

**WHAT DO I TAKE WITH ME?: THE MEDIATING EFFECT OF SPIN-OUT TEAM SIZE AND  
TENURE ON THE FOUNDER-FIRM PERFORMANCE RELATIONSHIP**

**RAJSHREE AGARWAL<sup>1</sup>**  
**UNIVERSITY OF MARYLAND**  
[rajshree@umd.edu](mailto:rajshree@umd.edu)

**BENJAMIN A. CAMPBELL**  
**THE OHIO STATE UNIVERSITY**  
[campbell@fisher.osu.edu](mailto:campbell@fisher.osu.edu)

**APRIL M. FRANCO**  
**UNIVERSITY OF TORONTO SCARBOROUGH**  
[april.franco@rotman.utoronto.ca](mailto:april.franco@rotman.utoronto.ca)

**MARTIN GANCO**  
**UNIVERSITY OF MINNESOTA**  
[mganco@umn.edu](mailto:mganco@umn.edu)

**ABSTRACT**

Our study revisits the founder-firm performance relationship by examining the mediating effect of spin-out team characteristics. We theorize that founding team size and tenure mediate the founder effect on parent and spin-out performance, thus highlighting the critical need for founders to transfer or recreate complementary assets across firms. The support for our hypotheses, through use of linked employee-employer US Census data from the legal services industry, has theoretical and practical implications for the knowledge-based view and human resource strategies for both existing and entrepreneurial firms.

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<sup>1</sup> Corresponding author. All authors contributed equally and the names are listed in alphabetical order. We thank the Ewing Marion Kauffman Foundation for support of the project. The research in this paper was conducted under Special Sworn Status of the U.S. Census Bureau at the Chicago Census Research Data Center. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. This research uses data from the Census Bureau's Longitudinal Employer Household Dynamics Program, which was partially supported by the following National Science Foundation Grants: SES-9978093, SES-0339191 and ITR-0427889; National Institute on Aging Grant AG018854; and grants from the Alfred P. Sloan Foundation and the Social Science and Humanities Research Council of Canada. The authors are grateful to Seth Carnahan for able research assistance. The manuscript has benefited from comments received from Gilad Chen, and seminar participants at the 2010 Academy of Management meetings, HBS Strategy Research Conference, University of Illinois, University of Maryland and University of Toronto.

*“Not everyone can be a founder. We talk about the founders of startups and companies. We focus on the founders. The founders get press coverage. Sometimes they get rich. But for every founder, there is an early employee that takes near equal risks in joining an early-stage company.”* David Crow, StartupNorth (2009)

Extant work on spin-outs—start-ups founded by a former employee of an established firm within the same industry—underscores the role of founders as conduits of knowledge from the parent firm to the new venture (Agarwal, Echambadi, Franco, & Sarkar, 2004; Klepper & Sleeper, 2005; Phillips, 2002). Moreover, work on entrepreneurship has focused on understanding which employees are most likely to leave and start entrepreneurial ventures; both Klepper & Thompson (2010) and Campbell, Ganco, Franco & Agarwal (2012) theorize why the best employees are the most likely to spin out. Not surprisingly, founder characteristics are also critical for firm performance: the departure of higher performing founders creates greater adverse effects for the parent firm, and higher beneficial effects for the spin-out firm (Campbell et al., 2012; Elfenbein, Hamilton & Zenger, 2010; Klepper & Thompson, 2010). This scholarly attention on founder characteristics is mirrored by the attention received in the popular press.

Founders rarely venture out on their own though (Wasserman, 2012), often turning to their colleagues to recruit and assemble a team (Wezel, Cattani, & Pennings, 2006; Groysberg, Nanda & Prats, 2009). For example, many of the first 14 employees of Johnson and Johnson, which spun out in 1886, came from the parent firm Seabury and Johnson (Kilmer House, 2012). Walt Disney recruited Mickey Mouse co-creator Ub Iwerks, a fellow employee at Pesmen-Rubin Commercial Art Studio, when founding Disney (Gabler, 2006). Similar accounts abound in the semiconductor industry: Intel’s creation represented the exodus from Fairchild Semiconductor, not only of founders Gordon Moore and Robert Noyce, but also early employees such as Andrew Grove who later led the firm to new heights (Moore & Davis, 2004). Consistent with these anecdotes, scholars have found that the size and tenure of the founding and early employee teams adversely impacts parent performance (Wezel et al., 2006) and positively impacts spin-out performance (Phillips, 2002; Beckman, 2006; Delmar & Shane, 2006).

However, the theoretical models examining the “main effects” of either founder characteristics or team size and tenure on parent/spin-out performance may be underdeveloped. Are the effects independent of each other, or are they intricately related? If related, what is the nature of the interplay? For example, while Campbell et al. (2012) discuss the founder’s ability to transfer or recreate complementary assets as key, they do not separate the founder’s individual effect from the effect of the complementary human assets that founders *take with them* from the parent to the spin-out firm. On the other hand, models that focus only on founding team size and tenure (e.g. Wezel et al., 2006; Phillips, 2002) fail to acknowledge that these are related to the founder’s ability to recruit their colleagues while undertaking a risky new venture. Addressing the micro level interactions that result in overall firm capabilities is important to advance our understanding of the knowledge-based view of the firm, inasmuch as both founders and their teams represent critical repositories of knowledge and capabilities that impact the performance of both the parent and spin-out firm.

Accordingly, we develop our theory of the mediating effect of team size and tenure on the effect of founder characteristics on parent firm and spin-out performance. For the founder, we use individual performance, as reflected by earnings, to capture multiple “quality” dimensions including intelligence (Schmidt & Hunter, 1992; Ree & Earles, 1992), education (Mincer, 1974), rank (Phillips, 2002; Rajan & Zingales, 2001; Wezel et al., 2006), entrepreneurial human capital and innate ability (Elfenbein et al., 2010), ability to generate value (Campbell et al., 2012), social networks (Burton, Sørensen, & Beckman, 2002) and other indicators of “star performance” (Groysberg, et al., 2008; Groysberg et al., 2009). These attributes of individual quality have been shown to result in higher individual performance as measured by earnings across multiple studies in management (Barney & Wright, 1998; Castanias & Helfat, 1991; Gerhart & Milkovich, 1990; Rosen, 1981; Wright, McMahan & McWilliams, 1994) and labor economics (Becker, 1964; Mincer, 1974; Schultz, 1961; Spence, 1973; Willis, 1986).<sup>2</sup> We argue that founders’

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<sup>2</sup> Within psychometric literature (cf. Chin 1998), scholars have noted the differences between formative and reflective indicators of a particular construct, based on the underlying cause and effect relationships. Formative

performance determines the size and tenure of that they can assimilate from their prior employer, which in turn impacts firm performance. Specifically, we hypothesize that size and tenure of spin-out team members mediate the negative relationship between founder and parent performance, and the positive relationship between founder performance and spin-out survival.

These relationships are particularly relevant to professional service firms. In professional service firms, knowledge resides in human assets and complementary organizational routines and procedures are critical for the creation and appropriation of value. Further, most of the existing literature on the effect of higher performing individuals on parent and spin-out performance has focused on professional service firms (e.g. Campbell et al., 2012; Phillips, 2002; Wezel et al., 2006; Groysberg et al., 2009). In line with this established literature, we examine our hypotheses in the empirical setting of the legal services industry. Using a custom data extract of the Longitudinal Employer-Household Dynamics (LEHD) Project at the U.S. Census Research Data Center, we find that high performance of founders is an important determinant of both team size and tenure. We find strong support for our hypotheses that team size and tenure mediate the effect of founder performance on spin-out survival. For parents, the size of the spin-out team mediates the adverse effect of high performing founders on parent firm performance, while this is not the case for team tenure.

Our study contributes to the knowledge-based view of the firm by shedding light on the micro-foundations of organizational capabilities and performance, as related to individuals and teams. We answer the call to unpack the micro-level mechanisms that underpin firm-level outcomes (Coleman, 1988; Abell, Felin, & Foss, 2008). Hence, we complement studies that

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indicators "cause" the construct; for example, higher levels of intelligence, education, etc. will result in higher performance. Omission of any one formative indicator may alter the face validity of the construct itself (Diamantopoulos & Winklhofer, 2001). Reflective indicators, on the other hand, represent the effects of the construct. For example, higher earnings and higher job evaluation ratings could reflect high performance. In a reflective construct, however, omission of items does not cause validity problems because the items are interchangeable due to the underlying inter-item correlations (Nunnally & Bernstein, 1994) and hence use of one item is appropriate as long as it reflects the construct. Thus, in our context, wherein higher earnings have been shown to be reflective of performance by multiple literatures using multiple methodologies, we use earnings as an indicator of an individual's performance. In what follows, we use "higher performing individuals", "higher performers" and "founders with higher performance" interchangeably when theorizing relationships, and measure individual-level performance with individual-level earnings within our empirical context.

abstract away from the individual and teams to focus only on the firm level of analysis (e.g. Agarwal et al., 2004; Chatterji, 2009; Klepper & Sleeper, 2005). In doing so, our work challenges received wisdom in the knowledge-based view that team relationships serve as an important isolating mechanism for a firm's competitive advantage because they embody firm specific capital and are less mobile than individuals (Coff, 1997; Barney & Wright, 1998; Wright et al., 1992). In contrast, we show that assimilating a team is endogenous to individual performance, and it is the ability of high performing individuals to *take the team* with them, rather than the transferability of their own performance *per se*, that erodes the parent's competitive advantage. Further, we separate out the mediating effects of knowledge *transfer* in the form of team size, from knowledge *replication*, embodied in team routines through longer tenure, and show that knowledge transfer matters in explaining parent performance more than knowledge replication.

Our contributions to the knowledge-based view are particularly salient for the entrepreneurship literature. By examining the impact of knowledge flow mechanisms on both parent firm performance and spin-out performance simultaneously rather than each in isolation, we highlight that the effect of knowledge flow is potentially asymmetric during the spin-out process. Knowledge flows from a parent to a spin-out may have a differential impact on spin-out performance than on the performance of the parent. Thus, our holistic model of how founders and their spin-out teams jointly determine new venture performance provides an important complement to prior work that under-specifies the relationship between founders and their teams (Campbell et al., 2012; Phillips, 2002; Wezel et al., 2006) and highlights the need for future research that continues the exploration of the micro-foundations of entrepreneurship.

Our findings have multiple practical implications. The popular press frequently emphasizes founders as the crucial determinant of performance of their firms. Similarly, the loss of key employees is considered a significant threat to the competitiveness of established firms. Our results indicate that the role of entire teams that share prior work experience and move to a new setting may be underappreciated. From the established firm's perspective, our findings imply that high performing employees attract not only a larger team of other employees, but

particularly those employees who have more experience. The negative performance impact on the established firm is thus exacerbated by the loss of employees with complementary skills rather than driven purely by a loss of a high performing individual. These implications may lead to distinct employee retention strategies. For instance, managers may want to target their retention strategies toward co-workers and subordinates of the employee who is likely to spin out. Such strategies will help minimize the negative impact associated with the loss of human capital as well the competitive threat from the start-up. These strategies may also be easier to implement, inasmuch as they permit response to actual threats of employee spin-outs as opposed to forecasting and addressing which employees are likely to leave to found a start-up. From the spin-out's perspective, our results highlight the importance of the founder's individual performance in the entrepreneurial team assembly process. Importantly, our study shows that being a high performing individual within an established firm is correlated with the ability to attract complementary human capital and thus enhances the success of future entrepreneurs.

#### **THEORETICAL FRAMEWORK**

Extant research within the knowledge-based view points to the beneficial effect of founder's prior knowledge and experience gained at the parent firm on spin-out performance (Agarwal et al., 2004; Franco & Filson, 2006; Klepper & Sleeper, 2005; Phillips, 2002) and adverse effect of losing employees to spin-outs on the performance of the parent firm (Phillips, 2002; Wezel et al., 2006; Aime, et al., 2010; Campbell et al., 2012). The positive performance consequences for spin-outs have been attributed to the role of founders' knowledge as a conduit for the inheritance of technological and market pioneering capabilities (Agarwal et al., 2004) and managerial and process capabilities (Dencker, Gruber, & Shah, 2009), or to other relevant knowledge such as embeddedness within social networks (Burton et al., 2002).

Many of these studies, however, focus on aggregate firm-level capability measures, rather than use measures of individual characteristics of the founder. Among studies that explicitly link founder characteristics to the performance of either the parent or the spin-out, scholars have focused on the "core" founder's ability (Wasserman, 2012), where the core founder is the

individual who has the highest prior rank (Phillips, 2002; Rajan & Zingales, 2001; Wezel et al., 2006), prior earnings (Campbell et al., 2012), or is otherwise a “star” performer (Groysberg et al., 2008; Groysberg et al., 2009). Regardless of the measure used, these studies consistently find that founders with high performance on the underlying quality dimensions negatively impact parent firm performance, and positively impact spin-out firm performance.

Acknowledging the fact that individuals rarely venture out on their own, scholars have also examined the characteristics of the team of employees that leave a parent firm to join a start-up (Beckman, 2006; Eisenhardt & Schoonhoven, 1990; Groysberg et al., 2009; Wezel et al., 2006). This research has focused on two important characteristics of the spin-out team: team size and team tenure. We turn to each below, noting that team size represents the transfer of resources from the parent to the spin-out firm, while shared experiences that enable replication of routines and procedures from the parent to the spin-out are embodied in team tenure.

The size of an exiting team represents a transfer of complementary resources due to both a simple additive effect of the capabilities of each individual team member and synergies or complementarities of capabilities within the set of team members. Larger team sizes imply greater transfer of aggregate capabilities from the parent to the spin-out (Wuchty, Jones, & Uzzi, 2007) and reflect the complementary fit among the individuals. Indeed, both Agarwal et al. (2004) and Wezel et al. (2006) note that larger teams include complementary capabilities such as technical and market knowledge. In the context of parent firm performance, Wezel et al. (2006) and Phillips (2002) show that team exits relative to individual exits imply greater disruptions and hence translate into a greater negative impact on the parent firm. Further, when parents and spin-outs compete in the same markets, the increased competition caused by the spin-out (Phillips, 2002) results in an additional mechanism through which the transfer of rival resources represented by team size adversely affects parent firm performance. For spin-outs, larger teams represent greater resource endowments and greater perceived legitimacy and reputation, and thus provide performance benefits (Beckman, 2006; Delmar & Shane, 2006; Phillips, 2002).

Also, larger teams facilitate specialization of the team members, which enables each individual to concentrate on specific roles based on their specific skills (Sine, Mitsuhashi, & Kirsch, 2006).

Additionally, team tenure has been highlighted as critical to the replication of routines that were present in the parent firm within the spin-out firm context (Beckman, 2006; Eisenhardt & Schoonhoven, 1990; Phillips, 2002; Wezel et al., 2006). Harking back to Stinchcombe (1965), scholars have stressed that spin-outs' ability to replicate organizational routines from their parent firm depends on team tenure, particularly when these routines are embodied in shared knowledge. Because routines reflect existing interaction patterns among multiple actors and codification of knowledge (Nelson & Winter, 1982), experiential wisdom (Gavetti & Levinthal, 2000), greater trust and communication (Eisenhardt & Schoonhoven, 1990) and are associated with learning-by-doing (Argote, Beckman, & Epple, 1990; Becker, 2005), teams with more experience or tenure at a firm are better able to recreate structural and strategic routines (Beckman, 2006; Eisenhardt & Schoonhoven, 1990; Sine et al., 2006; Wezel et al. 2006). Accordingly, scholars have found a negative effect of the tenure of departing teams on parent firm performance. Wezel et al. (2006) and Phillips (2002) argue that the tenure of employee teams leaving the organization for spin-outs is associated with a disruption of routines, thus driving the adverse performance effect on the parent. Importantly, Aime et al. (2010) find that the loss of competitive advantage can occur even if the parent firms are able to retain established routines. For spin-outs, the positive effect of team tenure on performance has been attributed to a superior ability to replicate routines, norms and procedures, given greater managerial skills and tacit knowledge regarding setting up and running an organization (Mostafa & Klepper, 2010; Phillips, 2002; Sine et al., 2006; Wezel et al., 2006) that result in quicker decision making and time to market (Beckman, 2006; Eisenhardt & Schoonhoven, 1990).

Thus, in summary, the existing literature has substantially improved our understanding of the competitive dynamics between parent and spin-out performance as it relates to founder characteristics, departing team size, and departing team tenure. However, these studies make an important implicit assumption: that departing team size and team tenure are determined



independently of the founder, and thus may be modeled either separately as “main effects” (e.g. Beckman, 2006; Phillips, 2002; Groysberg et al., 2009; Wezel et al., 2006), or may be interacted to examine “moderating effects” (e.g. Groysberg et al., 2008). We extend the previous research by explicitly theorizing mediation hypotheses that recognize the endogeneity of the team size and team tenure variable to founder characteristics.

### **Founder Performance, Team Size and Tenure**

While the individual effects of founders, team size and team tenure on parent and spin-out performance have been examined, the process leading to the decisions of individuals to move with a founder to a new venture has received relatively less attention. Firms embody complementarity in resources (Teece, 1986), and in professional services context, these complementarities represent synergies in skills, tasks and responsibilities across individual employees. For example, Wasserman (2012) underscores that in seeking potential candidates for co-founders and early employees, the core founder must focus on the complementary human, social and financial capital that these key individuals bring with them.<sup>3</sup> These individuals may be identified from direct contact (friends/family and co-workers), indirect contact (mutual acquaintance), or impersonal search (strangers identified for particular abilities). Among these sets of relationships, Wasserman (2012) integrates findings across multiple studies to note that firms with founders and early hires that are composed of prior co-workers are the most enduring and likely to succeed. For example, Agarwal et al. (2004) found that such spin-out firms not only outperform other start-ups, but incumbent-backed ventures and diversifying entrants as well.

Focusing on the context of spin-out formation, potential founders and their colleagues at the parent organization go through a matching process that ultimately determines the characteristics of the departing team. From the perspective of the individual who is the potential

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<sup>3</sup> There is significant variation in the criteria used across new ventures in determining who is awarded a co-founder status and who is considered an early employee. For example, Andrew Grove was not a co-founder of Intel, but a very critical team member of the new venture nonetheless (Moore & Davis, 2004). On the other hand, some organizations may more easily bestow founder status, using it as a symbolic designation for all early employees (Wasserman, 2012). Researchers have acknowledged that regardless of designation, *all* individuals who are part of the initial start-up of the organization have a critical imprinting role on the organization (Stinchcombe, 1965).

core founder, as defined above, key criteria for team assembly relate to the valuable complementary human, social and financial capital that each colleague delivers. Given the riskiness of embarking on a new venture, the potential core founder is likely to seek out those colleagues that not only embody high levels of capabilities individually, but also represent strong relationship bonds that include the stable routines and trust that enable tackling tough business problems (Wasserman, 2012). However, not every potential founder is equally likely to attract co-workers possessing these capabilities, since co-workers need to be convinced to leave their existing stable work environment for the uncertain option of joining a new venture.

Through both economics and organizational behavior lenses, we explore the connection between an individual's performance and spin-out team assembly. First, economics logic implies that among prospective founders who are contemplating spinning-out, higher performing individuals face a higher opportunity cost. The more highly paid the potential founder, the greater the expected performance of the spin-out must be in order to convince a rational individual to venture out. The opportunity cost in terms of lost earnings for the founder provides a powerful signal to co-workers on the expected success of the venture (Spence, 1973). Co-workers combine this signal with other direct information, insights, and biases to form their assessment of the attractiveness of the spin-out opportunity which, in turn, shapes their own willingness to forgo their secure employment and join the new venture. This mechanism is particularly strong for more experienced workers. Because workers with higher tenure are less likely to leave their organization (Maertz & Griffeth, 2004), they require a stronger signal of new venture success in order to be convinced to leave. Thus, high performing founders have access to a larger and more experienced pool of potential spin-out team members, which leads to superior performance and a self-fulfilling prophecy of the economic signal (Merton, 1968).

Although signaling is a very important mechanism underpinning the ability of high-earning founders to generate high quality teams and thus impact firm performance, it is not the only mechanism that drives the relationship between founders and team assimilation. The necessity of complementary human capital to the success of a venture may depend on the nature

of tasks chosen by or assigned to the focal employee. Job complexity requires individuals that have higher underlying quality attributes (Garicano, 2000; Jones, 2009), and is associated with high labor market demand (Spitz-Oener, 2006) and consequently with higher performance in the form of earnings (Ophem, Hartog, & Vijverberg 1993). Job complexity also creates stronger incentives for high performing individuals to spin-out with a greater proportion of their existing team. Prior work has shown that higher complexity of tasks increases interdependencies among team members (Fleming & Sorenson, 2004). When solving a complex task, the team members' collaborative activities are fine-tuned; even the replacement of a single team member may have a dramatic negative effect on performance (Solow et al., 2002). Consequently, potential founders who create value by solving complicated problems have a strong incentive to keep collaborative teams intact. Similarly, team members collaborating on complex problems may need to significantly re-align their activities if part of their team departs and they decide to stay with the current firm. Further, it will be particularly beneficial to leave with those subordinates or co-workers who have longer tenure with each other, as a way of preserving the productive interdependencies and routines. Consistent with this logic, Ganco (2013) showed that complexity increases the likelihood of team, relative to individual spin-outs.

The organizational behavior literature on job embeddedness further informs the process of spin-out team formation. Job embeddedness highlights three dimensions—link, fit, and sacrifice—that impact the extent to which employees are wedded to their existing employment (Mitchell et al., 2001; Swider, Boswell, & Zimmerman, 2011). While “link” relates to the formal and informal ties with the institution, “fit” focuses on compatibility and comfort levels, and “sacrifice” relates to the tangible and intangible benefits that may be lost upon leaving the organization (Swider et al., 2011). These three important constructs provide insights on the manner in which a founder's characteristics determine the founding team size and tenure. Given that employees in an established organization are more often than not organized in vertical hierarchical structures, the links that subordinates have to the organization are embodied within the links to their superior (Rajan & Zingales, 2001). Thus, individuals who are already leaders in

the parent organization are more likely to convince linked subordinates to leave with them (Rajan & Zingales, 2001). Similarly, employee perceptions of fit with the organization are also intricately tied to the comfort and compatibility with their immediate superiors, as indicated by the vast literature on “leader-member exchange” or LMX (cf., Graen & Scandura, 1987). Ballinger, Lehman & Schoorman (2010) note that subordinate employees experience significantly more negative affect and are more likely to develop turnover intentions when their leaders depart. Importantly, Carnahan, Shapiro, & Agarwal (2012) theorize how departing leaders, particularly with transformational qualities, are more likely to elicit their subordinates to follow them to their next destination. Finally, perceptions of sacrifice are related to the risk and uncertainty associated with leaving a stable work place to be part of a new venture. In this context, Campbell et al. (2012) note that high performing individuals have a higher ability to recreate and transfer complementary assets, including the critical complementary *human capital* that is required for new venture success. The demonstrated leadership traits of such individuals are more likely to convince co-workers of their entrepreneurial ability, as scholars have noted the similarities between characteristics of leaders and entrepreneurs (Campbell et al., 2012; Ensley, Pearce, & Hmieleski, 2006). Thus, co-workers of high performing founders are more likely to perceive that the pecuniary and non-pecuniary returns from moving with the founder justify the decision (Carnahan, Agarwal, & Campbell, 2012).

Not only are high performing individuals more likely to play to potential recruits’ concerns of link, fit and sacrifice, but given these individuals’ high associated rank and status, they are likely to be in contact with more employees, in particular those with longer tenure in the firm. Thus, high performing individuals will be able to assemble a larger team, potentially with significant functional heterogeneity that has both complementary and supplementary fit. Further, given their superior performance and higher associated opportunity cost, they will be better able to address the dimensions of link, fit and sacrifice for co-workers with longer tenure, than individuals with lower performance. Importantly, they may also be able to create a contagion effect that promotes lift-outs of entire team members (Groysberg, et al, 2008). Thus,

*H1: Founder performance will be positively related to the size of the spin-out team*

*H2: Founder performance will be positively related to the tenure of the spin-out team*

### **Mediation of Founder —Firm Performance Relationship by Team Size**

A founder's ability to depart with teams of larger sizes will have important performance implications for both the parent and the spin-out firm. For the parent firm, while losing a "star" employee implies a significant loss of human capital, the performance effects may be driven by the individual's ability to recreate and transfer complementary assets (Campbell et al., 2012), thus increasing the competitive rivalry ramifications for the parent. The size of the team represents a greater transfer of rival resources than the simple additive effect of the resources of each individual team member. Because the core founder chooses the team members in order to maximize the value of the new firm, the synergies and complementarities between the founder and other team members will have a superadditive effect, which increases with team size.

First, when departing with teams of larger size, high performers not only take the tacit knowledge possessed by each departing employee, in a professional services context they also transfer the personal relationships with suppliers, complementors and clients. Importantly, aside from the additive effects of the transfer of each departing team member's human, social and financial capital, a founder who leaves with a team versus alone adversely impacts the parent firm for reasons directly related to the team formation. As indicated above, when starting a new venture, core founders need to not only select who among their co-workers may be best for the new venture, but also have to convince them to leave their existing employment. The selection and matching process thus requires significant vetting of each other by all departing team members. Founders that are able to assemble larger teams leave with more comprehensive knowledge breadth and depth, since departing teams may be constructed to optimize on linkages within and across specialized skills (Horwitz & Horwitz, 2007). Accordingly, it will be more costly for the parent firm to replace the knowledge embodied by high performing individuals who take a team of employees that works in concert to create value. In other words, the negative impact of the core founder's departure is the result of entire team's exit and not just the

departure of the individual. As a result, we posit a mediating relationship: the effect of founder performance on the firm performance occurs through the size of the assembled team.

For spin-outs, we expect that greater transfer of resources when founders assemble a larger team will have a positive effect on performance. Critical factors impacting new venture survival are its resource endowments and its perceived legitimacy and reputation. Founders who are able to assemble a larger team create a greater transfer of resources and relationships from the parent firm to the spin-out, and have more individuals contributing to the development of valuable organization capabilities. Further, larger team size allows the core founder to optimally configure the resources and knowledge embodied in each team member through the definition of roles, and the development of routines for generating organizational knowledge through specialization of members who can focus on specific roles and generate task-specific skills (Sine et al., 2006). The ability of a new venture to learn from other firms increases with the size of the start-up (Almeida, Dokko, & Rosenkopf, 2003), so founders who assemble larger teams are able to acquire more knowledge than founders with smaller teams. Together, these factors indicate that founders access critical knowledge through their ability to assemble a large team.

In summary, while prior literature suggests that the higher performing founders will enhance the performance of their new ventures and harm the performance of the parent firm due to superior individual skills and ability, we argue that this occurs due to the mediating effect of the teams they assemble to take to their young, uncertain organizations (Alvarez & Barney, 2005). Combining the effects on parent and spin-outs yields:

*H3: Team size mediates (a) the negative effect of founder performance on source firm performance and (b) the positive effect of founder performance on spin-out performance*

### **Mediation of Founder —Firm Performance Relationship by Team Tenure**

Prior literature has established that the performance of both parent and spin-out firms are affected by the longevity of experience embodied in the departing team. Consistently, we assume that the longer the individual team members were employed at the parent, the greater is the knowledge of routines and procedures of the parent firm possessed by them (Beckman,

2006; Phillips, 2002; Wezel et al., 2006). Because routines reflect “experiential wisdom” (Gavetti & Levinthal, 2000) and are associated with learning-by-doing (Argote et al., 1990, Becker 2005), when founders leave with employees that have larger accumulated experience in an organization, they are better able to replicate the routines from their parent to the spin-out. The greater the tacit knowledge embedded in the firm specific routines, the longer it will take for employees to acquire the requisite managerial skills and organizational capital. Thus, a founder’s ability to assemble teams that have longer team experience will critically determine to the extent to which important parent firm-specific knowledge can be replicated at the spin-out.

When founders depart with teams with longer tenure, their ability to replicate firm routines, norms and procedures within a spin-out organization will increase competitive pressure on the parent organization (Aime et al., 2010; Wezel et al., 2006), especially if the new organization is competitively “close” to the parent firm and targets the same customers. The greater the tenure of the team departing with the core founder, the more likely the spin-out’s routines and procedures will resemble the ones of the parent, and the greater the adverse impact on the parent firm. Thus, because higher performing founders can assemble a more experienced team, another mechanism through which founder performance impacts parent firm performance is the ability to attract experienced team members.

For spin-outs, a necessary condition for a new venture’s success is the founder’s ability to establish norms, routines and structures within which resources can be appropriately configured. Sine et al. (2006) and Gjerlov-Juel & Guenther (2012) find that start-ups with better developed structures and routines are more likely to be successful given early imprinting effects (Stinchcombe, 1965). Thus, in addition to the human capital available within the spin-out, the ability to replicate routines, norms and procedures is critical (Phillips, 2002; Wezel et al., 2006), and the managerial skill and the tacit knowledge of how to run an organization may be particularly useful within the context of the start-up firms (Mostafa & Klepper, 2010; Sine et al., 2006). As a result, founders who are able to transfer teams with longer tenures have a head start on many of the critical organizational and structural hurdles encountered in the nascent years of

the start-up. We thus anticipate that founders that assemble teams with longer tenure will have higher performance. Analogous to our prior hypothesis, the benefits to spin-out performance that are associated with a high performing founder partially occur through the assembly of teams that share longer experience, rather than a direct effect alone. Together, this implies:

*H4: Team tenure mediates (a) the negative effect of founder performance on source firm performance and (b) the positive effect of founder performance on spin-out performance*

## **DATA AND METHODOLOGY**

### **Context: The U.S. Legal Services Industry**

Several considerations, as also related to creation of variables necessary to test our hypotheses using large scale secondary and universal data under a reasonable set of assumptions, make the legal services industry an ideal setting. Conducting our analysis requires a context (a) representative of an important sector of the US economy, (b) where employee mobility and entrepreneurship is the critical manner in which knowledge is transferred or replicated across organizations, (c) where the important complementary assets are also embodied in other people, rather than in physical capital or intellectual property, (d) for which performance data is available at both the firm and individual level, and (e) where founders among a team of departing employees may be reasonably identified from their performance data, given industry norms.

First, the legal service industry is representative of the professional services sector, which has a prominent and growing role in the U.S. economy. Starting in the mid-20<sup>th</sup> century, there has been an increasing focus on services relative to manufacturing (Baumol, 1967, Fuchs, 1968), causing the service sector to now account for almost half of the U.S. GDP, while manufacturing sector has shrunk to less than half the service sector's size (BEA, 2008). In addition, a significant portion of this change is due to the growth in professional services (Buera & Kaboski, 2012).

Second, for a knowledge-based view study, legal services is a canonical example of a knowledge intensive industry where human assets are easily mobile and are the most important input in value creation and appropriation. There are very few barriers to entry and employee mobility in this industry because non-compete clauses are not enforceable and individuals who



have the necessary credentials are able to easily move between firms or create new ones.<sup>4</sup> Due to high human rather than physical capital intensity, the flow of knowledge via mobility across organizational boundaries is much easier than in manufacturing industries (Teece, 2003). Thus, examining our research questions in the legal services context allows us to isolate the factors related to the creation of entrepreneurial teams while abstracting away from other factors that may affect spin-out formation in manufacturing industries like technology and/or physical capital intensity (Agarwal et al., 2004; Klepper & Sleeper, 2005).

Third, the complementary assets that founders need to recreate or transfer across organizations are mainly embodied in people. These assets largely comprise of knowledge and skills related to legal practice (which may be tacit or codified; and industry or firm specific), client relationships, and brand reputation. The knowledge and skills related to legal practice are embodied in people, and most legal services firms are organized around the partnership model, with an emphasis on role complementarity among employees. The partners, experienced and practicing lawyers themselves, are the principals and equity holders in the firm and other individuals are employed either as staff (administrative assistants, secretaries and paralegals); or other lawyers (associates and non-equity partners).<sup>5</sup> Lawyers also embody client relationships, the source of revenue for the firm. Shely (2006), notes that firms are ethically obligated to inform clients when lawyers depart, since “clients are not chattels—the firm and departing lawyer cannot decide which clients can stay and which can go—the clients decide” (p 69). As in most professional contexts, client loyalty in legal services is largely to the lawyers who represent them and thus are the ‘face of the firm’ (Berling, 1993; Crosby, Evans, & Cowles, 1990; Iacobucci & Ostrom 1996; Solomon et al., 1985). Having clients who are willing to follow to the startup rather than stay with the parent (Beatty & Lee, 1996; Stull, 2009; Taylor, 2000, 2005) is an important complementary resource. This also implies that employees starting new firms can

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<sup>4</sup> Given state-specificity of bar exams, lawyers’ credentials are more transferable within than across state borders. Thus, the direct costs of mobility and of new firm generation are low within states in this industry.

<sup>5</sup> Lawyers typically account for approximately 80 percent of employees (Wymer, 2009). Equity partners are typically lawyers who have been promoted after six to ten years of practicing law and receive a share of profits.

potentially cash in on their parent firm's reputation, and use prior employer affiliation as a source of legitimacy for their new ventures (Burton et al., 2006). Indeed, news releases of new legal firms, as exemplified by the "Churn" section of *American Lawyer*, a leading practitioner journal, prominently discuss the employment history of their founders and employees.

Fourth, the dominance of the partnership model in legal services, as noted above, allows measurement of firm performance using data on employee compensation. Almost all revenues (overhead and other costs are typically a small and constant fraction of revenue) are returned back to employees and partners in the form of taxable earnings (Gilson & Mnookin 1985). Further, given the close connection between revenue generating client relationships and the underlying characteristics of employees, employee earnings reflect the value they bring to the firm, due to the composite effects of multiple dimensions including rank (Levine, 1993; O'Reilly, Main, & Crystal, 1988; Phillips, 2002; Rajan & Zingales, 2001; Wezel et al., 2006), human capital investments in education and experience (Mincer, 1974), social networks (Shaw, Duffy, Johnson, & Lockhart, 2005), or other indicators of "star performance" (Groysberg et al., 2008; Groysberg et al., 2009; Rosen, 1981). Accordingly earnings serve as a reliable reflective measure of individual level performance in legal services.<sup>6</sup>

Finally, conducting a large scale study that utilizes reliable data on compensation under strict confidentiality restrictions implies that we are constrained in the ability to know who the *core* founder is, within the departing team of employees. However, the legal services context permits the reasonable assumption that the core founder is the highest earner in the team, given industry norms.<sup>7</sup> This is also consistent with other studies in professional services that identify the leaders among teams based on their compensation, rank or other measures of "star" performance (Campbell et al., 2012; Groysberg et al., 2008; Phillips, 2002). For many of the

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<sup>6</sup> As noted in an earlier footnote, reflective indicators of an underlying construct may be interchangeable due to the positive inter-item correlations (Nunnally & Bernstein 1994) and hence use of one item is appropriate as long as it reflects the construct.

<sup>7</sup> Our understanding of the industry norms has been informed by articles and blogs published in industry practitioner outlets such as the *ABA Journal* (flagship journal of the American Bar Association) *American Lawyer*, *JD Journal*, and *abovethelaw.com*, as well as in-depth conversations with practicing lawyers.

reasons noted above, employees with the highest earnings before the spin-out event are the most critical to the success of the new venture. Specifically, when a new law firm is founded, the significant uncertainty about the success of the new firm stems from two main sources: Will clients follow? Will the “right” team follow? The highest earner in the departing team is most likely to bring the biggest “book” of client relationships. For the employees contemplating departure, the highest earner in the team serves both as a proxy for the external opportunities embodied in the start-up venture, and as a signal of opportunity costs, and we accordingly designate the highest earner as the core founder. Further, since earnings is also closely related to rank and status, it also captures the leader-subordinate relationships within law firm hierarchies that manifest the link, fit and sacrifice dimensions emphasized in organizational behavior studies (Mitchell et al., 2001; Rajan & Zingales, 2001; Swider et al., 2011). We note, however, that our study is limited inasmuch as our use of large scale, anonymous, and secondary data preclude us from identifying who actually initiated the idea.

**Data Source:**

The data are from a custom extract that contains linked employer-employee records drawn from state-level unemployment insurance (UI) records as well as several data products from the U.S. Census Bureau which comprise the Longitudinal Employer-Household Dynamics (LEHD) Project available at the Census Research Data Centers. Employers provide their state with a form ES-202 which lists all active employees covered under the UI program, their taxable earnings, and the firm’s characteristics each quarter. The LEHD project constructs two types of longitudinal records, those that include information for all employees under the UI program, including employer name and taxable earnings for all employment “spells” (periods), known as *employment history files*, and longitudinal records of all firm-level characteristics, *employer characteristic files*, from these mandatory submissions. In addition, the *individual characteristics files* append demographic information, including race, ethnicity, gender, age, and education. These files are either drawn or imputed from the Social Security Administration’s “Personal Characteristics Files,” the Decennial Census, the Current Population Survey, and the Survey of Income and

Program Participation. By combining these data files, we have detailed information on individual employees and firm level characteristics, along with the history of all employee-employer dyads.

Our data identify all individuals employed in U.S. legal services (NAICS code 541100) over more than ten years in ten large states. Since the data are drawn from mandatory filings, they cover the entire universe of legal services firms in the ten states. This universality permits us to track interfirm employee mobility and to identify new firms.

For the empirical analysis, we construct two frames of data—the parent firm frame, and the spin-out firm frame. For the parent firm frame, we construct a panel of parent firms (i.e. established firms that generated a spin-out in the prior period) where each observation represents a parent-firm year in which an established firm spawned at least one spin-out. This frame allows us to measure the immediate effect of losing a founding team on parent firm performance. To ensure that we have the appropriate sample to test our hypotheses, we impose the following restrictions: First, we exclude very small firms (less than five people) to eliminate their effects on the measured impact of mobility on firm performance. Second, to rule out potential reverse causality due to impending firm death, we limit our sample to “healthy” established firms by eliminating any observations where the firm dies within the next two years.<sup>8</sup> Third, to ensure that outlier observations are not driving results, we exclude firms with revenues per employee of less than \$10,000 or more than \$1,000,000, and firms that lost or gained more than 500 employees in any payroll class to an established firm or to a spin-out in a given year. These bounds also permit better identification of legal service partnerships. While the partnership structure is the dominant architecture in NAICS code 541100, there are other firms in this industry code that are not legal service partnerships: specifically, this industry code includes firms that contract to do low-end work for law firms such as paralegal firms and legal courier services. The lower bound we impose on revenues per employee allows us to exclude these non-law firms from our analyses. This restriction may also exclude very poorly performing

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<sup>8</sup> As would be expected, when “dying” firms are included in the analysis, there is a strong negative relationship between general mobility and firm performance, and there is no discernible difference of employee entrepreneurship over and above general mobility.

law firms and “hobby” law firms. Excluding these firms allows us to minimize the concerns of “rats leaving a sinking ship” where founders form firms not out of choice, but out of necessity. The upper bound on revenues per employee allows us to exclude the few firm-year observations that represent extreme earnings spikes. Since these extreme earnings spikes could trigger mobility and entrepreneurship through other mechanisms than our focal mechanisms, we refrain from including them in our analysis. The restriction on turnover allows us to exclude mergers, acquisitions, and administrative recoding of organizational identifiers.<sup>9</sup>

For the spin-out firm sample, we begin by identifying new firms in which at least one employee appeared in the payroll of an existing firm in our data in the preceding year. Approximately 10,000 spin-outs meet this criterion. We then construct a panel of all years between spin-out birth and their last observed year in our data.

## **Variables**

We aggregate the employee-level data to the parent firm and spin-out firm level to construct the following variables, and report the descriptive statistics and correlations in Tables 1 (parent firm frame) and 2 (spin-out frame).

***Parent firm performance:*** Consistent with prior work (Campbell et al., 2012) we use the firm’s revenue per employee to measure parent firm performance in the year following the spinout event. The firm’s revenue is obtained by aggregating the taxable income paid to everyone on the firm’s payroll (all earnings of partners, associates, paralegal, and administrative staff). The measure is net of non-compensation costs and set-asides for future years), and allows us to compare the productivity of firms of different sizes. To avoid estimating a spurious relationship caused due to denominator changes, we include replacement hires in our measure.

***Spin-out firm performance:*** To measure spin-out performance, we follow extant studies (Agarwal et al., 2004; Wezel et al., 2006; Phillips, 2002) and focus on survival, since it is a more accurate measure of the primary objective of the newly founded organization. For

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<sup>9</sup> An administrative recode is when the data collection agency changes a firm’s identification number. Administrative recodes appear in the data to be large mobility events where *all* of a firm’s employees move from an existing firm to a new firm. Inclusion of these events would contaminate our measures of mobility to spin-outs.

entrepreneurial start-ups, income-based measures may not reflect true performance and exhibit high variance and noise, given uncertainty and investment for developing future business opportunities (Campbell, 2013). Further, analysis of spin-outs using revenue per worker would condition our estimation on better surviving firms. We construct a dummy for “failure” which takes the value of 1 if the spin-out exits in the next year.

***Founder earnings:*** We use the earnings of the founder of the spin-out team as a reflective measure of the individual’s performance or underlying attributes related to quality. To operationalize this measure, we use the earnings of the individual that had the highest earnings while employed at the source firm among all individuals in the departing team. For parent firms that experienced more than one spin-out event in a year, we compute an average of the earnings of the founders across these events.

***Spin-out team size:*** This measure is a count of all individuals who moved from the parent firm to the focal spin-out in a year. For parent firms that experience multiple spin-out events in a particular year, we averaged the team size across the different spin-outs for that year.

***Spin-out team tenure:*** This measure captures the average number of years that the departing team members were employed at the parent firm. As above, for parent firms experiencing multiple spin-outs in any one year, we use the average across all spin-out events for that year.

***Control variables:*** The control variables in our parent performance estimations include firm fixed effects, time-variant firm-level variables, local labor market variables, as well as demographic variables. In addition to the time invariant firm fixed effect, we include controls for firm age, firm size and a lagged dependent variable to control for prior performance. We also control for the variance in earnings within each firm year. This measure allows us to control for the role of firms’ compensation structures in triggering mobility and employee entrepreneurship (Carnahan, Agarwal, & Campbell, 2012). At the local market level, we control for the number of other firms in the Metropolitan Statistical Area (MSA), total payroll in the MSA, total payroll in the MSA squared, growth of total payroll in the MSA, and growth of total payroll in the MSA squared. The MSA total payroll measures proxy for the overall demand for legal services in the

local market and the growth measures proxy for changes in demand in the local market. We add controls for employee demographic characteristics such as mean age, race and gender composition of the firm and mean education in the last quarter of each year. Since spin-outs are a subset of all mobility events, and some employees of the firm may move to other established firms, we also control for the effects of all employee exits in a year from the focal firm. These controls for all exiting employees include the number of individuals who left the firm, as well as the education, age, and gender of these employees. Further, we include controls for average team size, tenure and earnings for all departing employee events experienced by the firm in the focal year. These latter controls permit us to measure the effect of our key mobility to spin-out related measures, *above and beyond* the general effects of mobility. We also include the payroll of the parents' spin-outs in the new firms' first year of existence (averaged across all spin-outs if the firm spawned multiple spin-outs in a given year), this measure allows us to control for the effect of the opportunities that are being transferred from the parent firm.

In our spin-out survival estimations, we control for factors that may correlate with survival and spin-out team characteristics. We include controls for the size of the spin-out at entry to control for founding employees that came from other parent firms, and also current size of the spin-out. As in the parent firm regressions, we include a control for the revenues of the spin-out at founding to address the extent to which opportunities were available at the firm's inception. To capture the level of resources available at the prior employers of early employees at new ventures, we control for the average size<sup>10</sup> of the parent firm(s) across all employees in the new venture in the first year of existence and we control for the age of the founder's parent firm. Left censored age is accommodated with a dummy variable which takes the value 1 for firms that were founded prior to the first year in our data. We also include controls for quadratic terms for age of the spin-out to account for differences in hazard rates over time. Finally, to

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<sup>10</sup> The size of the parent firm(s) is measured in the first quarter of the year to prevent confounding of the results due to turnover that occurs during the remainder of the year. In instances where employees in the first year come from more than one established firm, we compute the average across all such parents.

capture competitive effects, we include the same MSA level controls as in the parent firm frame, and include year fixed effects to control for changes in conditions across years.

### **Estimation Methodology**

We estimate panel regression models that capture the relationship between the mediators and the spin-out founder earnings in hypotheses 1 and 2. We employ linear panel regression for parent firm performance after a spin-out event, and a cloglog model specification for spin-out survival to test hypotheses 3 and 4. In the parent sample, we utilize parent firm fixed effects to capture unobserved heterogeneity. In the spin-out sample, we estimate the effect of time-invariant spin-out team characteristics on survival which precludes us from using fixed effects.

To conduct our tests for mediation, we utilize Sobel (1982) tests and use a Monte Carlo Method to calculate confidence intervals (Selig & Preacher, 2008). Given large scale data and computing limitations, bootstrapping approaches to mediation analyses are not feasible in this analysis, however, Sobel tests are appropriate with our large sample sizes (Preacher & Hayes, 2008; Hayes & Preacher, 2010; Imai, Keele, & Tingley, 2010). We also confirm that the results are supported in the Baron & Kenny (1986) framework.

## **RESULTS**

We provide tests of our hypotheses in in Tables 3 and 4 respectively. In Table 5, we present results from Sobel (1982) tests and Monte Carlo confidence intervals (Selig & Preacher, 2008) to confirm our mediation hypotheses. In Table 3, models 1 and 2 demonstrate the relationship between spin-out founder earnings, team size and team tenure using the parent firm sample. The models include firm and year fixed effects as well as other time varying controls as described above. In both models, the positive and statistically significant coefficient of founder earnings indicates that higher earning founders attract larger teams and teams with greater tenure, and thus support hypotheses 1 and 2.

In Model 3, Table 3, we verify the adverse main effect of founder earnings on parent firm performance. The strong and significant negative relationship between founder earnings and parent firm performance is consistent with prior work (Campbell et al., 2012). The estimates



indicate that in a firm with average characteristics, a \$100,000 increase in the earnings of a founder has an adverse effect on the parent firm's revenue per employee of \$1,610 per employee in the year after losing (and potentially replacing) the founder. At mean levels, this translates to a 2.3 % loss in revenue per employee, and a \$135,000 loss in total revenue - above and beyond the revenue impact of losing a similar employee through general mobility.

Models 4 and 5 present single mediation models where the mediators of interest are spin-out team size and spin-out team tenure respectively. In model 6, we present the full model that includes all independent variable of interest. In model 4, the effect of departing spin-out team size on parent firm performance is strongly negative and significant even in the presence of founder earnings, and the coefficient on founder earnings becomes insignificant. The estimates of model 5, however, indicate that the tenure of the team that moves with a departing founder has no significant effect on parent firm performance. In model 6, spin-out team size is strongly significant while neither the direct effect of founder earnings nor the indirect effect via the tenure of the departing team is significant. The results in Table 3 are thus consistent with hypothesis 3a but not with hypothesis 4a. Using the estimates in model 6, a one person increase in the size of the spin-out team is associated with a \$969 decrease in revenues per employee at the parent firm in the subsequent year. At mean levels, this represents an \$81,000 loss in firm revenues above and beyond the loss associated with general mobility, and a 1.5% decrease in revenues per employee. Our findings are consistent with a 1 to 2 % change in productivity that is attributed to mobility (Parrotta & Pozzoli, 2012).

While the analysis in Table 3 aggregates across the multiple spin-out events within and across years for each parent, the results in Table 4 provide similar evidence for the spin-out sample. In Table 4, the focal unit of analysis is a single spin-out, and models 1 and 2 provide estimates of a panel regression where spin-out team size and team tenure respectively are a function of founder earnings, and controls relevant to the spin-out sample. In line with the results using the parent firm data, there is a strong significant relationship between founder earnings and the size and tenure of the team they assemble. Thus, regardless of whether one

focuses on the founder earnings compared to all other founders within a parent firm (Table 3), or founder earnings compared to other founders of all spin-outs (Table 4), these findings provide strong support for Hypotheses 1 and 2.

Model 3 of Table 4 presents the main effect of founder earnings on spin-out failure (the inverse of survival). The significant negative coefficient on founder earnings is consistent with prior work documenting the beneficial impact of founder earnings on spin-out performance (Gimeno, et al., 1997; Phillips, 2002). In terms of magnitude of the effect, at mean levels, we find that a \$100,000 increase in a founder's earnings decreases the likelihood of spin-out failure in any given year by 5% in any year. Given that the average age of a spin-out in our ten year sample is approximately four years, this implies a cumulative decrease in failure of almost 20%, and thus a substantial effect across multiple years.

Models 4-6 provides the tests of our mediation relationships, individually and collectively for team size and tenure. In models 4 and 5, each potential mediators is negatively related to spin-out failure even when controlling for founder earnings, and the direct effect of founder earnings is smaller in magnitude than in the model without mediators presented in Table 6. Model 6 of Table 4 presents the full model with both potential mediators. The results are suggestive of a partial mediation model where both potential mediators are negatively related to spin-out failure and the direct effect of founder earnings loses magnitude. Together, the results support the conditions necessary for the presence of a mediation effect of spin-out team size and spin-out team tenure on the effect of founder earnings on spin-out performance – consistent with hypotheses 3b and 4b. Given the estimated coefficients, an increase of founding team size by one person decreases the rate of failure in any given year by 4% and an increase in the average tenure of a founding team decreases the rate of failure in any given year by 6%.

In Table 5, we report the results of Sobel (1982) tests and Monte Carlo confidence intervals (Selig & Preacher, 2008) for all potential mediators. The z-score column contains the Sobel test statistic. The last columns in the panel contain the lower and upper bounds of a 95% confidence interval on the indirect effect using a Monte Carlo approach with 20,000 repetitions.

Under the assumption of normal sampling errors for the coefficients of interest, random draws from the distributions of the coefficients are performed to simulate the magnitude of the indirect effect and a confidence interval is then constructed from these simulations. We first examine the effect of mediators on the parent firm performance. The results in Table 3 suggest that spin-out team size satisfies the requirements for mediating the relationship between departing founder earnings and parent firm performance, while spin-out team tenure does not satisfy the requirements of mediation. The tests in the upper panel of Table 5 emphasize these results. The results demonstrate the z-score of the Sobel test is strongly significant for spin-out team size and is insignificant for spin-out team tenure and the Monte Carlo simulation suggests the confidence interval of the indirect effect associated with spin-out team size is statistically significantly different from zero, while the indirect effect associated with spin-out team tenure is not different from zero. This allows us to reject the null hypothesis that spin-out team size has no indirect effect, but we cannot reject that spin-out team tenure has no indirect effect. Thus, these test results are consistent with hypothesis 3a but not with 4a.

In the lower panel of Table 5, we examine the effect of mediators on spin-out firm performance. We find that for both potential mediators, the Sobel test statistic is significant at the 1% level rejecting the null hypothesis that there is no indirect effect. For both mediators, the 95% confidence interval does not include zero which, consistent with the Sobel test allows us to reject the null-hypotheses that there is no indirect effect. The data provide strong evidence of the presence of a mediating effect of spin-out team size and tenure on the relationship between founder earnings and spin-out performance. This provides support for hypotheses 3b and 4b.

In Table 6 we assess whether the mediators function simultaneously or sequentially. For both the parent and the spin-out sample frames, we specify a set of seemingly unrelated regressions to estimate the indirect effect that occurs via team size alone, the indirect effect that occurs via tenure alone, and the joint indirect effect. In the parent sample, we find that the indirect effect of only team size on parent firm performance is negative and statistically significant, while the indirect effect team tenure in isolation is not significant. Their joint effect

on parent firm performance is negative and significant. In the spin-out sample, we find that in isolation, both team size and team tenure have significant negative indirect effects on spin-out failure and their joint indirect effect is also significant and negative.

Finally, we note that the results described in Table 5 are consistent with the causal steps approach to analyzing mediation (Baron & Kenny, 1986). In Tables 3 and 4, model 3 corresponds to Baron and Kenny's first condition of mediation. Models 1 and 2 correspond to the second condition of mediation and Models 4-6 allow the assessment of the third and fourth conditions. The Baron and Kenny framework supports that team size mediates founder earnings, but team tenure does not in the parent firm estimates in Table 3 and supports the mediation effect of both the team size and team tenure in the spin-out estimates in Table 4.

### **Robustness Tests**

We perform a variety of robustness tests to examine the sensitivity of our results to alternate specifications and to alternative samples.

***Robustness to alternate specifications.*** We test the sensitivity of our results on spin-out performance to using revenue per employee as the dependent variable instead of firm survival. In Table 7, we re-estimate all of our spin-out results using revenue per employee. We find results that are generally consistent with our results using survival as the dependent variable, except that we do not find the hypothesized results on the team size coefficient. We note, however, that new firms are also *small* firms, and often, the spin-out team size may be the overall firm size. Given that early employees often forgo compensation in the short term to support long-term success, while we present the results on revenue per employee, it is with caution since it may not accurately capture firm performance in a spin-out context.

Additionally, we examine the robustness of our spin-out results to estimation using linear probability models and Cox proportional hazard models. These methods provide an alternate way to account for non-independence within observations across time. The results are available in Table 8. Our results are fully robust to these specifications.

***Robustness to alternative samples.*** In our base analyses, we exclude all firms with revenue per employee less than \$10,000 or greater than \$1,000,000. The lower bound eliminates firms that are unlikely to be law firm partnerships and firms that are not full-time endeavors. The upper bound eliminates firms that experience extreme spikes in revenues per employee which may trigger mobility and employee entrepreneurship through channels other than the focal mechanisms. In unreported regressions<sup>11</sup>, we test the sensitivity of our results. The results are unchanged for any upper bound up to and including \$1.5M of revenue per employee. This upper bound includes all but a handful of observations of very extreme outliers. The results are also unchanged for any lower bound between \$0 and \$50,000 of revenue per employee.

Another concern with our findings is that the results may be shaped by unobserved variation in the source of founding employees, since spin-out firms often draw employees from more than one established firm. To assess the sensitivity of our results to this concern, we re-estimate all of our results on the subsample of spin-outs where all founding employees at a new venture come from the same parent firms. Again, while we face disclosure constraints for this subsample analysis, unreported findings are strongly supportive of the results documented above (which include start-ups where employees come from multiple source firms).

In summary, the results are supported across multiple tests, multiple approaches to trimming outliers, and multiple specifications. We find strong support for the hypotheses that founder earnings impacts the departing team size and team tenure. Further, team size mediates the effect of founder earnings on both parent and spin-out firm performance. However, team tenure mediates only the effect of founder earnings and spin-out performance.

## **DISCUSSION AND CONCLUSION**

Within the rich literature on the competitive dynamics of parents and spin-outs, scholars have explicitly examined the effects of founder characteristics, founding team size and team

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<sup>11</sup> In order to protect the confidentiality of the respondents in the data, the Census Bureau reviews all results for disclosure in order to verify that it is not possible to identify any specific data from any specific respondents. Testing different outlier bounds creates a series of nested samples and some very small implicit samples. This creates disclosure limitations on sub sample analysis: when two slightly different samples are disclosed, it might be possible to infer identifying information about the handful of firms that are in one sample but not the other.

tenure on firm performance (Beckman, 2006; Campbell et al., 2012; Groysberg et al., 2008; 2009; Klepper & Thompson, 2010; Phillips 2002, Wezel et al., 2006). While collectively the scholarly work consistently points to an adverse effect on parent firm performance and a beneficial effect on spin-out firm performance, each of these studies have examined the effects of the three variables largely in isolation of the others. In doing so, these studies make the implicit assumption that effects of departing team size and team tenure are independent of the founder effect, and thus may be modeled either separately as “main effects” (e.g. Beckman, 2006; Phillips, 2002; Groysberg et al., 2009; Wezel et al., 2006), or may be interacted with founder performance to examine “moderating effects” (e.g. Groysberg et al., 2008). In contrast, we develop a theoretical framework that explicitly recognizes that higher performing founders have a higher likelihood of assembling teams that have the right mix of complementarities and experience, and thus, team size and tenure mediate the effect of founder performance (as measured by earnings) of both parent and spin-out performance. We test our hypotheses in the context of the legal services industry—a professional services context where employee mobility is critical to knowledge transfer and replication—and use the longitudinal and comprehensive linked employee-establishment data compiled in the Census LEHD project for our analysis.

The empirical analysis supports almost all the hypothesized relationships. Higher performing founders are more likely to assemble a team that is larger (hypothesis 1) and with higher tenure (hypothesis 2). Further, our results strongly support the mediating effect of team size on the negative relationship between founder and parent firm performance (hypothesis 3a), and the positive relationship between founder and spin-out performance (hypothesis 3b). Finally, the results fail to support the mediating effect of team tenure on founder and parent firm performance (hypothesis 4a), but show strong support for team tenure mediating the founder and spin-out performance relationship (hypothesis 4b). Thus, our results highlight the importance of understanding the linkages between founder and team characteristics. Rather than simply using either founder performance or team size and experience, we show that a richer model based on the interplay of these characteristics provides us with a deeper understanding

for how these factors impact both parent and spin-out performance. In particular, our results show that attributing the negative impact on the parent firm and the spin-out success to founders directly neglects their impact on performance due to their ability to assemble a team of complementary skills and experience. Higher performing founders are both better able to identify complementary human assets and better able to convince human assets to join them.

Our large-scale quantitative results are consistent with the motivating anecdotal evidence. While the stories of Robert Noyce and Gordon Moore serially founding Fairchild Semiconductor and Intel with other critical employees are legion (e.g. Moore & Davis, 2004) other, perhaps lesser known, examples are also very illustrative. No doubt, Walt Disney's individual characteristics played an important role in Ub Iwerks' willingness to forgo a steady job at Pesman-Rubin Commercial Art Studio in his hometown of Kansas City, and venture to California with Disney. In turn, the early and turbulent years for Disney witnessed Iwerks' steadfastness to the founder, even as Disney lost the ownership rights to the Mickey Mouse precursor "Oswald the Lucky Rabbit" to distributor Charles Mintz, who hired away most of Disney's key animators (Gabler, 2006). The complementarities and longstanding trust within the team of two played a critical role in Disney, Inc.'s ultimate success. Similarly, Johnson and Johnson was created by brothers, Edward M. Johnson and James W. Johnson, who had sales and engineering backgrounds respectively at parent firm Seabury and Johnson, which was actually started by a *third* brother, Robert W. Johnson. The complementary skills of Johnson and Johnson's founders and its early hires of Robert W. Johnson and 14 other Seabury and Johnson employees were critical to the ultimate demise of Seabury and Johnson, and to the spectacular success of Johnson and Johnson. In this case, Edward M. Johnson and James W. Johnson had high rank and quality, which combined with familial bonds and prior work experience, helped recruit the employees who had important complementary skills and experience from the surgical dressings business unit of Seabury and Johnson (Kilmer House, 2012).

In addition to highlighting the effect of team formation on the performance of spin-outs and parents, our study also has important implications for future research on the *transfer* versus

*spillover* effects of the knowledge between parent and spin-out firm performance. In this context, the lack of support for Hypothesis 4a, while all other hypotheses are strongly supported is particularly interesting. While there are many factors that could lead to the lack of support for Hypothesis 4a, examining this non-result through the lens of knowledge transfer versus spillover is potentially insightful, indicating a direction for future research. Since team size represents a *transfer* of rival resources from the parent to the spin-out, the symmetric support for Hypotheses 3a and 3b indicates that gains in spin-out firm performance are at the expense of the parent firm. Because better founders may be able to attract more employees from the parent firm due to better opportunities or more advantages relative to the parent firm., the size of the team reflects not only the additive influence of individuals leaving *en masse*, but also the effect of selection and synergies in the team composition: larger teams imply that these employees are walking out with higher potential value. However, to the extent that team tenure is a loose proxy for the knowledge of routines and practices implemented in the organization, and thus accessible to both organizations simultaneously, its effects are consistent with the impact of replication of non-rival knowledge or *spillover* of knowledge from the parent to the spin-out. The lack of support for hypothesis 4a while there is strong support for hypothesis 4b then suggests that parent firms are not necessarily hurt even as spin-outs benefit from knowledge spillovers. The parent firm is relatively unaffected, beyond the transfer of personnel, by the experience embodied in the departing team. Nonetheless, for a spin-out, the effect of additional team experience is as important as the team size. Thus, our study is consistent with the presence of differential effects of transfer versus spillover of knowledge on parent and spin-out firms respectively and suggests a fruitful line of further research in which the differential effects of knowledge transfer and spillovers are more fully explored.

Our research has a number of limitations, several of which may be rich avenues for future work. While, for the reasons noted in the empirical context section, the legal services industry permits us to closely mirror our hypothesized mechanisms with our empirical measures, there are nonetheless some generalizability concerns. We believe that the mechanisms and



relationships will hold across several other knowledge-based service industries, such as advertising, accounting, consulting, and financial services. However, future research could examine if our results also extend to manufacturing, wherein important complementary assets also relate to physical capital and intellectual property. Second, we do not measure direct competitive interactions between the parent and the spin-out. In particular, since we do not have access to the specialties of the team members, or other measures of the actual knowledge possessed by team members, we cannot compare the spin-out's set of specialties or knowledge base with that of the parent firm. Third, we cannot measure the opportunity pursued by the spin-out founder. While we control for the potential opportunity set by using the revenue stream in the founding year, we cannot directly infer any information on the size of the opportunity. This is an important limitation because the magnitude of the exogenous opportunity may be an omitted variable that drives the results. An alternative explanation is that higher quality opportunities are pursued by a larger and higher quality pool of employees. As a result, better opportunities lead to higher earning founders and larger, more experienced teams, as well as positive outcomes for spin-out success and negative revenue outcomes for the parent firm. However, we note that in the legal services context, opportunities are largely in the form of client relationships, which are in turn endogenous to the individuals that form the spin-out venture. Fourth, we cannot distinguish between voluntary and involuntary mobility. Prior work, however has noted that lower performing employees are more likely to seek employment at existing organizations rather than create new ventures (Campbell et al., 2012; Carnahan, Agarwal, & Campbell, 2012). To the extent that such individuals found new firms as an employment option of last resort, the adverse effect on parent firm performance of losing these lower earning employees and their experience may understate the impact of employee entrepreneurship and our estimates are conservative tests of our hypotheses. Fifth, we cannot completely rule out reverse mediation. In the spin-out sample, the reverse mediation tests were statistically insignificant. However, in the parent firm sample, we found that team-size affects firm performance through founder performance. We note that this pathway is logically unlikely,

particularly in our empirical context. Our reading of practitioner journals and conversations with lawyers indicate that a spin-out process where a team forms and then identifies a founder is much less likely than a process where the founder leaves and then rallies a team.<sup>12</sup> Finally, while we cannot explicitly address the skills and knowledge that followers bring to a spin-out, we assume that founders rally teams that provide complementary human capital, where the focus is on complementarity in skills and tasks. This assumption potentially contrasts with the existing literature on homophily of teams in new ventures that demonstrates that founders construct teams of people who come from similar backgrounds and have similar characteristics (Ruef, Aldrich, & Carter, 2003; Parker, 2006). An important direction for future research is to decompose demographic homophily and skill or task diversity within founding teams and examine the relationships between the two facets and their impacts on firm performance.

Limitations notwithstanding, we contribute to the literatures on the knowledge-based view of the firm and strategic human capital in the context of entrepreneurship. Our study contributes to the knowledge-based view (KBV) of the firm by exploring the micro-foundations of organizational capabilities and performance as related to individuals and teams, and thus answers calls for research linking micro level individual choices to macro level organizational level outcomes (Coleman, 1988; Abell, Felin, & Foss, 2008). While much of the extant work on parent-spin-out competitive dynamics abstracts away from the individual to focus on the firm level of analysis (e.g. Agarwal et al., 2004; Chatterji, 2009; Klepper & Sleeper, 2005), we add to the growing literature stream that connects individuals and team level constructs to organizational level outcomes. Within KBV, scholars have examined the extent to which tacit knowledge residing in individuals and in firm routines can be a source of competitive advantage (Barney & Wright, 1998; Coff, 1997; Wright et al., 1992). While their characteristics of valuable and rare are uncontested (Barney & Wright, 1998), imitability through employee mobility can result in such tacit knowledge *not* translating into sustainable competitive advantage (Coff, 1997;

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<sup>12</sup> Practitioner websites note the ethical restrictions on a founder's solicitation of other lawyers and staff *prior* to leaving. See for example the advice provided at <http://www.nowhiringu.com/so-you-are-leaving-your-law-firm-heres-how-to-do-it/>

Peteraf, 1993). Spin-outs represent a canonical case of knowledge diffusion across organizations through employees. We investigate the effects of such knowledge diffusion on both parent and spin-out firms simultaneously rather than separately, and thus are able to shed light on the micro-foundations of their competitive dynamics.

From an established firm's perspective, scholars in the strategic human capital domain have suggested that focusing on *team production* can serve as an isolating mechanism that inhibits the ability of any one individual to transfer value to a rival organization (Coff, 1997; Barney & Wright, 1998; Wright, et al., 1992). However, other scholars have documented that high performing individuals can "lift-out" teams (Groysberg, et al., 2008; Huckman & Pisano, 2006), but not examined whether such strategies have a stronger effect on the parent firm's competitive advantage. Our research contributes within this literature stream by drawing on the micro-underpinnings, and demonstrating how high performing individuals are particularly able to assemble larger and longer tenured teams of former co-workers. By highlighting that the ability to transfer a team is endogenous to individual efforts, we show that prior work that points to teams as isolating mechanisms for competitive advantage may have underappreciated the intricate connections between high performing individuals and their teams.

Our research also answers Agarwal, Audretsch & Sarkar (2010)'s call for research on knowledge-based competitive dynamics among firms by disentangling the effects of knowledge transfer from knowledge spillover. Our study sheds light on the underlying factors that enable spin-outs to initiate creative destruction (Schumpeter, 1934) on their parent firms. Our research suggests that the destruction of parent firm value wrought by the creation of spin-outs occurs potentially through the transfer of rival assets, not through the replication of non-rival assets. Further, by examining the impact of knowledge flow mechanisms on both parent firm performance and spin-out performance simultaneously rather than individually, we highlight that the effect of knowledge flows is potentially asymmetric during the spin-out process. Knowledge flow from a parent to a spin-out may have a differential impact on spin-out performance than on the performance of the parent. This asymmetry helps us make a stronger claim on the causal

patterns underpinning the role of knowledge on firm performance and provides an additional contribution (both theoretically and methodologically) to the knowledge-based view. Our theory and findings suggest that researchers should shift their attention to theories and empirical methods that go beyond focusing on one variable at a time and develop richer models that allow for interrelationships between variables and levels of analysis.

In the entrepreneurship domain, scholars examining micro-underpinnings of a firm's knowledge-based capabilities to explore performance effects have focused on "independent" effects of either the founders (Campbell et al., 2012; Phillips, 2002) or the founding teams (Beckman, 2006; Delmar & Shane, 2006). Because there are important interactions between founders and their founding teams, theory regarding the role of either founders or founding teams in isolation is under-specified and potentially incorrect. We thus build and extend prior literature by demonstrating a mediating relationship where team formation is endogenous to founder capabilities. This shows that firm performance is affected by the capabilities of a founder through the founder's ability to rally a high quality team. As the first study to explicitly model and test this relationship, our holistic model of how founders and their spin-out teams jointly determine start-up performance provides an important complement to prior work that under-specifies the relationship between founders and founding teams (Phillips, 2002; Wezel et al., 2006; Campbell et al., 2012) and highlights the need for future research that continues the exploration of the micro-foundations of entrepreneurship.

The mediating effect of complementary human assets leads to important practical implications for both spin-out founders and for managers of established firms faced with the threat of losing employees to a new venture. For spin-out founders, our results highlight the importance of both attracting a larger team and one with higher experience. While much of the entrepreneurship literature highlights the role of founders, a key mechanism through which founders affect the potential success of their ventures is assembling a strong, productive team. As a result, potential founders who are unable to attract colleagues to move with them to their new venture should reconsider founding a new venture. The ability to attract colleagues is an

important validation of the opportunity identified by the potential founder and of the ability of the founder to exploit that opportunity. If founders are unable to convince colleagues to leave their current jobs for the risk and uncertainty of a new venture, they are unlikely to be successful despite their own quality and confidence in the opportunity. In assembling a new team, founders must be cognizant of the interaction between their own quality and the team's quality. By developing links with co-workers and other potential team members at work, founders can increase the likelihood of success of their entrepreneurial venture. So, individuals who are interested in becoming entrepreneurs should start early in making connections with co-workers and developing these relationships as well as determining which co-workers have important complementary skills for the future venture. This highlights the value of developing social networks and enhancing leadership skills to potential founders.

For managers of parent firms that face the threat of an employee leaving to start a new venture, the mediating effect we identify sheds light on a powerful tool for minimizing the impact of losing a spin-out founder. Instead of investing in costly mechanisms that identify and discourage potential entrepreneurs, parent firms can take a more focused and reactive approach and target potential followers after a founder leaves the parent firm. Instead of discouraging potential entrepreneurs from establishing new ventures, the new goal may be to limit the founder's ability to assemble a team from their fellow employees at the parent firm. This could, in turn, be cost effective since team members typically receive lower pay relative to founders. By providing team members who provide important complementary assets to the founder with a retention package, the firm could simultaneously lower the adverse effect of the spin-out and the costs of preventing it. This is particularly true of the most recent hires, since they often are lower paid and the effect of team experience on the parent firm's performance is insignificant. Because the departing team's size plays such an important role in the adverse effect of a departing founder on parent firm performance (Phillips, 2002; Wezel et al., 2006), managers at existing organizations should focus on identifying factors that increase loyalty and connection of team members not to each other, but to the firm at large.

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TABLE 1  
Summary Statistics for Parent Sample

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Revenue/employee (measured in thousands)	67.85	45.15	1.00																
2 Team size, spin-out	1.50	1.69	0.03	1.00															
3 Avg tenure, spin-out team	1.95	1.96	0.05	0.16	1.00														
4 Spin-out founder earnings	50632	77517	0.32	0.28	0.22	1.00													
5 Avg. spin-out payroll in first year of existence	196.46	1804.11	0.03	0.10	0.02	0.08	1.00												
6 Avg. earnings, all employee exits	41471	46213	0.33	0.19	0.18	0.82	0.07	1.00											
7 Avg tenure, all employee exits	1.66	1.42	0.03	0.10	0.76	0.15	0.01	0.20	1.00										
8 Firm size	83.79	286.13	-0.02	0.07	0.00	0.00	0.04	0.01	-0.03	1.00									
9 Total number of employee exits	9.12	26.30	0.01	0.18	0.02	0.04	0.06	0.05	-0.03	0.70	1.00								
10 Avg team size, all employee exits	1.31	1.02	-0.01	0.57	0.10	0.17	0.06	0.20	0.07	0.30	0.53	1.00							
11 Within firm payroll variance	12497	152693	0.54	0.01	0.01	0.14	0.01	0.11	0.00	-0.01	0.00	0.01	1.00						
12 Firm age	4.67	2.79	0.05	0.05	0.36	0.04	-0.01	0.05	0.42	0.04	0.03	0.03	0.00	1.00					
13 Number of firms in MSA	1739	1610	0.17	0.01	0.02	0.07	0.01	0.08	0.00	-0.04	-0.01	-0.03	0.04	0.14	1.00				
14 Number of firms in MSA <sup>2</sup> (measured in thousands)	5617	9134	0.14	0.02	0.04	0.06	0.01	0.07	0.02	-0.03	-0.01	-0.02	0.03	0.17	0.95	1.00			
15 Payroll of all firms in MSA	13.45	1.81	0.12	0.05	0.01	0.06	0.04	0.07	-0.03	0.32	0.28	0.11	0.02	0.10	0.47	0.40	1.00		
16 Payroll of all firms in MSA <sup>2</sup>	184.22	48.99	0.11	0.05	0.01	0.05	0.04	0.07	-0.03	0.34	0.30	0.12	0.02	0.11	0.44	0.38	1.00	1.00	
17 Growth in MSA payroll	0.00	0.03	0.00	0.02	-0.01	0.00	-0.03	0.00	-0.01	0.04	0.02	0.02	0.00	-0.02	-0.06	-0.05	0.16	0.16	1.00
18 Growth in MSA payroll <sup>2</sup>	0.00	0.01	-0.01	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	-0.05	-0.04	0.07	0.08	0.66

Note: Sample size of all variables is 11,822 parenting years.

TABLE 2  
Summary Statistics for Spin-out Firm Sample

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Failure	0.07	0.25	1.00																
2 Avg tenure, spin-out team	1.62	1.77	-0.03	1.00															
3 Team size, spin-out team	1.66	1.99	-0.03	0.10	1.00														
4 Founder earnings	62089	92597	-0.03	0.15	0.26	1.00													
5 Spin-out size at entry	6.31	63.10	-0.01	-0.01	-0.01	0.00	1.00												
6 Spin-out payroll at entry	605.30	3254.69	-0.02	-0.01	0.02	0.03	0.77	1.00											
7 Avg emp. of parent firm(s)	352.94	4456.48	0.00	-0.03	0.01	-0.01	0.01	0.01	1.00										
8 Age of parent firm at spin-out birth	2.96	2.44	-0.02	0.59	0.03	0.02	0.00	-0.01	-0.02	1.00									
9 Dummy: age of parent is censored	0.19	0.39	0.00	0.07	0.08	-0.03	0.01	0.02	-0.03	0.07	1.00								
10 Spin-out size	12.71	66.59	-0.02	-0.02	0.04	0.00	0.68	0.75	0.02	-0.02	0.03	1.00							
11 Spin-out age	3.80	2.56	-0.06	-0.13	0.02	0.01	0.03	0.04	-0.04	-0.28	0.11	0.06	1.00						
12 Spin-out age <sup>2</sup>	21.02	26.65	-0.06	-0.14	0.02	0.01	0.03	0.03	-0.04	-0.27	0.11	0.05	0.96	1.00					
13 Number of firms in MSA	2887.90	3551.11	-0.10	0.07	0.01	0.06	-0.02	-0.03	0.06	0.16	-0.15	-0.03	0.18	0.19	1.00				
14 Number of firms in MSA <sup>2</sup> (measured in thousands)	21000	49200	-0.09	0.06	0.00	0.04	-0.01	-0.02	0.07	0.14	-0.14	-0.02	0.15	0.16	0.95	1.00			
15 Payroll of all firms in MSA	12.59	2.22	0.03	0.07	0.00	0.05	0.07	0.10	0.04	0.17	-0.15	0.12	0.22	0.22	0.70	0.58	1.00		
16 Payroll of all firms in MSA <sup>2</sup>	163.51	56.76	0.03	0.08	0.00	0.05	0.08	0.11	0.04	0.18	-0.14	0.12	0.23	0.23	0.72	0.62	0.99	1.00	
17 Growth in MSA payroll	0.07	-0.16	0.07	0.06	-0.01	-0.01	-0.02	-0.03	0.03	0.11	-0.01	-0.03	0.13	0.15	0.53	0.53	0.58	0.63	1.00
18 Growth in MSA payroll <sup>2</sup>	0.03	0.13	0.05	0.05	-0.01	-0.02	-0.02	-0.02	0.02	0.08	0.01	-0.02	0.08	0.09	0.30	0.29	0.37	0.40	0.85

Note: Sample size of all variables is 42,624 firm years spanning approximately 10,000 spin-outs.

TABLE 3  
Mediation of Founder Earnings on Parent Firm Performance

DV: Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Spin-out Team size	Spin-out Team Tenure	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Spin-out founder earnings (measured in thousands)	0.0099	(0.0004) ***	0.0074	(0.0005) ***	-0.0161	(0.0077) **	-0.0066	(0.0082)	-0.0179	(0.0080) **	-0.0086	(0.0084)
Team size, spin-out							-0.9605	(0.2656) ***			-0.9691	(0.2657) ***
Avg tenure, spin-out team									0.2476	(0.2559)	0.2757	(0.2557)
Lagged Revenue/employee (measured in thousands)					-0.0020	(0.0012) *	-0.0021	(0.0012) *	-0.0020	(0.0012) *	-0.0021	(0.0012) *
Avg spin-out payroll in first year (in thousands)	0.0568	(0.0109) ***	0.0003	(0.0113)	0.0291	(0.1951)	0.0865	(0.1954)	0.0295	(0.1951)	0.0874	(0.1954)
Avg earnings, all employee exits (in thousands)	-0.0133	(0.0008) ***	-0.0087	(0.0009) ***	0.1414	(0.0148) ***	0.1286	(0.0152) ***	0.1436	(0.0149) ***	0.1309	(0.0153) ***
Avg age, all employee exits	0.0082	(0.0046) *	-0.0011	(0.0047)	-0.0813	(0.0809)	-0.0734	(0.0809)	-0.0810	(0.0809)	-0.0731	(0.0809)
Avg education, all employee exits	-0.0048	(0.0180)	-0.0115	(0.0187)	-0.3158	(0.3192)	-0.3201	(0.3188)	-0.3129	(0.3192)	-0.3169	(0.3188)
Avg tenure, all employee exits	0.0447	(0.0218) **	1.0767	(0.0227) ***	-0.5361	(0.3863)	-0.4935	(0.3860)	-0.8027	(0.4746) *	-0.7900	(0.4739) *
Firm size	-0.0008	(0.0002) ***	0.0001	(0.0002)	-0.0296	(0.0041) ***	-0.0304	(0.0041) ***	-0.0296	(0.0041) ***	-0.0304	(0.0041) ***
Total number of employee exits	-0.0158	(0.0018) ***	0.0010	(0.0018)	0.0794	(0.0312) **	0.0641	(0.0315) **	0.0791	(0.0312) **	0.0637	(0.0315) **
Avg team size, all employee exits	1.3861	(0.0345) ***	0.0732	(0.0358) **	0.1839	(0.6112)	1.5148	(0.7127) **	0.1657	(0.6114)	1.5065	(0.7127) **
Within firm payroll variance (measured in thousands)	-0.0001	(0.0002)	-0.0001	(0.0002)	0.1245	(0.0029) ***	0.1244	(0.0029) ***	0.1245	(0.0029) ***	0.1244	(0.0029) ***
Firm age	0.0365	(0.0265)	0.0163	(0.0276)	1.4328	(0.4697) ***	1.4678	(0.4691) ***	1.4288	(0.4697) ***	1.4636	(0.4692) ***
Regional market controls?	Y		Y		Y		Y		Y		Y	
Demographic controls?	Y		Y		Y		Y		Y		Y	
Firm fixed effects?	Y		Y		Y		Y		Y		Y	
Year effects?	Y		Y		Y		Y		Y		Y	
Constant	-1.6026	(5.4991)	-5.0244	(5.7136)	16.9347	(97.4101)	15.2927	(97.2789)	18.1610	(97.4191)	16.6434	(97.2852)
N Observations	11822		11822		11822		11822		11822		11822	
N Groups	7349		7349		7349		7349		7349		7349	
R-sq: within =	0.38		0.5		0.33		0.33		0.33		0.33	
between =	0.42		0.67		0.32		0.31		0.32		0.31	
overall =	0.37		0.59		0.31		0.3		0.31		0.3	

Notes: Standard errors are robust and clustered on parent firm. Regional Market Controls include: Number of firms in MSA, Number of firms in MSA<sup>2</sup>, Payroll of all firms in MSA, Payroll of all firms in MSA<sup>2</sup>, Growth in MSA payroll, growth in MSA payroll<sup>2</sup>. Demographic Controls include: Avg age, Avg education, Avg tenure, % male, % white.

\*\*\* Significant at the 1% level \*\* Significant at the 5% level \* Significant at the 10% level.

TABLE 4  
Mediation of Founder Earnings on Spin-Out Firm Failure

DV: Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Spin-out	Team size	Spin-out	Team Tenure	Failure		Failure		Failure		Failure	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Founder earnings (measured in thousands)	0.0057	(0.0007) ***	0.0026	(0.0002) ***	-0.0015	(0.0003) ***	-0.0009	(0.0003) ***	-0.0012	(0.0003) ***	-0.0007	(0.0003) **
Team size, spin-out team							-0.0660	(0.0154) ***			-0.0629	(0.0152) ***
Avg tenure, spin-out team									-0.0505	(0.0149) ***	-0.0462	(0.0148) ***
Spin-out size at entry	-0.0020	(0.0003) ***	-0.0003	(0.0001) ***	-0.0027	(0.0018)	-0.0029	(0.0018)	-0.0027	(0.0018)	-0.0029	(0.0018)
Spin-out payroll at entry (measured in thousands)	0.0024	(0.0070)	0.0034	(0.0033)	0.0368	(0.0168) **	0.0328	(0.0168) *	0.0371	(0.0169) **	0.0331	(0.0169) *
Avg emp. of parent firm(s) (measured in thousands)	0.0055	(0.0020) ***	-0.0054	(0.0013) ***	-0.0011	(0.0043)	-0.0009	(0.0043)	-0.0012	(0.0043)	-0.0010	(0.0043)
Age of parent firm at spin-out birth	0.0195	(0.0048) ***	0.4484	(0.0048) ***	-0.0547	(0.0109) ***	-0.0537	(0.0109) ***	-0.0332	(0.0124) ***	-0.0341	(0.0124) ***
Dummy: Age of parent is censored	0.4217	(0.0329) ***	0.0553	(0.0208) ***	0.0191	(0.0546)	0.0365	(0.0548)	0.0203	(0.0546)	0.0363	(0.0548)
Spin-out size	0.0026	(0.0005) ***	-0.0002	(0.0002)	-0.0087	(0.0015) ***	-0.0078	(0.0015) ***	-0.0088	(0.0015) ***	-0.0080	(0.0015) ***
Spin-out age	-0.0013	(0.0135)	0.0887	(0.0091) ***	-0.1337	(0.0296) ***	-0.1321	(0.0296) ***	-0.1295	(0.0296) ***	-0.1283	(0.0296) ***
Spin-out age <sup>2</sup>	0.0013	(0.0013)	-0.0053	(0.0008) ***	0.0050	(0.0031)	0.0049	(0.0031)	0.0048	(0.0031)	0.0047	(0.0031)
Regional market controls?	Y		Y		Y		Y		Y		Y	
Constant	1.2891	(0.2533) ***	0.5116	(0.1941) ***	-4.1325	(0.6148) ***	-4.0633	(0.6135) ***	-4.1121	(0.6143) ***	-4.0494	(0.6131) ***
N Observations	42624		42624		42624		42624		42624		42624	
R <sup>2</sup>	0.08		0.37									
Log-likelihood					-8581.44		-8570.32		-8575.63		-8565	
LR chi2(28)					3623.91		3646		3635		3655	

Note: All models include year fixed effects. Standard errors are robust and clustered on parent firm. The universe represents approximately 10,000 spin-outs. Regional Market Controls include: Number of firms in MSA, Number of firms in MSA<sup>2</sup>, Payroll of all firms in MSA, Payroll of all firms in MSA<sup>2</sup>, Growth in MSA payroll, growth in MSA payroll<sup>2</sup>.

\*\*\* Significant at the 1% level \*\* Significant at the 5% level \* Significant at the 10% level.

TABLE 5  
Mediation Model Test Statistics

<b>Spin-out performance</b>									
	c	a	SE_a	b	SE_b	Z	effect ratio	MCMAM 95% CI	
Mediator: spin-out team size	-0.0009	0.0057	0.0007	-0.0660	0.0154	-3.838	0.409	-0.00058	-0.00019
Mediator: spin-out team tenure	-0.0012	0.0026	0.0002	-0.0505	0.0149	-3.239	0.110	-0.00021	-0.000005
<b>Parent firm performance</b>									
	c	a	SE_a	b	SE_b	Z	effect ratio	MCMAM 95% CI	
Mediator: spin-out team size	-0.0066	0.0099	0.0004	-0.9605	0.2656	-3.571	1.441	-0.01477	-0.00433
Mediator: spin-out team tenure	-0.0179	0.0074	0.0005	0.2476	0.2553	0.966	-0.103	-0.00188	0.00562

Notes:  $z = a*b/\sqrt{a^2SE_b^2+b^2SE_a^2}$

effect ratio =  $a*b/c$

MCMAM 95% CI = 95% confidence interval for the magnitude of the indirect effect using MCMAM (Monte Carlo Method for Assessing Mediation) with 20,000 repetitions (Selig and Preacher, 2008).

TABLE 6  
Joint Mediation Test Statistics

<b>Parent</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z-stat</b>
Indirect via Team size	-5.85E-06	1.57E-06	-3.74
Indirect via Tenure	1.60E-06	1.48E-06	1.08
Joint Indirect	-4.25E-06	2.09E-06	-2.04
<b>Spin-out</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z-stat</b>
Indirect via Team size	-1.27E-008	3.38E-009	-3.76
Indirect via Tenure	-7.46E-009	2.15E-009	-3.47
Joint Indirect	-2.02E-008	3.89E-009	-5.18



Table 7  
Mediation of Founder Earnings on Spin-Out Firm Revenue/Employee

DV: Variable	Model 1		Model 2		Model 3		Model 4	
	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee	Revenue/Employee
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Founder earnings (measured in thousands)	0.0720	(0.0328) **	0.0706	(0.0325) **	0.0641	(0.0408)	0.0645	(0.0406)
Avg tenure, spin-out team			1.0496	(0.2905) ***			1.0205	(0.3059) ***
Team size, spin-out team					0.3378	(0.3632)	0.2627	(0.3706)
Spin-out size at entry	-0.0804	(0.0108) ***	-0.0801	(0.0107) ***	-0.0799	(0.0108) ***	-0.0797	(0.0107) ***
Spin-out payroll at entry (measured in thousands)	3.4497	(0.2059) ***	3.4461	(0.2050) ***	3.4492	(0.2061) ***	3.4458	(0.2052) ***
Average team member earnings (measured in thousands)	0.2607	(0.0770) ***	0.2586	(0.0768) ***	0.2699	(0.0854) ***	0.2658	(0.0856) ***
Avg employment of parent firm(s) (measured in thousands)	-0.0061	(0.0513)	-0.0006	(0.0512)	-0.0075	(0.0512)	-0.0018	(0.0511)
Age of parent firm at startup birth	0.1731	(0.1591)	-0.2971	(0.2102)	0.1648	(0.1588)	-0.2905	(0.2127)
Dummy: Age of parent is censored	-5.8721	(0.8787) ***	-5.9362	(0.8835) ***	-5.9878	(0.8297) ***	-6.0245	(0.8324) ***
Spin-out size	-0.0485	(0.0082) ***	-0.0483	(0.0081) ***	-0.0493	(0.0083) ***	-0.0489	(0.0082) ***
Spin-out age	0.1093	(0.3993)	0.0159	(0.3991)	0.1110	(0.3991)	0.0198	(0.3993)
Spin-out age <sup>2</sup>	-0.0187	(0.0354)	-0.0132	(0.0353)	-0.0190	(0.0353)	-0.0136	(0.0353)
Regional market controls?	Y		Y		Y		Y	
Constant	-36.8014	(7.0176) ***	-37.3350	(7.0385) ***	-37.2515	(6.9635) ***	-37.6703	(6.9793) ***
N Observations	42624		42624		42624		42624	
R <sup>2</sup>	0.17		0.18		0.18		0.18	

Note: All models include year fixed effects. Standard errors are robust and clustered on parent firm. The universe represents approximately 10,000 spin-outs. Regional Market Controls include: # firms in MSA, # firms in MSA<sup>2</sup>, MSA total payroll, MSA total payroll<sup>2</sup>, MSA payroll growth, MSA payroll growth<sup>2</sup>.  
\*\*\* Significant at the 1% level \*\* Significant at the 5% level \* Significant at the 10% level.

TABLE 8  
Mediation of Founder Earnings on Spin-Out Failure – Alternate Specifications

	Linear Probability Model			Cox Proportion Hazard Model		
	Coefficient	Std. Err.		Haz. Ratio	Std. Err.	z
Founder earnings (measured in thousands)	-0.00002	(0.00001)		0.9999995	(0.0000003)	-1.56
Avg tenure, spin-out team	-0.00282	(0.00081)	***	0.9272470	(0.0134460)	-5.21 ***
Team size, spin-out team	-0.00225	(0.00060)	***	0.9541752	(0.0141096)	-3.17 ***

Note: All models are the same specification as in Table 4.  
\*\*\* Significant at the 1% level \*\* Significant at the 5% level \* Significant at the 10% level.