do so. In support of recent theory, we find that the strength of intellectual property rights and the availability of venture capital have negative and positive effects, respectively, on the likelihood that employees become entrepreneurs. These institutional factors also moderate the effect of technology relatedness such that spinouts by employees with experiences related to core technology are curbed more severely by stronger intellectual property rights protection regimes and lacking of venture capital.

Introduction

Prior literature on spinouts from private business firms suggests they are a controversial phenomenon mainly because incumbent firms may be harmed by the exit of employees who start competing ventures (Campbell, Ganco, Franco, and Agarwal, 2012). However, the social mobility of employees (e.g., engineers, managers, and scientists) is a key mechanism in knowledge spillovers that provide the essential fodder of economic growth (Agarwal, Ganco, and Ziedonis, 2009; Acs, Braunerhjelm, Audretsch, and Carlsson, 2009; Agarwal, Audretsch, and Sarkar, 2007; Thompson and Fox-Kean, 2005; Thornton and Thompson, 2001). The knowledge spillover theory of entrepreneurship generally suggests that more value is created by spinouts than is lost by incumbents (Bloom, Schankerman, and Van Reenen, 2013).

A large body of empirical research on spinouts includes studies in industries such as the automobile (Boschma and Wenting, 2007; Klepper, 2007), disk drive (Agarwal, Echambadi, Franco, and Sarkar, 2004; Franco and Filson, 2006), laser (Klepper and Sleeper, 2005), semiconductor (Klepper, 2009b), and biotechnology (Stuart and Sorenson, 2003). The focus of these studies is intra-industry spinouts, which usually produce a subset of their parents' products (Klepper, 2009a). Other studies examine spinouts in various countries such as Sweden and Denmark (e.g. Andersson and Klepper, 2013; Eriksson and Kuhn, 2006; Sørensen and Phillips, 2011; Sørensen 2007). Unlike the industry studies, country studies examine both intra- and inter-industry spinouts and the definition of spinouts in these studies does not require the condition of being in the same industry as the parent firm (Eriksson and Kuhn, 2006).

Researchers have suggested that employees spin the ideas out that do not fit well with their parents' main activities. For example, Cassiman and Ueda (2006) argue that firms have limited resources and cannot optimally develop all of their innovations. Thus, they select the

ones that fit with their core capabilities. Spinouts that are based on ideas unrelated to core technology of a parent firm may produce products that are different from those of their parents (Klepper, 2009a) and cater to the needs of different customer groups (Hellman, 2007) or different industries. Spinouts that are founded by employees working on ideas related to core technology of their parent firms are more likely to be intra-industry spinouts.

We draw from the work of Hellmann (2007) arguing that organizations often curb innovations on the part of their employees when their managers perceive these initiatives to be distractions from assigned work tasks. He likens this condition to the classic problems of exploitation of core activities choking out exploration endeavors within firms (March, 1991). Managers' opposition to employees' participation in non-core activities is unfortunate given that many important organizational innovations may occur via broad exploration in areas peripheral to the firm. Klepper and Thompson (2010) propose that "strategic disagreements" may be the main motive behind spinouts (p. 526). Examples include when managers want to invest in new technology but the firm does not or when the firm wants to invest in new technology but managers do not (Thompson and Chen, 2011).

Contextual factors also play a vital role in spinout formation. Hellmann (2007) argues that firms cut employees out of intellectual property ownership in order to prevent spinouts, noting that when employees own the intellectual property they are more likely to leave to form their own start-ups. According to Agarwal and Shah (2014), "in weak appropriability regimes, employee founded firms seem to suffer less from a deterrent effect, and capitalize on tacit knowledge and industry specific information gained through employment." (p. 1111). Similarly, the likelihood of employees turning into entrepreneurs is also expected to increase when venture

capital is available to help foster spinouts. For instance, Chatterji (2009) suggests that employee entrepreneurs do better in terms of attracting venture capital.

The above arguments lead us to our research questions: Are spinouts more likely to emerge from employee experiences in activities that are related or unrelated to the core technology of the firm? Do the strength of the intellectual property rights regimes and the availability of venture capital in a country encourage or discourage spinouts, especially by employees experienced in activities related to the core technology of the firm? Following Hellmann (2007), we argue that spinouts are less likely to come out of employee experiences in activities related to the core technology of the firm. We also propose that the strength of the intellectual property rights regimes in a country discourages spinouts, especially those that come from employee experiences in organizational activities related to core technology of the firm. Further, we predict that availability of venture capital in a country encourages spinouts, particularly those from employees experienced in activities related to the core technology of the firm.

We test these hypotheses using a unique multisource dataset of 2748 observations in 29 countries derived from the 2011 Global Entrepreneurship Monitor's Adult Population Survey combined with data on institutions from the World Economic Forum. We use a multi-level modeling approach, which allows us to investigate the relationships of individual and institutional factors with spinouts simultaneously.

Theoretical background

Organizational experiences are an essential source of knowledge, cognitions, networks, and values motivating entrepreneurial entry (Agarwal and Shah, 2014; Sørensen and Fassiotto, 2011). Therefore, it comes as no surprise that most entrepreneurs emerge out of organizations

(Cooper, 1986), with the majority of start-ups founded by entrepreneurs that go to market with product ideas that were acquired while working for a previous employing organization (Bhide, 2000). It is important to study spinouts because new ventures founded by employees have more technological and market know-how than other start-ups (Agarwal et al., 2004). They also perform better, and survive longer than internal corporate ventures of diversifying incumbent organizations (Chatterji, 2009).

Much of the literature on spinouts juxtaposes them with spin-offs and internal corporate ventures. We limit our study to spinouts because there are ample studies on spin-offs already. Agarwal et al. (2004) define spinouts as “entrepreneurial ventures by ex-employees of an incumbent firm” (p. 501) in the same industry and operationalize them as a dummy variable with values of 1 (0 otherwise) when “at least one founder of a firm was an ex-employee of an incumbent firm in the year prior to its formation” (p. 511). Hellmann (2007) uses “start-up”⁵ to describe a business created by an employee, “if employees own the intellectual property, they may leave to do a start-up.” (p. 919). Franco and Filson (2006) define spinouts as “firms started by a former employee of an incumbent firm.” (p. 841). Klepper and Sleeper (2005) use ‘spinoff’⁶ to describe “entrants founded by employees of firms in the same industry.” (p. 1291). Likewise, Thompson and Chen (2011) employ the term “employee spinoffs” to refer to “new firms founded by former employees of incumbent firms in the same industry.” (p. 455). Andersson and Klepper (2013) define spinoffs as new firms that have a majority of their founders who were employees at the same parent firm. Thus, employee spinoffs (or spinouts) can be differentiated from corporate spinoffs, which are new businesses owned by incumbent organizations. More than a

⁵ In Hellman (2007) a "start-up" describes what we denote as a "spinout."

⁶ According to Franco and Filson (2006), what Klepper and Sleeper (2005) refer to as a “spin-off” actually describes a “spinout”.

decade after Agarwal and associates' (2004) research, spinouts still remain a conceptually and empirically underdeveloped phenomenon, with no agreed definition among researchers. The common thread among definitions of spinouts is that they are *independent businesses created by employees*. Thus, we use this definition for the purposes of this paper.

Some explanations for spinouts focus on the pure economic cost benefit analysis of leaving employment (Cassiman and Ueda, 2006). Interestingly, spinouts may be less likely when employers are at the cutting edge of technology because they are better able to keep key personnel interested (Agarwal et al., 2004). Tailored compensation packages (e.g., high wages and stock options) can also prevent valuable employees from leaving to start their own new ventures (Campbell et al., 2012; Carnahan, Agarwal, and Campbell, 2012). However, generous remuneration acts as a double-edged sword, keeping more employees from leaving, but also financing those that choose to leave and start their own ventures. Besides, the entrepreneurial aspirations of employees may stem from psychic benefits (e.g., achievement and self-actualization) quite apart from financial rewards (Franco and Filson, 2006). Firms may also share intellectual property rights with key employees and withhold them from others (Hellmann, 2007; Klepper and Sleeper, 2005), or retain the option to buy back the start-up later (Rohrbeck, Döhler, and Arnold, 2009).

Researchers have explained spinouts as reactions to organizational crises such as the turnover of key leaders, and limited opportunities for advancement up the corporate ladder (Agarwal et al., 2004). For instance, according to Hellmann (2007), "some entrepreneurs start their companies only after being rejected by their employers." (p. 920). Thus, frustrated employees may consider alternative opportunities outside of firm boundaries to continue to develop the ideas they become attached to due to their high perceived value. Klepper and

Thompson (2010) elaborate this idea, noting that employees may exit their firms due to strategic disagreements with their employers to pursue their own ventures. In particular, when employees strongly believe in the prospects of a new product, technology, or business model, but do not find sufficient support for their projects from their employer, they may leave to pursue the new resource or activity. Conversely, when an employer chooses to go with a new technology, product, or business model, but the employees have more faith in the old, they may leave to found a new firm using the older resource or activity.

Another key explanation for spinouts lies in the incumbents' lack of complementary assets, which refer to resources needed for manufacturing, supply chain management, marketing and sales, and the other organizational functions to take an innovation to market (Steiglitz and Heine, 2007). Armed with just the idea for an innovation is not enough, a firm may require many different types of resources and capabilities to put together a new business. Some complementary assets may be valuable and difficult to obtain. Employees may leave if their employing organizations cannot commit to gaining access to key complementary assets required for an internal new corporate venture.

Eriksson and Kuhn (2006) examine the population of Danish spinouts (defined by them as new firms founded by groups of individuals from the same former employer between 1981 and 2000), and show that compared to other start-ups, spinouts tend to be associated with larger entry size and greater likelihood of survival, even during downturns. Similarly, Dahl and Sorenson (2013) find that, in the Danish context, firms founded by individuals with prior industry experience tend to have higher performance than those founded by individuals without such experience. They suggest that the tendency of individuals with industry experience to hire experienced employees may account for performance differences. Interestingly, according to

Basu, Sahaym, Howard, and Boeker (2015), founders who recombine knowledge elements that diverge modestly from the knowledge of their parent firms (former employers) are likely to be more impactful (i.e., lead to more subsequent citations). They also reveal that founders who bring core knowledge from their parent firms create more impactful ventures as compared to those with only peripheral knowledge. On a related note, Klepper and Sleeper (2005) use a sample from the U.S. laser industry to demonstrate that spinouts initially tend to produce laser design similar to those made by their parent firms and that spinout founders are likely to draw on rather narrow experiences. Chatterji's (2009) study in the medical device industry indicates that spinouts that inherit technical knowledge from their parent do not perform better than other spinouts. His results suggest that the superior performance of spinouts in the medical device field is because of nontechnical types of knowledge such as regulatory knowledge, marketing knowledge, and how to identify new opportunities in this field. These types of knowledge are specifically beneficial to spinouts that operate in technology areas closely related to their parents.

Institutional influences

Apart from what goes on inside organizations, whether or not employees start ventures may also depend on contextual influences. Various types of institutions regulate the behaviors of firms and entrepreneurs (Williamson, 2000). Two of the most important ones, according to the extant literature, are intellectual property rights and venture capital availability (Autio, Kenney, Mustar, Siegel, and Wright, 2014; Samila and Sorenson, 2011a, 2011b). Intellectual property rights provide key strategic advantages to incumbents. For instance, incumbencies exploit intellectual property rights to prevent new entrants from commercializing competing innovations (Laplume, Pathak, and Xavier-Oliveira, 2014). Litigious firms can weaken competitors, and build reputations for toughness in protecting their intellectual property by extracting steep

royalties (Somaya, 2003). Agarwal et al. (2009) cite several examples: (a) In 1984, National Semiconductor filed a lawsuit against spinout Linear Technology, which was commercializing chips invented at National; (b) In the 1980s, Intel had a policy to file two intellectual property lawsuits per quarter simply to act as a deterrent to its employees. More generally, Kim and Marschke (2005) suggest that firms react to the threat of employee turnover by investing more in easier-to-enforce patents rather than relying on trade secrets and non-compete agreements.

Firms have incentives to invest in patent thickets and patent pools to fight new entrants (Jaffe and Lerner, 2011; Ziedonis, 2004). While employees who seek to become entrepreneurs can sometimes also access intellectual property rights to protect their own innovations, it is largely an incumbent's game. The cost of legal actions essentially prohibits successful new entrant litigation. For instance, non-disclosure and non-compete agreements are enforced by employers, thereby restricting their employees from spinning out new ventures using trade secrets. Hellmann (2007) predicts, "start-ups occur when the firm has weaker property rights." (p. 930). States such as California that refuse to enforce non-compete agreements and tend to side with employees in trade secrets cases (Hyde, 1998) also spur more spinouts in their jurisdictions (Gilson, 1999). Likewise, Stuart and Sorenson (2003) report that states that do not enforce non-compete agreements have more start-ups shortly after exogenous shocks (e.g., steep incumbent market downturn due to new technology). Similarly, using Michigan (which strengthen its laws regarding non-compete agreements in 1984) as a natural experiment, Marx, Strumsky, and Fleming (2009) conclude that these agreements reduce employee mobility by 8.1%. Interestingly, they also find that such agreements are much more potent (reducing employee mobility by 16.2%) when used against employees with firm-specific capabilities and those with specialized knowledge. They suggest that in response to strong enforcement,

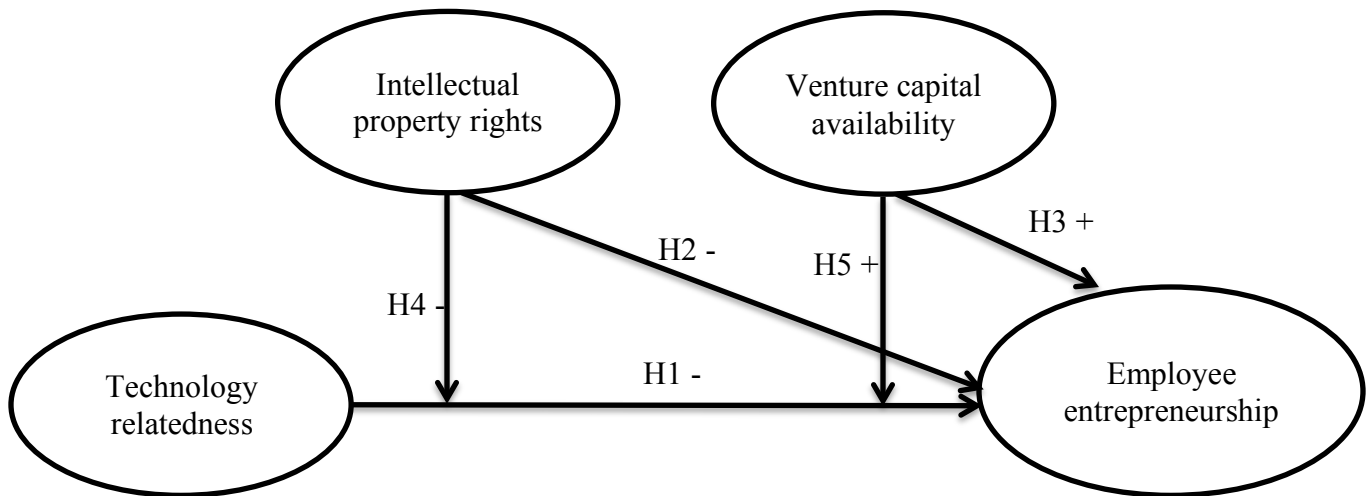
unsanctioned spinouts may put strategic distance between themselves and their jilted parents in order to avoid retributions.

Another key institution that affects financing for entrepreneurs is the availability of venture capital. Linkages to venture capitalists are important for new ventures because they can provide a combination of financial support and advice as well as legitimacy to external stakeholders, including creditors, suppliers, and customers (Lee, Lee, and Pennings, 2001). Cash and legitimacy reduce uncertainty for stakeholders transacting with entrepreneurial ventures, thus lowering transaction costs for the fledgling firm. Specifically, the reputational benefits that accrue from venture capital backing make it easier for nascent entrepreneurs to acquire necessary complementary assets.

Hypotheses Development

Figure 3-1 depicts our theoretical and empirical model. First, employees involved in core activities in a firm are less likely to spinout new ventures. Next, strength of the intellectual property rights is expected to be negatively related to employee entrepreneurship, whereas venture capital availability is anticipated to be positively related to employee entrepreneurship. We also hypothesize moderating effects of these institutional variables with technology relatedness such that employees with experiences in activities related to the core technology of the firm are more likely to become entrepreneurs when intellectual property rights are weak and venture capital is plentiful.

Figure 3-1. A Conceptual and empirical model



Technology relatedness

Prior literature on intra-industry spinouts suggests that employees leave to start firms utilizing technologies that are related to the core technologies of their former employers (Klepper and Sleeper, 2005). However, employees can also spin out ventures utilizing technologies unrelated or peripheral to those of their former employers (Cassiman and Ueda, 2006).

Hellmann's (2007) model suggests that spinouts typically involve opportunities that do not fit well with the firm's core activities due to two main reasons. Firstly, core activities are more likely to be well supported by the firm's existing strategies and complementary assets (Campbell et al., 2012). Thus, employees working on core technology will have more opportunities to develop related technologies within internal corporate ventures rather than feeling the need to pursue their desires outside of the boundaries of their parent organizations. Employees working in activities related to the core technologies of their employers may experience fewer strategic disagreements with their employers (Klepper and Thompson, 2010) because their business ideas are more likely to be compatible with the organization's current strategy and resources

(Cassiman and Ueda, 2006). There is already some empirical evidence for this contention from a study, which demonstrates that spinouts tend to increase for firms with more focused business strategies, presumably because rewarding only a narrow set of ideas increases the external spillover of new ideas (Gompers, Lerner, and Scharfstein, 2005).

A second reason to expect more spinouts from employees working on activities unrelated to their employers' core technology comes from a compensation perspective. According to Agarwal et al. (2004), employees are less likely to leave their firms to create start-ups if the firm is at the cutting edge of technology and market knowledge because such exposure acts as a non-pecuniary benefit. Employees working with and developing the core technology of the firm tend to be exposed to more advanced technologies because firms typically invest more of their developmental resources in these activities. By contrast, employees working on unrelated technologies are less likely to receive generous investments to pursue innovation within these peripheral areas. For instance, a technology leader in pharmaceuticals may employ legacy systems for many of their peripheral activities, such as accounting or internal information technology, or simply outsource these activities. Employees working on the core technologies of the firm are also likely to be compensated more favorably, raising the opportunity cost of leaving stable employment.

Thus, the strategic disagreements and compensation perspectives both suggest:

Hypothesis 1. *Employees with experiences in activities related to core technologies are less likely to become entrepreneurs.*

Intellectual property rights

Firms' ownership of intellectual property rights has negative effects on employees' entrepreneurial intentions, particularly when such rights are actively enforced (Acs and Sanders,

2008). Top managements seeking strategies to keep their valuable human resources from leaving the organization – and especially from spinning out competing ventures – may look to protection of trade secrets to keep innovations from spilling out when employees turnover. Agreements that limit competition and disclosure of company ideas can be used to reign in potential spinouts. Defectors can be threatened with legal sanctions and intimidated into paying exorbitant fees for the use of ideas. This can help to establish a reputation for toughness and thus act as a deterrent to employee entrepreneurship (Agarwal et al., 2009).

As an alternative, firms can exploit the patent system to monopolize their ideas, keep them in-house as internal corporate ventures, or monetize them as spin-offs. Overall, in environments where intellectual property rights are strongly enforced, employers may have the upper hand and can suppress unwanted spinouts. For example, many employees sign non-compete and non-disclosure agreements protecting client lists and trade secrets of employers upon hiring. Depending on the laws and practices of different countries, these contracts are binding under a variety of conditions including: defined geographic boundaries, reasonable time limits, and substantive ongoing compensation paid to the former employee.

Copyrights may also be important restrictors of spinouts. If spinouts use software, scripts, descriptions, messages, manuals, images, sounds, videos, or logos of their previous employer to aid them in developing their own business, they can conceivably be accused of infringement. Thus, overall, it seems that various types of intellectual property rights are likely to restrain employees from starting their own ventures. In sum:

Hypothesis 2. *The stronger the intellectual property rights regime in a country, the less likely employees will become entrepreneurs.*

Venture capital availability

Venture capitalists are always looking out for opportunities to invest in new firms. Many desirable opportunities come from current and former employees of incumbent firms and numerous spinouts have been funded with venture capital (Bhide, 2000). Spinouts make for potentially attractive investment opportunities for venture capitalists because they often have superior technological and market know-how than other start-ups, reducing uncertainty and offering higher performance (Agarwal et al., 2004).

Venture capital availability is likely to embolden employees looking for complementary assets that are unavailable within their employing organizations (Hellmann, 2007; Stieglitz and Heine, 2007). When venture capitalists target a particular industry with their funds, they may assist entrepreneurs with the spinout process. In this way, they may be acting like a magnetic external force tearing at the fabric of normal organizational life by plucking out initiatives with high innovation content. Venture capitalists often offer more than money and legitimacy; they also seek to guide strategy and open up new opportunities for their investees. More generally, venture capital can provide the funds that are needed to acquire the complementary assets allowing full exploitation of the business model. Hence, we propose:

Hypothesis 3. *The greater the venture capital availability in a country, the more likely employees will become entrepreneurs.*

Technology relatedness and intellectual property rights

Core technologies are more strongly associated with incumbent revenue streams and, therefore, spinouts using them are more likely to be competitive or cannibalistic in nature. Prior research has demonstrated that firms' performance suffers when their employees leave to form new competing ventures (Campbell et al., 2012). Thus, managers may perceive a spinout related

to core technology as a major competitive threat and deal with it by all available legal means (Klepper, 2002). As a consequence, employees working on core technology may not have many valid opportunities for spinouts (Marx et al., 2009). By contrast, employees working in peripheral areas are less likely to compete with their employers as a result of pursuing their entrepreneurial ambitions. Marx et al. (2009) give the example of C++ programmers who are less likely to infringe because programming languages are general purpose technologies as compared to specialized technologies, which are more likely to embody trade secrets.

Trade secret protection is likely to be more feasible for core technologies than for peripheral technologies. Under strong intellectual property rights regimes, firms can do much more to reign in potentially competitive spinouts. They may seek injunctions (e.g., cease and desist orders) preventing the start-up from operating, or may extract exorbitant fees from the start-up. They can also file suit against the former employee directly for breach of contract. In contrast, under weaker intellectual property rights regimes, using legal means available, it may be difficult to prevent spinouts even of core organizational technology. Thus, we suggest:

Hypothesis 4. *The strength of intellectual property rights regimes in a country moderates the relationship between experience in activities related to core technology of the firm and employee entrepreneurship. Stronger enforcement of intellectual property rights reduces the likelihood that employees with experience in activities related to the core technology of the firm will become entrepreneurs.*

Technology relatedness and venture capital availability

When venture capital is widely available, more spinouts are expected, but the type of opportunity that is utilized is also likely to be affected. Venture capital tends to seek high growth opportunities, with higher associated risks but also greater potential for reward. Spinouts aiming

to replicate core technologies of incumbent organizations may require larger investments, requiring access to more capital. For instance, venture capital backing may allow spinouts the necessary capital needed to pay for expensive litigation, or licenses imposed by incumbent firms. Even the core technology of a firm can be effectively replicated and commercialized in a spinout if the venture capital is sufficient to compensate the affected parties. Firms are much more likely to favor even competitive spinouts, if they are adequately compensated for any ensuing cannibalization. Moreover, since employees in the core of the organization tend to be better compensated, a large venture capital injection can compensate potential founders for opportunity costs.

According to Basu et al. (2015), spinouts that leverage the core knowledge of the firms are likely to be more valuable and impactful. Although most spinouts are likely to occur in non-core areas of the firm, some activities very near the core of the firm may also attract venture capital envy. When firms cater to their current customers, they may develop blind spots preventing them from seeing opportunities to cater to new customer segments (Christensen and Bower, 1996). Klepper and Sleeper (2005) find that most spinouts in the laser technology industry tend to have similar technology, but go after different customer segments. Thus, by helping to externalize these ventures, venture capital may increase the proportion of spinouts using core technology of the firm but target different customers. In summary:

Hypothesis 5. *Venture capital availability in a country moderates the relationship between experience in activities related to core technology of the firm and employee entrepreneurship. Venture capital availability increases the likelihood that employees with experience in activities related to the core technology of the firm will become entrepreneurs.*

Methods

Individual data and measures

We obtained individual level data from the 2011 adult population survey (APS) collected from 29 countries⁷ by the Global Entrepreneurship Monitor (GEM). The special theme of this survey was entrepreneurial activities of employees. It included questions that provide detailed information on work experiences of employees and for this reason the data set is well suited to test our hypotheses. APS focuses on individuals from 18–64 years and uses randomized cluster sampling (Levie, Autio, Acs, and Hart, 2014). In each country, professional survey firms or university research teams conduct the survey by telephone or via face-to-face interviews. The methodology is designed to provide a representative sample of the adult population in each country. We narrowed the APS data to respondents that completed the entrepreneurial employee module and reported that they were working for private firms.⁸ Thus, only respondents who were working for an existing organization at the time of the survey are included in this study. After excluding cases with missing values, we used 2748 observations from 29 countries to test our hypotheses (see Appendix 3-A for sample sizes and means of study variables by country). We used these data to measure employee entrepreneurship, technology relatedness, and the control variables.

Our dependent variable is *employee entrepreneurship*. We measure employee entrepreneurship as a binary variable with a value of 1 (otherwise 0) when the respondent reported that, at the time of the data collection, was either actively involved in setting up a

⁷ Whereas 52 countries participated in the GEM's special survey on employment activities in 2011, the technology questions were optional. Thus, only 32 countries participated in answering the technology relatedness question, which is the part of the survey where we get our measure of the independent variable of technology relatedness. We removed three countries that had five or fewer respondents (Bangladesh, Jamaica, and Pakistan), which reduced the number of countries from 32 to 29 for our main analysis.

⁸ Only respondents who described their employment status as 'full time or part time employee' answered the entrepreneurial employee module.

business that s/he would own or co-own, or was already owning and managing a business that was less than 30 months.

Our independent variable at the individual level is *technology relatedness*. We use two questions from the GEM 2011 APS survey to measure it. First, to screen the respondents who described their employment status full-time or part-time employees were asked if in the last three years, they had been involved in the development of new activities for their employer. If they answered yes, they were asked the second question, “To what extent is the technology of the new activity [in your employer’s organization] related to the core technologies of your employer?” The respondents could choose closely related, partially related, or not related. However, because closely and partially related groups were neither conceptually distinct nor significantly statistically different from each other, we collapsed these two levels and created a dichotomous variable. This variable was coded as 1 when the respondents were working on new activities in their employer’s organizations that were *related* to the core technologies of their employers, and 0 when they were working on new activities in their employer’s organizations that were *unrelated* to the core technologies of their employers.

We control for basic demographic features: *gender* (male = 0; female = 1), *age* (in years at the time of interview) and *educational attainment* (no education = 0, some secondary education = 1, secondary degree = 2, post-secondary education = 3, and graduate degree = 4). We also control for individual attributes: *capability perception* and *fear of failure*. Capability perception measures whether respondents believed that they had the knowledge, skill, and experience required to start a new business (1 = yes, 0 = no). Fear of failure indicates whether it prevented respondents from starting a business. It is reversed to represent a lack of fear of failure (1 = no fear of failure; 0 = yes, fear of failure).

We control for *organizational size* operationalizing it as the number of employees in the enterprise where the respondent was working; we apply a log transformation to normalize it.

Country data and measures

We rely on Global Competitive Report 2011-2012 published by the World Economic Forum (WEF, Schwab, 2011) to measure a country's intellectual property rights and venture capital availability. Since 1979, WEF has been studying national competitiveness and measuring Global Competitive Index (GCI) by collecting data from different sources: international organizations and national sources, and its own Executive Opinion Survey, which in 2011 was conducted in 142 countries. Intellectual property rights and venture capital availability were both derived from the Executive Opinion Survey (Schwab, 2011).

To measure intellectual property rights, respondents who participated in the WEF's Executive Opinion Survey were asked, "How would you rate intellectual property protection, including anti-counterfeiting measures, in your country?" (1 = very weak; 7 = very strong). WEF measured venture capital availability in terms of how easily entrepreneurs with innovative, but risky projects, could find venture capital in their respective home countries (1 = very difficult; 7 = very easy).

Estimation techniques

Our data have a hierarchal structure in which individuals are nested within countries, so we used multilevel logistic regression to test our hypotheses. More specifically, we used multilevel logistic regression with a random intercept. The general equations are given below.⁹

⁹ CP = Capability Perception; Orgsize = Organization Size; TR = Technology Relatedness; IPR = Intellectual Property Rights; VCA = Venture Capital Availability. This model assumes that the slope of each independent variable is fixed across countries.

Level 1 equation:

$$\text{Logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_{0j} + \beta_1 \text{Age}_{ij} + \beta_2 \text{Gender}_{ij} + \beta_3 \text{Education}_{ij} + \beta_4 \text{CP}_{ij} + \beta_5 \text{FearofFailure}_{ij} + \beta_6 \text{Orgsize}_{ij} + \beta_7 \text{TR}_{ij}$$

Level 2 equation:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} \text{IPR}_j + \gamma_{02} \text{VCA}_j + U_{0j}$$

The combined equation:

$$\text{Logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \gamma_{00} + \gamma_{01} \text{IPR}_j + \gamma_{02} \text{VCA}_j + \beta_1 \text{Age}_{ij} + \beta_2 \text{Gender}_{ij} + \beta_3 \text{Education}_{ij} + \beta_4 \text{CP}_{ij} + \beta_5 \text{FearofFailure}_{ij} + \beta_6 \text{Orgsize}_{ij} + \beta_7 \text{TR}_{ij} + U_{0j}$$

We first examined whether the use of multilevel technique is statistically supported. To check whether there is significant variability in the intercepts across countries, we conducted unconditional model (Bliese, 2002) which contains no predictors at either level but includes a random intercept term:

$$\text{Logit}(\pi_{ij}) = \beta_{0j}$$

$$\beta_{0j} = \gamma_{00} + U_{0j}$$

Where γ_{00} is the overall average log-odds of the outcome (fixed component of the model) and U_{0j} is the random deviation from this average for group j (the random component of the model). The results of the model show that the variance of the random intercept ($\hat{\sigma}_{u0}^2 = 0.43$, $p < 0.0001$) is significant, which indicates that there is statistically significant variability in the intercepts across countries. To determine the proportion of variance in the outcome that is explained by the group level, we calculated intraclass correlation coefficient (ICC). Intraclass correlation coefficient is the ratio of group level variance to the total variation (i.e., the sum of the between-

group and the within-group variances) (Shrout and Fleiss, 1979; Bliese, 2002). The within-group variance in logistic regression model is $\pi^2/3$ (Wang, Xie, and Fisher, 2011). Thus,

$$ICC = \frac{\hat{\sigma}_{u0}^2}{\hat{\sigma}_{u0}^2 + \pi^2/3} = \frac{0.43}{0.43 + 3.29} = 0.12$$

An ICC of 0.12 denotes the variance in outcome, spinouts, that is explained by the grouping structure. Since ICC is more than zero and the variance of $\hat{\sigma}_{u0}^2$ is statistically significant, the multilevel modeling approach should be used to analyze these data (Wang et al., 2011).

Results

Means, standard deviations, and Pearson correlations are shown in Table 3-1. The correlation between intellectual property rights and venture capital availability is high ($r = 0.72$). Thus, we checked for the presence of multicollinearity by calculating variance inflation factors (VIFs). All VIFs are less than 2.36, which are well within acceptable ranges (that is, less than 10), suggesting that multicollinearity is not a problem (Belsley, Kuh, and Welsch, 1980). The results of our multilevel logistic regression analyses are depicted in Table 3-2.

Table 3-1. Means, Standard deviations, and Spearman correlations^{a, b}

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9
1 Employee entrepreneurship	0.16	0.36									
2 Age	37.9	10.74	-0.12								
3 Gender	0.36	0.48	-0.04	-0.05							
4 Education	2.45	0.91	0.01	0.01	0.01						
5 Capability perception	0.69	0.46	0.18	0.02	-0.09	0.02					
6 Fear of failure	0.59	0.49	0.13	0.01	-0.05	0.02	0.16				
7 Organization size	4.42	2.63	-0.13	0.15	-0.13	0.20	-0.05	-0.03			
8 Technology relatedness	0.85	0.36	-0.05	0.03	-0.01	0.06	0.03	0.00	0.03		
9 Intellectual property rights	4.22	1.11	-0.18	0.19	-0.05	0.06	-0.11	-0.04	0.25	-0.06	
10 Venture capital availability	2.75	0.58	-0.06	0.05	-0.04	0.02	-0.04	0.02	0.17	-0.05	0.65

a. N =2748.

b. Correlations equal to |.04| or above are significant at p = 0.05 level, |.05| and above are significant at p = 0.01 level, and |.07| and above are significant at p = 0.001 level (two-tailed tests).

The results for the control variables are presented in Model 1 (Table 3-2). Demographic variables—age (older) and gender (female)—have a negative and statistically significant relation with spinouts. Educational attainment is positively related to spinouts. Individual attitudes of capability perception and lack of fear of failure have positive and significant relations with spinouts, which is consistent with previous research (e.g., Carsrud and Brännback, 2011). The size of the organization that employees were working for has a negative and significant relation with spinouts, thereby corroborating previous research findings (e.g., Sørensen, 2007).

Main effects

The results for the main effects are reported in Model 2 (Table 3-2). Hypothesis 1 proposes that employees working on activities related to core technologies are less likely to become entrepreneurs. The results support this hypothesis and show that technology relatedness is negatively associated with employee entrepreneurship (OR = 0.62, $p < 0.0001$). We find that the odds of founding a spinout decrease by 38% among employees who have experience in organizational activities related (vs. unrelated) to core technology of the firm.

Hypothesis 2 predicts that the strength of intellectual property rights regimes in a country is likely to discourage employee entrepreneurship. In support of this hypothesis, the results depict that intellectual property rights regimes are negatively associated with employee entrepreneurship (OR = 0.61, $p < 0.0001$). These findings indicate that in countries with stronger intellectual property rights, employees are less likely to start their own businesses. More specifically, the results reveal that a one unit increase in the strength of intellectual property rights will decrease the odds that an employee starts a spinout by 39%. Hypothesis 3 posits that venture capital availability in a country is likely to encourage employee entrepreneurship. The results do not support this hypothesis of the main effect of venture capital availability.

Table 3-2. Results of multilevel logistic regression (Dependent variable: Spinouts)^{a, b, c}

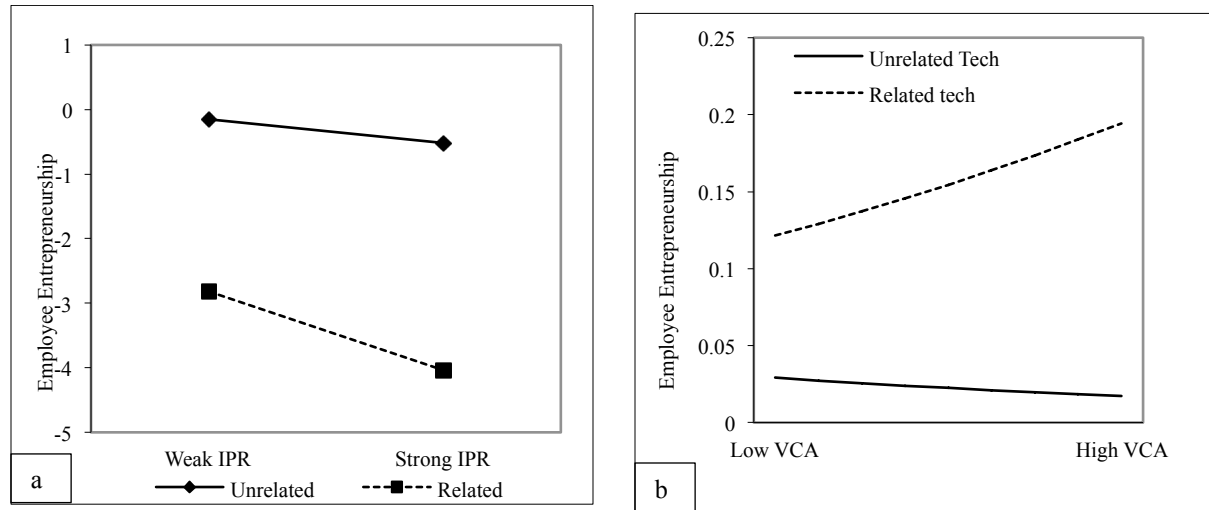
Variables	Model 1		Model 2		Model 3	
	B	OR	B	OR	B	OR
Intercept	-2.65*** (0.26)		-2.52*** (0.27)		-2.51*** (0.27)	
Age	-0.03*** (0.01)	0.97	-0.02*** (0.01)	0.98	-0.02*** (0.01)	0.98
Gender	-0.33** (0.12)	0.72	-0.32** (0.12)	0.73	-0.31** (0.12)	0.73
Education	0.13* (0.06)	1.14	0.13* (0.06)	1.14	0.13* (0.06)	1.14
Capability perception	1.15*** (0.16)	3.17	1.16*** (0.16)	3.18	1.16*** (0.16)	3.20
Fear of failure (reversed)	0.61*** (0.13)	1.83	0.61*** (0.13)	1.85	0.61*** (0.13)	1.85
Organization size (log)	-0.11*** (0.03)	0.89	-0.10*** (0.03)	0.90	-0.10*** (0.03)	0.90
Technology relatedness (TR)			-0.48*** (0.15)	0.62	-0.51*** (0.15)	§
Intellectual property rights (IPR)			-0.49*** (0.12)	0.61	-0.17 (0.19)	§
Venture capital availability (VCA)			0.34 (0.21)	1.40	-0.46 (0.40)	§
TR × IPR					-0.39* (0.19)	§
TR × VCA					0.94* (0.40)	§
Random Intercept	0.25*** (0.10)		0.11*** (0.06)		0.11*** (0.06)	
-2 Res Log Pseudo-Likelihood	14087.21		14137.97		14163.88	
Observations	2748		2748		2748	

a. *p <= 0.05; **p <= 0.01; ***p <= 0.001 (two-tailed tests).

b. B = Unstandardized regression coefficient; OR = Odds ratio; § = Odds ratio not available because it does not convey a meaningful metric when analyzing interactions. Standard errors are displayed in parentheses.

c. Age, IPR, and VCA are the only variables in our analysis for which the value of 0 is meaningless; therefore, we mean-center them for regression analysis (Cohen, Cohen, West, and Aiken, 2003; Wang et al., 2011).

Figure 3-2. The moderation effect of (a) intellectual property rights and (b) venture capital availability on spinouts



Interaction effects

The results depicted in Model 3 (Table 3-2) and plotted in Figure 3-2 (a and b) exhibit that the effect of technology relatedness on employee entrepreneurship depends on the institutional context. In Hypothesis 4, we propose that stronger enforcement of intellectual property rights in a country reduces the odds that employees with experience in activities related to the core technology of the firm will become entrepreneurs. The findings support this hypothesis ($B = -0.39, p < 0.05$; Figure 3-2a). Hypothesis 5 predicts that higher venture capital availability in a country increases the odds that employees with experience in activities related to core technology of the firm will become entrepreneurs. The results corroborate this hypothesis ($B = 0.94, p < 0.05$; Figure 3-2b). The results of the subsample analysis (Table 3-3) provide further support for Hypotheses 4 and 5.

Table 3-3. Results of the subsample analysis
(Dependent variable: employee entrepreneurship)

	Unrelated technology (Technology relatedness =0)			Related technology (Technology relatedness =1)		
	Estimate	S.E	Pr > t	Estimate	S.E	Pr > t
Intercept	-0.58	0.93	0.5352	-0.88	0.57	0.1383
Age	-0.01	0.01	0.6678	-0.03	0.01	<.0001
Gender	-0.46	0.28	0.1093	-0.27	0.13	0.0448
Education	0.33	0.15	0.0262	0.09	0.07	0.1774
Capability perception	1.16	0.34	0.0007	1.17	0.18	<.0001
Fear of failure (reversed)	0.23	0.28	0.4107	0.68	0.14	<.0001
Organization size (log)	-0.02	0.05	0.756	-0.12	0.03	<.0001
Intellectual property rights (IPR)	-0.36	0.17	0.044	-0.54	0.13	0.0004
Venture capital availability (VCA)	-0.23	0.36	0.5299	0.47	0.24	0.0589

Robustness checks

Firstly, to avoid an omitted variables bias, we ran two separate analyses with GDP per capita and the type of economy (innovation-, efficiency-, or factor-driven) dummies. The results of both analyses remain the same as presented in the main analysis. However, intellectual property rights has a high correlation coefficient with GDP per capita ($r = 0.90$) and with the type of economy ($r = 0.83$). Thus, we do not use GDP per capita or the type of economy in the main analysis.

Secondly, the results concerning the strength of intellectual property rights suggest the need for more fine-grained analyses as it is conceivable that different types of intellectual property rights have varying effects on entrepreneurial entry. The measure of intellectual property rights we use from WEF specifically measures the strength of intellectual property rights regimes in each country using a survey of country experts. In an attempt to assess the individual effect of different types of intellectual property rights, we created separate measures for the four types

(patents, trademarks, trade secrets, and copyrights) of intellectual property and tested their relationships as follows.

Hellmann (2007) suggests that patents provide stronger means of enforcement than trade secrets because infringement is much easier to prove. To examine the individual effect of patents, we log transformed the raw patent application counts from the World Intellectual Property Organization (WIPO). This measure is moderately correlated with the WEF's intellectual property rights measure ($r = 0.50$; $p < 0.0001$), but neither the main effect nor its interaction with technology relatedness is significantly associated with employee entrepreneurship.

To determine the independent effect of trademark law, we log transformed WIPO's raw counts of trademark applications. The measure is moderately correlated with WEF's measure of intellectual property rights ($r = 0.39$, $p < 0.0001$). However, similar to the patents, neither the main effect nor its interaction with technology relatedness has a significant association with employee entrepreneurship.

It is likely that trade secret protection has a more stifling effect on new ventures by employees than do patents or trademarks because the former are usually covered with non-disclosure and non-compete agreements, which typically outline the rights of employers as opposed to employees. Since we could not find a measure of trade secret protection, we coded one ourselves by interpreting the laws regarding employment covenants (non-compete and non-disclosure agreements) in each country in our analysis. We used an index giving one point for each of the following five characteristics of non-compete agreements: whether (a) they are enforceable without special payments; (b) they are binding for an indefinite period of time; (c) they are binding with no territorial boundaries; (d) they are binding even if no trade secrets are

involved; and (e) an employer can claim for damages. The measure was not highly correlated with WEF's intellectual property rights ($r = 0.12$; $p < 0.0001$). The results indicate that this measure is negatively related with employee entrepreneurship, however, this relationship is marginally significant (-0.27 ; $p = 0.07$). The interaction of trade secret protection with technology relatedness is not significant ($B = -0.32$; $p = 0.11$).

To assess the individual impact of copyrights, we used a measure of software piracy, which is a ratio of unlicensed/licensed software units in a given country from the 2011 Business Software Alliance and Software Information Industry Association global software piracy study (IPRC, 2003). As expected, the piracy rate is highly negatively correlated with the WEF's intellectual property rights measure ($r = -0.89$, $p < 0.0001$). The results indicate that piracy rate is positively and significantly ($B = 1.95$, $p < 0.01$) related with employee entrepreneurship, which is consistent with the main effect results for intellectual property rights. The interaction of piracy rate with technology relatedness is also significant ($B = 2.29$, $p < 0.05$).

In this study we excluded countries that did not collect data on technology relatedness. To check if included and excluded countries are from the same population we conducted a t-test on the countries' employee entrepreneurship rates. The results of the test show that the variance of the employee entrepreneurship rate in the two populations are not significantly different, however, the means of the employee entrepreneurship rates are significantly different between the two groups. These results do not allow me to definitively assert that the countries are from the same population, thus limiting generalizability claims. However, note that in the main analysis, we use many control variables that are not used in the t-test.

Discussion

We have validated key parts of Hellmann's (2007) economic theory of employee entrepreneurship by putting his claims under empirical scrutiny. The results validate individual and contextual antecedents of employee entrepreneurship, which are key mechanisms enabling knowledge spillovers from incumbent firms to new firms (Acs et al., 2009). The incumbent-centric view is that large firms are the major contributors to economic development, and the managerial literature encourages isolation mechanisms, including secrecy and intellectual property rights. By contrast, the employee entrepreneurship literature suggests that entrepreneurs may emerge out of incumbent firms to contribute to the economy as independent business ventures.

Implications for policy and practice

Our study results suggest that policymakers may need to be careful when crafting laws that affect employees' ability to become entrepreneurs. Demonstrating the contextual mechanisms that boost and stifle entrepreneurship by employees may also lead to the development of new economic levers encouraging development through entrepreneurship. For instance, intellectual property rights may not be strictly applied if they prevent employees from engaging in employee entrepreneurship, unless very serious damage to the employer can be proved. States seeking to encourage economic growth and development via entrepreneurship may look to exemplars such as California (Hyde, 1998), where non-compete and non-disclosure battles often end up favoring employees over employers. Enabling changes that favor employees may be politically challenging because individuals with the predilection for entrepreneurship may not be as organized or well-funded as the corporations and may, therefore, be less able to lobby for and fund political candidates favoring their interests.

Employees may want to stray from core activities when they view future value in opportunities that are peripheral to the firm (Klepper and Thompson, 2010). Employees that have ambitions to become entrepreneurs may want to navigate their careers within their employing organizations. For instance, when given a choice, such employees may seek to work on projects that are less related to the core technology of their employers. At a more basic level, employees may seek to avoid signing prohibitive agreements (i.e., non-disclosures and non-competes) or choose to work for companies that do not require them. Alternatively, they may foster relationships with venture capitalists in order to muster the financial power needed to spinout ventures related to the core technology of their employers.

In practice, entrepreneurs may seek to start their ventures in jurisdictions that act as havens from infringement litigation by their current or former employers. Born global ventures can locate where policies are favorable to their growth and development. Just as corporations often seek to locate their headquarters where tax policies are favorable, employees turned entrepreneurs may take advantage of opportunities to found their ventures where intellectual property rights are enabling for them rather than constraining.

Potentially, both parties (firms and employees) may benefit most if dynamic capabilities, such as the ability to orchestrate spin-offs effectively, are present in organizations. Placing promising intrapreneurs at the head of such initiatives and giving them sufficient ownership and autonomy may allow for a more equitable transfer to benefit the firm, the individual, and the economy as a whole. Firm executives may want to come up with organizational mechanisms that keep their key intrapreneurs in-house rather than losing them to external opportunities. For instance, the draw of venture capital might be matched internally with opportunities to fund projects within an organization. Firm executives may seek to influence the type of opportunities

that are created for the employees by authoritatively stating their strategic intentions for the organization. However, employees with strategic disagreements may be better off pursuing their ventures externally.

Study limitations and future research

Our cross-sectional analysis of single item, self-report measures in an unbalanced sample typical of using big survey data, leave much to be desired. For instance, several countries have a low number of respondents (see Appendix 3-A). However, there is a dearth of available datasets with the kind of coverage currently offered by GEM. For instance, some studies have used new firm creation data (e.g., by counting registrations of limited liability companies [LLCs]) as a proxy for entrepreneurial behaviors because there exists data for this measure across many countries. However, new LLCs are often created by incumbent firms when they create new divisions, joint ventures, or seek tax shelters. Thus, the data are polluted with corporate activities, many of which are focused on efficiency and savings rather than entrepreneurship.

Due to limitations of the GEM survey, it is possible that some of the employee experiences that are related or unrelated to the core technology of their employers could have occurred after they started their new independent ventures. Therefore, we cannot eliminate the possibility of reverse causality, though it is difficult to make a case for such a relationship.

Although our robustness checks sought to tease out the individual effects of the four types of intellectual property rights (patents, copyrights, trade secrets, and trademarks), future research may check to see if different rights affect entrepreneurship in various industries differentially. After all, as Agarwal and Shah (2014) point out, intra-industry spinouts range from as little as 25% of start-up activity in automobiles and disk drives to 80% in information technology and communications. Possibly, copyright laws may have negative effects on ventures that seek to

make use of content from various media (e.g., YouTube has been repeatedly engaged in copyright litigation by content owners). Patents may be most restrictive in the pharmaceutical industry, whereas trade secrets may matter more in mechanical and electrical industries. Weak trademark enforcement encourages counterfeiting in the garment industry (Wenting, 2008). It seems that we are just in the beginning stages of understanding these effects and that future research will need more granular measures to disentangle them. Further, it may be useful to compare spinouts from different types of organizations (e.g., universities, research institutes, private companies and public companies) as these have largely been studied separately.

Conclusion

Through industry studies, country studies, and other models, previous researchers allude to employees starting their new businesses using ideas that were related or unrelated to the core technologies of the incumbent firms. Hellmann (2007) put forward an economic model predicting how relatedness to the core technology may affect the entrepreneurial behaviors of employees. In this study, we tested this hypothesis and found support for it. Our results show that employees who work in areas unrelated to the core technology of their parent firms are more likely to become entrepreneurs.

We also found that institutional influences (intellectual property rights and venture capital availability) impact the likelihood that employees turn into entrepreneurs, especially those with experience in activities related to core technology. As such, we contribute to the broader literature on spinouts from the perspective of entrepreneurship as an outcome of knowledge spillovers from incumbent firms. Finally, our study points out that opening governance institutions (e.g., trade secret protection and other property rights to other stakeholders such as employees) may boost entrepreneurship.

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APPENDIX 3-A. Sample sizes and means of study variables by country

Country	No. of Observations	Spinouts	Technology Relatedness	Intellectual Property Rights	Venture Capital Availability
Algeria	24	0.25	0.83	2.20	2.10
Argentina	53	0.23	0.91	2.50	1.90
Australia	116	0.13	0.93	5.30	3.50
Barbados	8	0.13	0.88	5.10	2.30
Bosnia and Herzegovina	79	0.08	0.91	2.60	2.00
Brazil	28	0.29	0.86	3.20	2.80
Chile	148	0.30	0.82	3.60	3.10
China	76	0.11	0.83	4.00	3.50
Croatia	165	0.16	0.88	3.50	2.10
Germany	539	0.08	0.75	5.60	3.00
Greece	50	0.10	0.86	3.80	2.20
Hungary	121	0.12	0.87	4.10	2.10
Iran	10	0.40	1.00	2.70	1.80
Korea	88	0.06	0.94	4.10	2.20
Malaysia	19	0.05	0.74	4.90	4.10
Mexico	15	0.27	0.87	3.20	2.50
Netherlands	263	0.09	0.87	5.80	3.90
Nigeria	81	0.40	0.73	2.80	2.20
Peru	29	0.24	1.00	2.50	3.00
Poland	165	0.12	0.90	3.70	2.40
Romania	94	0.19	0.81	3.00	2.50
Russia	58	0.33	0.86	2.50	2.30
Slovakia	171	0.23	0.90	3.80	2.60
Slovenia	155	0.10	0.88	4.20	2.40
Thailand	30	0.33	0.90	3.10	2.90
Trinidad & Tobago	12	0.42	0.67	3.50	2.70
Turkey	37	0.32	0.89	2.70	2.40
Uruguay	101	0.22	0.86	4.00	2.50
Venezuela	13	0.54	0.92	1.80	2.10

CHAPTER 4: ESSAY 3

Individual-level ambidexterity and entrepreneurial entry

Abstract

This study examines the organizational drivers of entrepreneurial entry through the lens of individual-level ambidexterity. We theorize that employees that both explore and exploit new activities within organizations are more likely to become entrepreneurs outside the organization. Multi-level analysis results from a large sample of Global Entrepreneurship Monitor survey data support this hypothesis. This study contributes to the entrepreneurship literature by highlighting the role of individuals' prior ambidexterity experiences in organizations as foundational building blocks of entrepreneurial entry. The study links entrepreneurship and ambidexterity theories with evidence that an individual's ambidexterity and entrepreneurial activities are related.

Introduction

According to recent estimates, at least nine out of ten entrepreneurs work for organizations prior to launching their own ventures (Sørensen and Fassiotta, 2011). Researchers are just beginning to understand how organizational experiences influence entrepreneurs' transitions from paid employment, to starting their own businesses (Agarwal, Echambadi, Franco, and Sarkar, 2004; Bhide, 1994; Campbell, Ganco, Franco, and Agarwal, 2012; Stieglitz and Heine, 2007). For example, career experiences may be sources of entrepreneurial opportunities that employees can use to create new businesses and to potentially increase their economic and social mobility (Sørensen and Sharkey, 2014).

We examine the experience of individual-level ambidexterity (doing both exploration and exploitation activities) as a driver of an individual's entrepreneurship (the decision to set up a new business independent from their parent organization). Organizational ambidexterity is a well-developed construct that describes a firm that engages in both the exploration (developing new ideas) and exploitation (implementing a new activity) phases of the innovation process (Tushman and O'Reilly, 1996). Studies testing the ambidexterity hypothesis have demonstrated that organizational ambidexterity is positively related to firm performance (Cao, Gedajlovic, and Zhang 2009; He and Wong, 2004). Subsequently, individual-level ambidexterity has emerged as a new area of research that highlights the important role that individuals play in organizations (Mom, Van Den Bosch, and Volberda, 2009; Mom, Fourné, and Jansen, 2015).

Nonetheless, it is not yet clear whether employees' individual-level ambidexterity experiences in organizations are more likely to encourage entrepreneurship as compared to their exploration or exploitation experiences alone. In a recent study of entrepreneurial behavior in high growth ventures, Volery, Müller, and von Siemens (2015) suggest that entrepreneurs are involved in both exploration and exploitation behaviors. In this paper, we argue that both exploration and exploitation activities in organizations provide potential entrepreneurs with the preparation needed to start and run their own independent business ventures. Thus, ambidextrous employees—those who have already mirrored the two key entrepreneurial processes of exploration and exploitation while working for their employers—are more likely to have experiences conducive to entrepreneurship, as compared to those without such backgrounds. We argue that employees who were involved in ambidextrous activities in their employing organizations develop the depth and diversity of experience needed to effectively engage in entrepreneurship (Cooper and Park 2008; Cornelissen and Clarke, 2010; Jones and Casulli, 2014;

Marvel and Lumpkin, 2007; Srivastava and Laplume, 2014). This rationale leads us to our research question: *Are employees who had ambidexterity experiences while working in organizations more likely to become entrepreneurs?*

We seek to answer this question by analysing data from multiple countries provided by the Global Entrepreneurship Monitor (GEM). Indeed, we find that employees that engage in ambidexterity in their jobs are more likely to become entrepreneurs outside of their employing organizations. Ambidexterity experiences are also more important than experiencing only exploration (just development of ideas) or only exploitation (just implementation of ideas) in predicting entry into entrepreneurship.

The results of this study contribute to a better understanding of the role of prior employee organizational experiences in becoming entrepreneurs. The study extends the ambidexterity literature by further contributing to the growing research on individual level ambidexterity. Our results also contribute to the broader entrepreneurship literature by highlighting the role of actionable behaviors, as opposed to hard-to-change individual characteristics, traits and contextual factors. Our findings imply that prospective entrepreneurs should try to gain organizational experiences that involve both exploration and exploitation activities.

Theoretical Background

Freeman (1986) considers entrepreneurs as organizational products, suggesting that as compared to others, employees are more likely to become entrepreneurs (Audia and Rider, 2006). Similarly, Sorenson and Audia (2000) argue that work experience within incumbent organizations provides employees with opportunities to acquire knowledge of the business, build professional networks, keep a positive view under adversity, and foster confidence in their ability to create a new business. Sørensen and Fassiotto (2011) use the metaphor of fonts (as in

fountains or sources) to explore how employees might gain from their organizational experiences as well as how individuals' experiences can structure their choices. For example, breadth and depth of experience may enable individuals to recognize and exploit entrepreneurial opportunities (Cooper and Park, 2008; Shane, 2000, 2003; Shane and Venkataraman, 2000). Cornelissen and Clarke (2010) and Jones and Casulli (2014) argue that experience allows potential individuals to develop important heuristics and analogical reasoning that can together help in sensemaking for themselves and sensegiving to other stakeholders to deal with new situations more effectively.

On balance, these arguments can be interpreted as supporting the notion that existing organizations provide employees with an opportunity to prepare for entrepreneurship through involvement in exploration as well as exploitation activities. To provide a theoretical background for this argument and our subsequent hypothesis development, in the next section we review the literature on exploration and exploitation, organizational ambidexterity, and individual-level ambidexterity.

Exploration and exploitation

Strategic management literature differentiates between two major business activities: strategy formulation and implementation. Strategy formulation includes exploring new ideas for sensing opportunities, business direction, and domain definition, whereas implementation includes structuring, controlling, and coordinating business functions such as marketing, financing, and human resource management for exploiting selected opportunities (Govindarajan, 1988; Schendel and Hofer, 1979). Likewise, the organizational literature distinguishes between two basic types of processes: exploration and exploitation (March, 1991). Exploration typically involves experimentation and search, whereas exploitation involves implementation and

execution of a chosen path (Cheng and Van de Ven, 1996; March, 1991). He and Wong (2004) argue that both exploration and exploitation involve different types of learning and that exploitation is much more than simple rote or routine activities. Thus, they define the two dimensions as follows: “(1) an explorative innovation dimension to denote technological innovation activities aimed at entering new product-market domains and (2) an exploitative innovation dimension to denote technological innovation activities aimed at improving existing product-market positions.” (pp. 483-484). The lines between exploration and exploitation are not always clear (Lavie, Stettner, and Tushman, 2010) as individuals perform repetitive tasks, they also engage in some experimentation, and when individuals perform creative tasks, they sometimes use established procedures (Farjoun, 2010).

Lavie and colleagues (2010) suggest that in the context of an innovation, exploration and exploitation can be successive stages whereby exploitation follows exploration as the phases of idea development and its implementation in organizations. Further, they argue, “Realizing that new knowledge development depends to an extent on an organization’s current knowledge base (Cohen and Levinthal, 1990), scholars often find it challenging to distinguish between exploration and exploitation. We suggest that in this context exploitation is associated with building on the organization’s existing knowledge base. As long as the organization persists within an existing technological trajectory and leverages its existing skills and capabilities, its operations are geared toward exploitation.” (pp. 413-414). Considering these nuances, most researchers use March’s (1991) definitions of exploration and exploitation. Similarly, we define exploration as developing new ideas (including activities such as search and brainstorming on new ideas) and exploitation as implementing the new activity (including activities such as marketing, finding financial resources, and building a team).

Organizational ambidexterity

Ambidexterity refers to engaging in both exploration and exploitation. By pursuing organizational ambidexterity, firms may outperform, survive longer, innovate, and adapt to changing environments (O'Reilly and Tushman, 2008). Empirical studies have supported this theory by demonstrating that organizational ambidexterity is positively associated with firm performance (Cao et al. 2009; He and Wong, 2004; Junni, Sarala, Taras, and Tarba, 2013).

Within organizations, exploration and exploitation are often separated using dual structures (structural ambidexterity) so that both activities can occur without too much conflict between them. Individuals in such organizations are often put into silos where they are either involved in the division that explores or the one that exploits, and most of the behavioral integration between the two divisions is orchestrated by top managers (Lubatkin, Simsek, Ling, and Veiga, 2006; Smith and Tushman, 2005). However, middle managers and regular employees can also engage in both exploration and exploitation activities, especially when firms adopt contextual ambidexterity approaches. Under contextual ambidexterity, firms trust employees and encourage them to stretch their work to develop new products and processes, while also ensuring that sufficient discipline and support continue to deliver on existing value propositions (Birkinshaw and Gibson, 2004; Gibson and Birkinshaw, 2004). Human resources management research provides initial evidence that high performance work practices can enhance contextual ambidexterity (Kang and Snell 2009; Patel, Messersmith, and Lepak, 2013). Contextual ambidexterity is really about enhancing trust, discipline, stretch, and support (Kang and Snell, 2009; Patel et al., 2013) in an organization so that individuals feel that they can pursue exploration while continuing to execute and implement.

Individual ambidexterity

Although the majority of studies conceptualize ambidexterity at the organization or business-unit level, it can also be studied at an individual level. The extant literature investigates individual-level ambidexterity via managerial (Mom, Van Den Bosch, and Volberda, 2007; Mom et al., 2009) and network means (Rogan and Mors, 2014), psychological characteristics and traits (Good and Michel, 2013; Laureiro-Martínez, Brusoni, Canessa, and Zollo, 2015), behavioral traits (Keller and Weibler, 2014), and neuroscience approaches (Aston-Jones and Cohen, 2005; Laureiro-Martinez, Brusoni, and Zollo, 2010).

At the individual level, Mom et al. (2009, p. 812) define ambidexterity as an individual's "behavioral orientation toward combining exploration and exploitation related activities within a certain period of time." They propose that ambidextrous individuals have three key characteristics: (1) they are able to host contradictions; (2) engage in multitasking; and (3) actively refine and renew their skills, expertise, and related knowledge. Similarly, Raisch, Birkinshaw, Probst, and Tushman (2009) suggest that ambidextrous individuals are able to manage conflicting objectives, perform paradoxical thinking, and take on multiple roles. Likewise, Miron-Spektor, Gino, and Argote (2011) reveal that paradoxical frames encourage conflict and improve individuals' abilities to integrate contradictions. Jarzabkowski, Smets, Bednarek, Burke, and Spee (2013) argue that individual level ambidextrous behaviors may include expanded practice repertoires, situated improvising, mutual adjustment (or tolerance), and switching between institutional logics. Mom et al. (2007) posit that individuals placed in a position to do both exploration and exploitation are more likely to recognize opportunities and exploit knowledge. Similarly, O'Reilly and Tushman (2004) describe ambidextrous individuals as those who can make use of both short term and long term oriented logics. For Tushman,

Smith, and Binns (2011), individual ambidexterity is about managing both exploration and exploitation simultaneously. Good and Michel (2013) approach individual ambidexterity from a cognitive perspective. They consider that exploration is about search and creativity involving divergent thinking (idea generation), whereas exploitation is about focusing on task execution and ignoring alternative ideas.

We define exploration as developing new ideas (including activities such as search and brainstorming on new ideas) and exploitation as implementing the new activity (including activities such as marketing, finding financial resources, and building a team). Exploration experiences increase the variability of an individual's action repertoire, while exploitation experiences focus on specific implementation actions (Gupta, Smith, and Shalley, 2006; Rosing, Frese, and Bausch, 2011). In general, exploration increases breadth of experience through search and experimentation, whereas exploitation increases depth of experience related to execution and efficiency (Cornelissen and Clarke, 2010; Marvel and Lumpkin, 2007).

Ambidexterity and entrepreneurship

At the ambidexterity and entrepreneurship interface, it is worth highlighting that some opportunity recognition research focuses on differences in knowledge (or knowledge asymmetries); that is, why some individuals recognize opportunities while others do not (Eckhardt and Shane, 2003; Shane and Venkataraman, 2000). Opportunity recognition abilities may differ among individuals because they have different pieces of the totality of information available in the world (Hayek, 1945; Baron and Ensley, 2006). It is also understood that opportunity exploration and exploitation each require different resources and skills sets (Choi and Shepherd, 2004). More recently, Volery and associates (2015) use structured observation of six entrepreneurs over four working days from an exploration-exploitation perspective. Their

qualitative analysis reveal six behavioral patterns that include boundary spanning and nurturing platforms for both exploration and exploitation, engaging in convergent and divergent thinking, switching back and forth between task-oriented and change-oriented activities, shifting the focus of the organization between exploration and exploitation, and avoiding being trapped in exploitation by consciously allocating time for exploration. In essence, their analysis suggests that successful entrepreneurs are involved in both exploration and exploitation behaviors.

Hypothesis Development

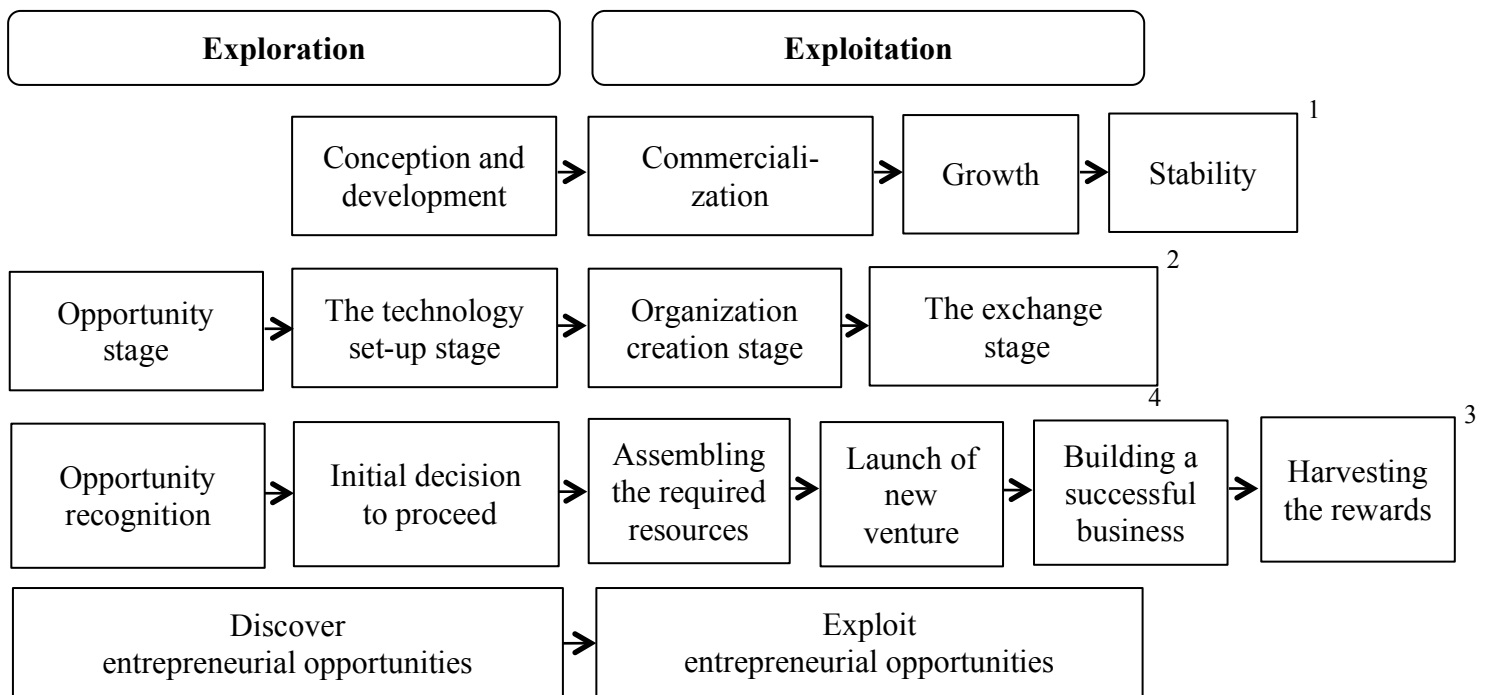
Preparation for entrepreneurship can be viewed as a proactive process whereby individuals can take steps to ensure that they have the required attributes, enter the right stages, and set up appropriate goals and motivations to become entrepreneurs (Cope, 2005). Entrepreneurial preparedness reflects cumulative experiences that shape both the probability of starting a business and the subsequent performance of the entrepreneur in launching the business. One area of preparedness that has attracted significant attention is prior entrepreneurial experience. For instance, Gimeno, Folta, Cooper, and Woo (1997) find that those individuals who had higher prior entrepreneurial experiences earn more in their subsequent ventures.

We propose that ambidexterity experienced by an employee in an organization captures the essence of the preparation needed to start a business. Individuals who become part of both the exploration and exploitation stages of organizational activities are those we label as ambidextrous. Employees' engagement in the exploration mode may facilitate opportunity recognition, whereas their involvement in the exploitation mode may aid them in handling operational challenges. Experiencing both exploration and exploitation modes as an employee of an organization can help host contradictions (Mom et al., 2009) and deal with both sensing and seizing of potential opportunities. These ambidextrous experiences can also facilitate

entrepreneurial recombinations (Shane, 2012), which require breadth and depth of experience (Cornelissen and Clarke, 2010; Marvel and Lumpkin, 2007).

The entrepreneurial process is often conceptualized as stage-based (see Figure 4-1). For example, Kazanjian and Drazin (1990) suggest four stages: conception and development, commercialization, growth, and stability. Bhave (1994) created a more granular process-based model of entrepreneurial venture creation, also dividing it into four stages: the opportunity stage, the technology set-up stage, the organization-creation stage, and the exchange stage. What these models have in common is that they start with the generation of ideas and end with the execution of those ideas (Baron and Shane, 2008; Shane and Venkataraman, 2000; Wood and McKinley, 2010).

Figure 4-1. Stage-based approaches to entrepreneurship



Based on: 1. Kazanjian and Drazin (1990); 2. Bhave (1994);
3. Baron and Shane (2008); and 4. Shane and Venkataraman (2000).

The above argument suggests that when employees participate in both exploration and exploitation (that is, individual-level ambidexterity) in an organizational setting, they are developing the breadth and depth of experience needed to engage in entrepreneurship (Cornelissen and Clarke, 2010; Marvel and Lumpkin, 2007). Hence, we expect that:

Hypothesis 1: Ambidexterity experience increases the likelihood that employees will become entrepreneurs.

Hypothesis 1a: Employees with ambidexterity experience are more likely to become entrepreneurs than those with only exploration experience.

Hypothesis 1b: Employees with ambidexterity experience are more likely to become entrepreneurs than those with only exploitation experience.

Hypothesis 1c: Employees with ambidexterity experience are more likely to become entrepreneurs than those with no emphasis (that is, neither exploration nor exploitation experience).

Methods

Sample

To test our hypothesis, we sought data with information on both organizational and entrepreneurship experiences. The data set provided by the Global Entrepreneurship Monitor (GEM) in 2011 is well suited for this purpose. The special theme of the GEM 2011 adult population survey (APS) was entrepreneurial activities of employees. The survey included questions that provide detailed information on work experiences of employees.

GEM is a project that started in the late 1990s to create harmonized data about entrepreneurial activities across countries. Previous studies have documented that GEM data are reliable and valid (Reynolds et al., 2005). However, one of the criticisms of GEM data is the use of single-item questions and dichotomous yes/no answer categories. According to Estrin, Mickiewicz, and Stephan (2013), this criticism is valid for potentially ambiguous, attitudinal, and

perceptual constructs; it is less problematic for unambiguous/observable behaviors such as developing new activities in an existing organization or starting a new business (for example, Bergkvist and Rossiter, 2007).

GEM's adult population survey focuses on individuals from 18–64 years and uses randomized cluster sampling (Levie, Autio, Acs, and Hart, 2013). In each country, university research teams or survey research firms conduct the survey by telephone or via face-to-face interviews. The methodology is designed to provide a representative sample of the adult population in each country. During 2011, teams from 52 countries collected data on entrepreneurial employee activity. We narrowed the APS data to respondents that completed the entrepreneurial employee module. Thus, only respondents who were working for an existing organization at the time of the survey are included in this study. After excluding cases with missing values, we used 44,839 observations from 52 countries to test our hypothesis (Appendix 4-A provides summary information for the countries in the sample).

Measures

Dependent Variable. Our dependent variable is employee entrepreneurship, which is a binary variable with a value of 1 (otherwise 0) where the respondents reported that, at the time of the data collection, they were either actively involved in setting up a business that they would own or co-own, or were already owning and managing a business that was less than 30 months old¹⁰.

¹⁰ Data related to independent variable of organizational experiences (ambidexterity, exploration, and exploitation experiences) are limited to the previous three years. Since it is not appropriate for the dependent variable to go further back than the independent variable, we limit our study to nascent and new businesses up to 30 months old. Thus, the independent variable of organizational experiences precedes the dependent variable by six months.

Independent Variables. GEM defined two phases for developing new activities: the first phase consists of idea development for a new activity, and the second phase concerns preparation and implementation of the new activity. The respondents who reported their employment status as full time or part time employee answered two separate questions (Figure 4-2) whether, in the last three years, they were involved in (a) idea development (exploration) and (b) implementation of the new idea (exploitation) for their employer. These questions provide valuable information on employees' recent experience. Following He and Wong (2004) and using these two questions, we defined four types of organizational experiences as follows:

Ambidexterity experience indicates when employees had been involved in the phase of idea development for a new activity (exploration) *and* implementation of the new activity (exploitation) for their employer in the previous three years.

Exploration experience refers to when employees had been involved only in the idea development phase but not in implementing the idea for their employer in the previous three years.

Exploitation experience reflects when employees had not been involved in idea development, but only in implementing the idea for their employer in the previous three years.

No emphasis (He and Wong, 2004) specifies when employees had been involved neither in idea development nor in implementing the idea for their employer in the previous three years.¹¹

¹¹ The GEM survey did not collect any other data on the routine work of these employees. Thus, comparisons to the employees' other routine activities were not feasible.

Figure 4-2. Types of organizational experiences

		Phase 1: Idea development for a new activity, this includes for example active information search, brainstorming on new activities and submitting your own ideas to management. Have you been actively involved in this phase in the past three years?*	
		Yes	No
Phase 2: Preparation and implementation of a new activity, this includes for example promoting your idea, preparing a business plan, marketing the new activity or finding financial sources and acquiring a team of workers. Have you been actively involved in this phase in the past three years?*	Yes	Ambidexterity experience	Exploitation experience
	No	Exploration experience	No emphasis

*Source: 2011 GEM Adult Population Survey questionnaire.

To test Hypothesis 1 (H1), we created dichotomous variable for ambidexterity experience that took the value of 1 (and 0 otherwise) when employees had been actively involved in the phase of idea development for a new activity (exploration) *and* implementation of the new activity (exploitation) for their employer in the previous three years. To test H1a, H1b, and H1c, we created a categorical variable of the four groups of employees, and compared employees with exploration, exploitation, and those without either experience (no emphasis condition) using ambidexterity experience as the reference group.

Control Variables. We used several controls that included variables at the individual and country levels. We obtained data on the individual level controls from the GEM dataset. Data on

the county level controls came from the Global Competitiveness Report published by the World Economic Forum (Schwab, 2011).

At the individual level, we controlled for basic demographic features: *gender* (male = 0; female = 1); *age* (in years at the time of interview), and *education*, which was measured based on United Nations International Standard Classification of Education (0 = pre-primary education to 6 = second stage of tertiary education).

We also controlled for individual entrepreneurial attributes: *opportunity perception*, *capability perception* and *fear of failure*. Opportunity perception was a dichotomous variable, which took the value of 1 (and 0 otherwise) when respondents believed that in six months following the survey there would be good opportunities to start a business in the area where they lived. Capability perception measured whether respondents believed that they had the knowledge, skill, and experience required to start a new business (1 = yes, 0 = no). Fear of failure indicated whether the fear of failure prevented respondents from starting a business. It was reversed to represent a lack of fear of failure (1 = no fear of failure; 0 = yes, fear of failure).

Previous research emphasized the effect of institutional environment on new business creation (for example, De Clercq, Lim, and Oh, 2013; Estrin et al., 2013; Hellman, 2007). To partial out for the effect of institutional context, we controlled for *intellectual property rights* and *venture capital availability*. Hellman (2007) showed that venture capital availability and intellectual property rights influenced employees' decision to leave their employer and start a business for themselves. We used the Global Competitiveness Report 2011-2012 published by World Economic Forum (Schwab, 2011) to obtain these two country-level variables. Venture capital availability measured how easy it was for entrepreneurs with innovative but risky projects to find venture capital in their countries (1 = very difficult; 7 = very easy). In our sample, values

for the venture capital availability ranged from 1.8 for Iran to 4.3 for Sweden. Intellectual property rights measured the rate of intellectual property protection in various countries (1 = very weak; 7 = very strong). In our sample, values for the intellectual property rights varied from 1.8 for Venezuela to 6.2 for Finland.

Finally, we controlled for organizational size operationalizing it as the number of employees in the enterprise where the respondent was working and applied a log transformation to normalize it.

Estimation techniques

Our data have a hierarchal structure in which individuals are nested within countries, so we used multilevel logistic regression to test our hypothesis (Cohen, Cohen, West, and Aiken, 2003). More specifically, we used multilevel logistic regression with a random intercept (De Clercq et al., 2013; Estrin et al., 2013). The predicted proportion follows the hierarchical logistic model given below.

$$\text{Logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \gamma_{00} + \gamma_1 X_{1ij} + \gamma_2 X_{2ij} + \dots + \gamma_n X_{nij} + U_{0j}$$

We first examined whether the use of multilevel technique is statistically supported. To check whether there is significant variability in the intercepts across countries, we ran an empty model (intercept-only model or unconditional means model) (Bliese 2002; Wang, Xie, and Fisher, 2011), which contains no predictors at either level but includes a random intercept term:

$$\text{Logit}(\pi_{ij}) = \beta_{0j}$$

$$\beta_{0j} = \gamma_{00} + U_{0j}$$

where γ_{00} is overall average of the log odds of the outcome (fixed component of the model) and U_{0j} is the random deviation from this average for group j (the random component of the model).

The results of the model show that the variance of the random intercept ($\hat{\sigma}_{u0}^2 = 0.52$, $p < 0.0001$) is significant, which indicates that there is statistically significant variability in the intercepts across countries. To determine the proportion of variance in the outcome that is explained by the group level, we calculated intraclass correlation coefficient (ICC). Intraclass correlation coefficient is the ratio of group level variance to the total variation (that is, the sum of the between-group and the within-group variances) (Shrout and Fleiss, 1979; Bliese, 2002). The within-group variance in logistic regression model is $\pi^2/3$ (Wang et al., 2011). Thus, ICC can be computed as follows:

$$ICC = \frac{\hat{\sigma}_{u0}^2}{\hat{\sigma}_{u0}^2 + \pi^2/3} = \frac{0.52}{0.52 + 3.29} = 0.14$$

An ICC of 0.14 shows the variance in outcome that is explained by the grouping structure. Since ICC is more than zero and the variance of $\hat{\sigma}_{u0}^2$ is statistically significant, the multilevel modeling approach is appropriate to analyze these data (Wang et al., 2011).

Results

Means, standard deviation, and the Pearson correlations are shown in Table 4-1. The correlations between intellectual property rights and venture capital availability ($r = 0.69$) and between ambidexterity and no emphasis condition ($r = -0.77$) are high. Thus, we checked for the presence of multicollinearity by calculating variance inflation factors (VIFs). All VIFs are less than 2.07, which are well within acceptable ranges (that is, less than 10), suggesting that multicollinearity is not a problem (Belsley, Kuh, and Welsch, 1980). We originally controlled for gross domestic product per capita, but removed it because it was highly correlated with the intellectual property rights variable. We wanted to control for the latter because its enforcement has been implicated in preventing employees from becoming entrepreneurs (Hellman, 2007).

Nonetheless, the results remain the same with or without gross domestic product per capita. The results of multilevel logistic regression are depicted in Table 4-2.

Table 4-1. Means, standard deviations, and Spearman correlations a,b

	Mean	S.D	1	2	3	4	5	6	7	8	9	10
1 Employee entrepreneurship	0.09	0.28										
2 Gender	0.44	0.5	-0.06									
3 Age	39.17	11.41	-0.08	0.02								
4 Education	3.65	1.29	0.01	0.07	-0.01							
5 Organization size	4.28	2.48	-0.08	-0.08	0.10	0.20						
6 Opportunity perception	0.39	0.49	0.15	-0.06	-0.08	0.02	0.01					
7 Capability perception	0.49	0.5	0.21	-0.13	-0.02	0.04	-0.07	0.14				
8 Fear of failure (reversed)	0.55	0.5	0.10	-0.08	-0.01	-0.01	-0.02	0.12	0.15			
9 Venture capital availability	2.96	0.66	0.01	-0.04	0.02	0.03	0.10	0.18	-0.04	0.04		
10 Intellectual property rights	4.27	1.11	-0.10	0.02	0.13	0.03	0.14	-0.01	-0.10	-0.02	0.65	
11 Ambidexterity experience	0.1	0.3	0.08	-0.03	0.03	0.14	0.06	0.08	0.13	0.05	0.07	0.12

a. N = 44,839

b. Correlations equal to .010 or above are significant at .05 level, .012 and above are significant at .01 level, and .016 and above are significant at .001 level (two-tailed test)

**Table 4-2. Results of multilevel logistic regression ^{a,b,c}
(Dependent variable: Employee entrepreneurship)**

Variables	Model 1		Model 2		Model 3	
	Estimate	OR	Estimate	OR	Estimate	OR
Intercept	-3.88*** (0.10)		-3.82*** (0.10)		-3.24*** (0.12)	
Gender	-0.32*** (0.04)	0.72	-0.31*** (0.04)	0.73	-0.31*** (0.04)	0.74
Age	-0.02*** (0.00)	0.99	-0.02*** (0.00)	0.98	-0.02*** (0.00)	0.98
Education	0.13*** (0.02)	1.13	0.10*** (0.02)	1.11	0.10*** (0.02)	1.11
Organization size (log)	-0.10*** (0.01)	0.91	-0.10*** (0.01)	0.91	-0.10*** (0.01)	0.91
Opportunity perception	0.60*** (0.04)	1.82	0.58*** (0.04)	1.78	0.58*** (0.04)	1.78
Capability perception	1.44*** (0.05)	4.24	1.40*** (0.05)	4.05	1.39*** (0.05)	4.02
Fear of failure (reversed)	0.40*** (0.04)	1.49	0.39*** (0.04)	1.47	0.39*** (0.04)	1.47
Venture capital availability (VCA)	0.31* (0.14)	1.36	0.33* (0.14)	1.39	0.34* (0.14)	1.40
Intellectual property rights (IPR)	-0.35*** (0.08)	0.71	-0.38*** (0.08)	0.69	-0.38*** (0.08)	0.68
Ambidexterity experience			0.56*** (0.05)	1.75		
Exploration experience					-0.46*** (0.10)	0.63
Exploitation experience					-0.24* (0.12)	0.79
No emphasis					-0.58*** (0.05)	0.56
Random Intercept	0.22*** (0.05)		0.22*** (0.05)		0.22*** (0.05)	
-2 Res Log Pseudo- Likelihood	261987.7		262427.6		262471.1	
Observations	44839		44839		44839	

a. *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001 (two-tailed test).

b. OR = Odds ratio; Standard errors are displayed in parentheses.

c. Age, VCA, and IPR are the only variables in our analysis for which the value of 0 is meaningless; therefore, we mean-center them for regression analysis (Cohen, Cohen, West, and Aiken, 2003; Wang et al., 2011)

Control variables

The results for the control variables are presented in Model 1 of Table 4-2. Whereas age and gender have a negative relationship ($p < .0001$), education has a positive relationship ($p < .0001$) with employee entrepreneurship. Individual entrepreneurial attitudes of opportunity perception, capability perception, and lack of fear of failure all have positive ($p < .0001$) associations with employee entrepreneurship. These results corroborate previous research findings (for example, Arenius and Minniti, 2005; Carsrud and Brännback, 2011). The size of the organization that employees were working for has a negative ($p < .0001$) relationship with employee entrepreneurship, which is consistent with previous studies (for example, Dobrev and Barnett, 2005). Venture capital availability has a positive ($p < 0.05$) association, whereas intellectual property rights has a negative ($p < .0001$) association with entrepreneurship. These findings concord with the literature (for example, Hellman, 2007).

Hypothesis testing

In H1, we predict that employees' ambidexterity experience increases their likelihood of becoming entrepreneurs. Our data analysis supports this prediction ($OR^{12} = 1.75$; $p < 0.0001$; Model 2 in Table 4-2). This result indicates that, holding all other variables in the model constant, the odds of becoming an entrepreneur increases by 75 percent among employees with ambidexterity experience compared to those without it.

H1a proposes that employees with ambidexterity experience are more likely to become entrepreneurs than those with exploration experience. Our results corroborate this hypothesis ($OR = 0.63$; $p < 0.0001$; Model 3 in Table 4-2) and reveal that, holding all other variables in the

¹². Odds ratio (OR) "is the ratio of the odds for $x = 1$ to the odds for $x = 0$ ". $OR = e^{\beta n}$, where $e = 2.718$ to the power of βn (the beta coefficient). (Hosmer, Lemeshow, & Sturdivant, 2013, p. 51).

model constant, the odds of becoming an entrepreneur decreases by 37 percent among employees with only exploration experience compared to those with ambidexterity experience.

H1b posits that employees with ambidexterity experience are more likely to become entrepreneurs than those with exploitation experience. Our results uphold this hypothesis (OR = 0.79; $p < 0.05$; Model 3 in Table 4-2). These findings imply that, holding all other variables in the model constant, the odds of becoming an entrepreneur decreases by 21 percent among employees with only exploitation experience compared to those with ambidexterity experience.

H1c suggests that employees with ambidexterity experience are more likely to become entrepreneurs than those without either experience (that is, no emphasis condition). Our results verify this hypothesis (OR = 0.56; $p < 0.0001$; Model 3 in Table 4-2). These findings denote that, holding all other variables in the model constant, the odds of becoming an entrepreneur decreases by 44 percent among employees who were involved in none of the phases of developing a new activity as compared to those with ambidexterity experience.

Supplementary analyses and robustness checks

Estimation Techniques. Although our use of multi-level modeling was appropriate due to significant between-country differences (ICC = 0.14) (Cohen et al., 2003), we also replicated our results using logistic regression method with country dummies as controls. The results of our hypotheses were consistent with the main analysis suggesting that our findings are robust across estimation methods.

Common Method Bias. Since most of the variables in this study were measured using the same survey, there exists a potential for common method bias. In order to test for this possibility, we conducted a Harman's one-factor test (Podsakoff and Organ, 1986). Results from this test showed four factors and the most covariance explained by one factor was less than 16.8 percent.

These results suggest that common method bias is not a major problem. Unfortunately, given that GEM surveys individuals anonymously, it is not possible to produce external measures or link to other objective measures.

Novelty of Exploration and Exploitation Activities. We were interested in examining the degree of novelty of the exploration and exploitation activities that employees were engaged in. Since the novelty questions were not a required part of the GEM survey, not all countries included them. But, we were able to access data for a sub-set of our sample, that is, for 32 of the 52 countries. The survey included two questions that asked to what extent the employees considered their new activities as novel for themselves and for their company (on a three-point scale). The first question referred to whether the customers were: (1) existing; (2) existing and new; or (3) new. The second question inquired whether the technology was (1) closely related; (2) partially related; or (3) not related. Existing customers and closely-related technology meant that the new activities were of low novelty to the firm. The means and ranges for the proportion of employees who perceived the novelty of their activities as low, moderate, and high were as follows: (a) high novelty: mean 20 percent, range 15-25 percent; (b) moderate novelty: mean 30 percent, range 30-31 percent; and (c) low novelty: mean 50 percent, range 45-55 percent.

We wanted to check whether or not the degree of novelty of the new activities makes a difference to the results. Therefore, we entered each of these two variables (mentioned above) as controls. Each of the controls showed that employees who were involved in more novel activities were more likely to be entrepreneurs. However, the results of ambidexterity were the same, indicating that the degree of novelty of the new activities did not change the results of ambidexterity in the study.

Alternative Operationalization of Ambidexterity. We conducted additional analysis to test a different definition of exploration and exploitation. We lumped together all those who were involved in the development or implementation of new activities and ideas, besides their routine activities, and defined them as ambidextrous. Then, we compared this group to all those employees with no emphasis (i.e., employees that were not involved in any phase of the new activities). As expected, the results were consistent with the main analysis presented in the paper. That is, those with experiences consistent with the broader definition of exploration and exploitation were more likely to become entrepreneurs than those without such experiences.

Endogeneity. Endogeneity can arise from several sources such as measurement error, nonrandom selection, and omitted variables that affect both independent and dependent variables of a model, and simultaneous causality between its independent and dependent variables (Bascle, 2008; Echambadi, Campbell, and Agarwal, 2006). Researchers have recognized that it is challenging to deal with endogeneity in entrepreneurship research (Shane, 2006). As mentioned above, we controlled for several individual characteristics that could confound the results: opportunity perception, capability perception, and fear of failure. However, these could not be used as instrument variables because they were related to ambidexterity as well as employee entrepreneurship (Semadeni, Withers, and Trevis Certo, 2014). Although we are unaware of uncontrolled confounds, there may be other variables that influence ambidexterity as well as entrepreneurship. Further, it is possible that the experience of entrepreneurship makes an individual a better employee or one that is more attracted to opportunities to flex their ambidexterity. Entrepreneurship and employment may be similar to parts of a cycle influencing each other. Thus, given these possibilities, there remains the potential of self-selection by employees into ambidexterity experiences with the expectation of becoming entrepreneurs.

Previous researchers have used Heckman two-step correction to deal with self-selection bias. Heckman correction uses probit regression in the first stage to compute Inverse Mills Ratio, which is then used in the ordinary least squares regression in the second stage (Hamilton and Nickerson, 2003). Since our dependent variable is binary, we used two-stage probit regression (using probit for both stages). The first stage of Heckman test should include at least one instrument variable that is strongly related to ambidexterity (the independent variable) but not related to the employee entrepreneurship (the dependent variable) in the study. We used customers' perceptions of the product/service as it fit these criteria. The results reveal that ambidexterity is significant ($p < .0001$), whereas the Inverse Mills Ratio is not significant ($p = .7486$). These results provide preliminary support for lack of endogeneity due to self-selection bias. However, this procedure may have problems because of heteroscedasticity, inappropriate standard errors, and multicollinearity (Leiblein, Reuer, and Dalsace, 2002). Thus, we also used another procedure, which can test for heteroscedasticity as well as endogeneity due to self-selection bias by simultaneously estimating two models in one step (Walton, 2014; SAS Institute Inc., 2014). Using this procedure, the results show that, assuming our model is correct, there is no support for either heteroscedasticity ($p = .99$) or endogeneity ($p = .41$). These results provide tentative support for lack of endogeneity due to self-selection bias. We do acknowledge, however, that there can still be endogeneity due to other reasons and that the above tests do not use hierarchical methods. Thus, it will be prudent to interpret the results of our analysis cautiously and continue to test them in future studies.

Individual Entrepreneurial Attitudes as Mediators. In order to test alternative theories¹³, namely, that experiences like ambidexterity lead to capabilities which then lead to employee

¹³ We thank an anonymous reviewer for making this suggestion.

entrepreneurship, we tested a mediation model. In the model, we use capability perception as a proxy for capability. In the GEM survey, it is measured as "the belief that one has the knowledge, skill, and experience required to start a new business". This analysis supports the partial mediation effect of capability on the relationship between ambidexterity experience and employee entrepreneurship. However, because the GEM data measures capability perception after the respondents created their businesses, and after they had the exploration and exploitation experiences, this mediation model is problematic. To solve the problem, we used entrepreneurial intention (i.e., whether, at the time of data collection, employees plan to start a business in the next three years) as a dependent variable. The results of this analysis show that capability perception is a partial mediator of the relationship between ambidexterity experience and entrepreneurial intention. However, for our main analysis we did not use entrepreneurial intention as the outcome variable because it would introduce difficulties in terms of an intention-action gap, and we are more interested in the relationship between ambidexterity and entrepreneurial behavior (e.g., those that took the substantive step to start a business). That said, taken together these results suggest that explanatory mechanisms such as capabilities may partially mediate the relationship of ambidexterity experiences and entrepreneurial intentions.

There are other explanatory mechanisms that can also mediate between individual-level ambidexterity experience and entry into entrepreneurship. Research shows that organizational experiences can influence individual entrepreneurial attributes such as opportunity perception and fear of failure. We tested mediation by these attributes and found they have partial mediation effects on the relationship between ambidexterity experience and entrepreneurial intentions too.

Discussion

The purpose of the current study is to develop and test the hypothesis that individuals with ambidextrous experiences in organizations are more likely to start their own businesses as compared to others who were involved in only exploration or exploitation. The results of this study support our hypothesis that individuals with ambidexterity experiences are more likely to engage in entrepreneurship. These results are consistent with findings of other studies that ambidextrous individuals have higher research performance in the public sector (Kobarg, Wollersheim, Welpel, and Spörrle, 2016), innovation performance in conventional as well as creative industries (Rosing and Zacher, 2016), and sales performance of customer service representatives (Jasmand, Blazevic, and de Ruyter, 2012).

Departing from much of the attribute-based and contextual approaches to entrepreneurship, our study emphasizes that entrepreneurial preparation can be a proactive process whereby individuals can take actions to acquire the skills and experiences to become entrepreneurs—we have shown that exploration and exploitation experiences can be key contributors to this requisite experience. Potential entrepreneurs can influence decisions about task assignments to ensure preparatory experiences are obtained. For instance, they might work for firms or departments of organizations that practice contextual ambidexterity instead of structural ambidexterity (Birkinshaw and Gibson, 2004; Gibson and Birkinshaw, 2004), seek out boundary-spanning roles (Volery et al., 2015) such as project management, or attempt to gain positions where behavioral integration is part of the role (Lubatkin et al., 2006; Smith and Tushman, 2005). Potential entrepreneurs may also favor firms that have high performance human resource practices that enable contextual ambidexterity by enhancing trust, discipline, stretch, and support (Kang and Snell, 2009; Patel et al., 2013).

In terms of theoretical contribution, our results surrounding ambidexterity are highly novel and help integrate two streams of research that have until now been separate. Individual-level ambidexterity has largely been studied in the context of organizations as a means to improve firm performance. Meanwhile, the employee entrepreneurship literature examines work experiences in organizations as important drivers of entrepreneurial entry (e.g., Burton et al., 2002; Cliff, Jennings, and Greenwood, 2006; Dobrev and Barnett, 2005; Lazear, 2004, 2005; Nanda and Sørensen, 2010; Sørensen, 2007; Sorensen and Fassiotto, 2011). Our study is among the first to link this individual level ambidexterity behavior as a form of preparation for entrepreneurship. Examining experiences in organizations is especially important given that the majority of entrepreneurs get their entrepreneurial ideas while working for their former employers (Bhide, 2000). For example, about 63 percent of nascent entrepreneurs in the GEM survey (2011) indicated that they had worked for an employer before starting their own business.

While the focus of our study was the role of organizational experiences in entrepreneurial entry, the findings also suggest that employer characteristics and policies impact the chance that an employee may experience ambidexterity. For example, organizations that break up exploration and exploitation tasks with structural separations may use differentiated incentive schemes (that is, different rewards for those who are engaging in exploration than those for individuals specializing in exploitation). Organizations using separate divisions for exploration and exploitation that do not communicate directly (Duncan, 1976; Tushman and O'Reilly, 1996) reduce the potential for employee exposure to ambidexterity. Structural separation of exploration and exploitation activities concentrates the integration of these activities among a few senior level managers. These managers may disallow overlapping cultures to form around exploration and exploitation activities (Gibson and Birkinshaw, 2004; Raisch et al., 2009) and therefore be

less likely to enable individuals to experience ambidexterity at work. By contrast, organizations using contextual ambidexterity, where both exploration and exploitation occur within the same unit along with incentive systems that accommodate individuals pursuing both activities, are more likely to provide individuals with an ambidexterity experience. Thus, contextual ambidexterity is likely to *encourage* subsequent entrepreneurship, whereas structural separation may *discourage* it.

Limitations and future research

The measure of ambidexterity in this study uses the involvement of employees in the development and implementation of activities within firms. This operationalization is novel but as we argued, it does capture the essence of ambidexterity. Future studies could look to develop more nuanced measures of ambidexterity to replicate the results of this study. For instance, researchers may develop a measure of ambidexterity that includes several items on a Likert-type scale to improve the validity and reliability of the measure. While GEM provided an opportunity to test our hypothesis with a large sample size, conducting a smaller survey and using a scale with a higher number of items would be useful.

It is possible that ambidexterity experiences are tempered by organizational role and job requirements. Potentially, those individuals who are forced to be ambidextrous because of the nature of their job responsibilities, may not be as likely to make use of this experience as the individual that intentionally engages in both activities. Perhaps the role of intentionality could be added in future research. Unfortunately the GEM survey did not collect data on the employees' organizational roles and functional areas.

While the measure of employee entrepreneurship in the current study allows us to test our hypothesis about employees-turned-entrepreneurs, we cannot differentiate among those that

compete with their former employer directly, indirectly, or not at all. More fine-grained data would be needed to test hypotheses about different types of employee exits. Future research may also test if the employees-turned-entrepreneurs are systematically different from employees that stay. It may also be interesting to investigate the role of technology in independent and corporate entrepreneurship, particularly organizations that can use spin-offs to retain their employees and prevent exits and spin-outs by the employees.

The effect of ambidexterity experience on entrepreneurial entry may depend on a country's level of institutional development. Individuals in a country with weak institutions may need ambidexterity experiences more than those in countries with strong institutions. Strong institutions can help individuals protect their specialized knowledge and expertise. In contrast, countries with weak institutions (e.g., contracting rules and norms) create barriers to team formation between individuals with mixed capabilities. Future research may test the moderating effect of country level institutions such as 'rule of law' on the relationship between ambidexterity and entrepreneurial entry.

Finally, we recognize that there is potential for endogeneity problems in research such as this. As discussed in detail in the supplementary analysis, we examined several ways to control for endogeneity. Our analysis provided tentative evidence that there may not be endogeneity due to self-selection bias. However, it is difficult to rule out all sources of endogeneity. Thus, we acknowledge endogeneity as a potential limitation of this research and urge future researchers to verify the findings of the current study.

Conclusion

This study examined the relationship between the ambidexterity experiences of individuals and the likelihood they will become entrepreneurs. Our analyses of GEM data supported the

proposed hypothesis. Ambidexterity appears to increase the likelihood that employees would become entrepreneurs. The study contributes to the literature on employees-turned-entrepreneurs by linking ambidexterity with entrepreneurship. Our results show that employees with ambidexterity experience (that is, exploration *and* exploitation) are more likely to become entrepreneurs than those with only exploration or exploitation experience. Both exploration and exploitation activities provide key experiences that increase the likelihood of an employee becoming an entrepreneur.

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Appendix 4-A: Sample descriptives

Country	N	Early stage entre.	Ambidexterity experience	Exploration experience	Exploitation experience	No emphasis
Algeria	341	0.088	0.076	0.041	0.000	0.883
Argentina	501	0.168	0.082	0.034	0.006	0.878
Australia	847	0.090	0.135	0.037	0.014	0.815
Bangladesh	141	0.135	0.007	0.000	0.000	0.993
Barbados	282	0.046	0.060	0.004	0.000	0.936
Belgium	693	0.049	0.150	0.072	0.053	0.724
Bosnia and Herzegovina	510	0.047	0.118	0.075	0.027	0.780
Brazil	458	0.072	0.041	0.017	0.004	0.937
Chile	711	0.211	0.150	0.045	0.037	0.768
China	1140	0.144	0.075	0.024	0.005	0.896
Colombia	3306	0.212	0.059	0.011	0.028	0.901
Croatia	724	0.059	0.184	0.065	0.055	0.696
Czech Republic	881	0.051	0.099	0.058	0.040	0.804
Denmark	1041	0.052	0.294	0.099	0.015	0.592
Finland	832	0.073	0.103	0.052	0.025	0.820
France	757	0.042	0.096	0.055	0.049	0.799
Germany	2029	0.052	0.177	0.054	0.045	0.724
Greece	503	0.030	0.062	0.016	0.034	0.889
Hungary	728	0.055	0.077	0.056	0.015	0.852
Iran	106	0.132	0.113	0.009	0.047	0.830
Ireland	817	0.028	0.105	0.064	0.011	0.820
Jamaica	173	0.150	0.023	0.000	0.000	0.977
Japan	1049	0.039	0.079	0.023	0.011	0.887
Korea	629	0.045	0.121	0.027	0.011	0.841
Latvia	892	0.124	0.055	0.028	0.024	0.894
Lithuania	832	0.056	0.175	0.102	0.023	0.700
Malaysia	592	0.035	0.024	0.010	0.003	0.963
Mexico	479	0.088	0.038	0.008	0.002	0.952
Netherlands	1324	0.073	0.187	0.066	0.029	0.718
Nigeria	353	0.385	0.031	0.000	0.025	0.943
Norway	618	0.058	0.000	0.000	0.000	1.000
Pakistan	182	0.099	0.022	0.011	0.000	0.967
Panama	542	0.183	0.020	0.007	0.004	0.969
Peru	185	0.319	0.135	0.016	0.000	0.849
Poland	723	0.089	0.136	0.059	0.047	0.758
Portugal	870	0.089	0.082	0.031	0.011	0.876
Romania	651	0.126	0.108	0.040	0.023	0.829
Russia	2158	0.035	0.014	0.008	0.004	0.974

Appendix 4-A. (continued)

Country	N	Early stage entre.	Ambidexterity experience	Exploration experience	Exploitation experience	No emphasis
Slovakia	763	0.105	0.111	0.079	0.026	0.784
Slovenia	808	0.031	0.134	0.043	0.033	0.790
Spain	5169	0.036	0.091	0.046	0.014	0.849
Sweden	943	0.050	0.306	0.082	0.034	0.578
Switzerland	732	0.067	0.090	0.041	0.029	0.840
Taiwan	869	0.044	0.060	0.020	0.007	0.914
Thailand	462	0.162	0.078	0.019	0.011	0.892
Trinidad & Tobago	393	0.209	0.033	0.013	0.000	0.954
Turkey	618	0.131	0.018	0.011	0.005	0.966
United Arab Emirates	1127	0.068	0.095	0.030	0.016	0.859
United Kingdom	641	0.055	0.101	0.047	0.014	0.838
United States	1889	0.134	0.136	0.051	0.015	0.799
Uruguay	607	0.166	0.124	0.071	0.016	0.789
Venezuela	218	0.225	0.041	0.005	0.018	0.936

CHAPTER 5: CONCLUSION

This dissertation provides a richer understanding of the phenomenon known as employee entrepreneurship by examining preparatory experiences and contextual determinants. This conclusion describes how the findings contribute to the theoretical and empirical literatures, as well as to managerial and entrepreneurial practice.

Theoretical Contributions

Integrated Conceptual Framework. As noted, spinouts have attracted interest of scholars in several different fields. In their efforts to study spinouts, industrial economists are mainly interested in the effects of spinouts on industrial clusters (Boschma, 2015; Klepper, 2011). Strategic management scholars examine the effects of spinouts on parent firms (Agarwal et al., 2016; Campbell et al., 2012; Mawdsley and Somaya, 2016), and entrepreneurship scholars investigate how individuals' work experiences influence their entrepreneurial activities (Frederiksen et al., 2016; Sorensen and Fassiotto, 2011).

While previous studies provide valuable insights about spinouts' antecedents and outcomes, they also create a fragmented body of knowledge. The first essay of this dissertation integrates the findings of previous research and proposes an integrated conceptual framework to show a comprehensive picture of the literature on spinouts. The framework shows that spinouts have antecedents at the individual, organizational, and institutional levels that, in turn, affect parent firm performance and external environments. Further, my review identifies several gaps in the literature that beg for future research to resolve contradictory findings.

Linking Institutions and Spinouts. This work deepens our understanding of the critical role that context and institutions play in the spinout process. My dissertation demonstrates how intellectual property rights can act as barriers to spinouts. Spinouts not only out-perform other

types of start-ups (Adams et al., 2016), they are also key to economic development through knowledge spillover (Agarwal, Audretsch, and Sarkar, 2007) and agglomeration (Boschma, 2015; Klepper, 2011); still, there are institutions that limit them. Perhaps further research into the role of institutions as filtering mechanisms (i.e., ensuring that only the fittest ideas come to market) is warranted. Research suggests that spinouts that leverage on the core technology of their parent firms create more valuable and more impactful knowledge (Basu et al., 2015). However, institutions such as intellectual property rights and non-competes mainly target impactful spinouts. My research shows that spinouts created by founders with work experiences in technologies related to their parent firms are more constrained by intellectual property rights than those with experiences peripheral to their parent firms' technologies.

This dissertation also shows that availability of venture capital in a country can boost spinouts, and especially those created by founders that have experiences in technologies related to the core areas of their parent firms. Arguably, if intellectual property rights filter spinouts, venture capital availability promotes spinouts. Employees can reduce the negative effects of constraining institutions (e.g., intellectual property rights and non-competes) by buying out their contracts or licensing their parent firms' technology. Rauch (2016) argues that non-competes reduce spinouts by employees who are financially constrained because they cannot afford to buy out their contracts. Venture capital circumvents these rules by allowing spinout founders to buy out their contracts and avoid other obligations and litigation from their parent firms.

Linking ambidexterity and entrepreneurship. My research on spinout founders' ambidexterity experiences advances the literature on entrepreneurial preparation. Previous studies have generated conflicting evidence about the role of technical and managerial experience (Chatterji, 2009). Drawing from the ambidexterity literature, I am able to predict that

individuals that experience both exploration and exploitation within their parent organizations are more likely to start their own businesses, compared to those with neither type of experience or only one type of experience. These findings are related to the ‘jacks-of-all-trades’ theory, which suggests that individuals with a broader range of knowledge and skills are more likely to become entrepreneurs (Lazear, 2004, 2005; Wagner, 2006). Based on the ‘jacks-of-all-trades’ theory, individuals who acquire a more balanced set of skills across various fields of expertise through their education and work experiences are more able to connect the dots and obtain the skills required to run a business. Therefore, they are more likely to become entrepreneurs. However, a key difference with our ambidexterity approach is that one may have a variety of experiences that do not span both exploration and exploitation activities.

Empirical Contributions

Cross-Country Sample. Nearly all of the existing studies on spinouts are based on a single industry or a single country. One of the challenges in spinout research is data availability: it is difficult to find a data set that allows researcher to trace back the pre-entry history of spinouts (Klepper, 2009). The availability of data on the pre-entry history of the entrants in a single industry gave rise to several single-industry studies, such as those on the automotive (Klepper, 2007; Boschma and Wenting, 2007), disk drive (Agarwal et al., 2004; Franco and Filson, 2006), laser (Klepper and Sleeper, 2005), semiconductor (Adams et al., 2013), and biotechnology (Stuart and Sorenson, 2003) industries. Another source of data that has been used to study spinouts is matched employer-employee data for a given country (e.g., Andersson and Klepper, 2013; Eriksson and Kuhn, 2006; Sørensen and Phillips, 2011). The empirical papers of this dissertation reverse this trend, adding some much-needed cross-country evidence to the conversation.

Multilevel Methods. The cross-country samples used in this research allow us to employ multilevel statistical modelling to test country-level moderators (e.g., intellectual property rights, venture capital availability, and non-compete strength). This is a contribution to the spinouts literature, which is currently dominated by single-level studies.

Practical Implications

Ambidexterity Experiences as Preparation. My research on ambidexterity experiences has important implications for entrepreneurial preparation, as prospective entrepreneurs can seek out ambidextrous experiences within their parent firms in order to increase their entry chances. This insight is highly practical because employees often have the opportunity to choose their projects in order to guide their career development. Employees who are not offered sufficient opportunity to experience both the exploration and exploitation phases can also leave to work for companies that are willing to give them the desired opportunities.

Intellectual Property Rights as Blunt Instruments. My research on intellectual property rights as barriers to spinouts represents a cautionary tale; it suggests that these property rights are “blunt instruments” that prevent more than what they are intended to prevent. In particular, the main goal of intellectual property rights seems to be to prevent employees from sharing trade secrets with competitors. However, these rights also have the effect of reducing new firm creation by employees. This situation is problematic because emerging evidence suggests that spinouts do not generally harm parent firms, and can actually help them by increasing alignment, boosting reputation, and providing future “spill-ins.” Accordingly, parent firms should be receptive to spinouts.

Future Research

After completing the studies in this dissertation, I have learned of many future research opportunities, but I will focus here on four key areas that seem especially ripe for future research.

Ambidexterity in Varying Contexts. After presenting my research on ambidexterity to several audiences, I discovered that there might be opportunities to test moderation effects related to a country's level of institutional development. For example, potential entrepreneurs in countries with weak institutions may need ambidexterity experiences more than those in countries with strong institutions. The logic behind this theory is that countries with weak institutions make it difficult for individuals with mixed capabilities to form a start-up team due to weaknesses in contracting. In contrast, strong enforcement of institutions and contracts can help individuals protect their specialized knowledge and expertise.

Individual Level Ambidexterity and Spinout Performance. In this dissertation, I show that individual level ambidexterity increases the likelihood that employees become entrepreneurs. However, it is not clear whether ambidexterity experience will lead to better performance. Previous research shows that firms started by entrepreneurs with a broader set of expertise and knowledge (i.e., jacks-of-all-trades) are more innovative (Strohmeier, Tonoyan, and Jennings, 2017). Future research may investigate the role of individual level ambidexterity on spinout performance.

From Spinouts to Hybrid Entrepreneurship. There is an opportunity to distinguish between hybrid entrepreneurship (i.e. starting a business while retaining a day job) and spinouts. Hybrid entrepreneurship literature is just beginning to delineate itself from the spinout literature. Scholars find that hybrid entrepreneurs remain employed by parent firms (Schulz et al., 2016; Raffiee and Feng, 2014), whereas spinouts are generally thought to be founded by former

employees. Obviously, many employees start their ventures while they are still employed, and may leave employment once their ventures become large enough to warrant their full-time attention.

Non-Competes. Whereas my supplementary analysis in Essay Two touched on this subject, my spinout research suggests the need to explore further barriers that may prevent spinouts from forming. Non-competes seem to be a particularly compelling area for future research. My other empirical investigations into non-competes suggest that they are effective suppressors of spinouts—especially those by lower-earning employees. This is an important finding, given that spinouts created by higher-earning employees have greater potential to negatively impact parent firms’ performance. Hence, it would be interesting to examine whether non-competes are over-stepping their desired effects.

The Effects of Spinouts on Parent Firms. Previous research shows that spinouts can have both negative (e.g., Campbell et al., 2012) and positive effects (e.g., Ioannou, 2014) on their parent firms’ performance. Future research should examine potential moderators that explain this inconsistency. Parent firms can benefit from knowledge that spills back into the parent organization from their spinouts (Agarwal, et al., 2007; Kim and Steensma, 2017). More research is needed to examine whether a parent firm’s hostility prevents it from benefiting from such spill-ins, and whether hostile or “friendly” parent firms perform better.

Conclusion

This dissertation has overcome certain theoretical and empirical barriers in the research on spinout and employee entrepreneurship. It also has direct implications for both management and entrepreneurship practices. Finally, the work highlights major avenues for future research that are expected to make significant contributions in the future.

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