Carnegie Mellon
Tepper
SCHOOL OF BUSINESS

DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY
INDUSTRIAL ADMINISTRATION
(ORGANIZATIONAL BEHAVIOR AND THEORY)

Titled

"KNOWLEDGE TRANSFER BY EMPLOYEES ACROSS FIRM BOUNDARIES: A MICRO PROCESS WITH CONSEQUENTIAL MACRO OUTCOMES"

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ABSTRACT

The dissertation examines how the micro processes surrounding employee mobility across boundaries affect firms' ability to learn from their new recruits. I draw on literature from multiple disciplines, including Organizational Theory, Strategic Management, Psychology, and Entrepreneurship, to inform our understanding of employee mobility and firm capabilities. The dissertation uses multiple methods, including archival data analysis on industry-wide employee mobility, interviews with mobile employees, and a group laboratory experiment in which participants move randomly between groups. The approach taken in the dissertation advances knowledge about the relationship between employment movements and competitive advantage. The results advance our understanding of conditions that allow employee prior experiences to provide vital resources to their new firms. In particular, the results show that recruits whose backgrounds match the hiring firm's strategic focus and new hires who have worked as generalists allow for added benefits for their hiring firms.

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Introduction

The theoretical case for the importance of employees and their mobility across firms to persistent economic prosperity is compelling. A region's continued economic success is contingent on its industrial responsiveness to change (Schumpeter, 1934). As new productive areas open up, a region's economy can thrive if its firms move into these areas. Individuals move across firm boundaries as part of resources being redistributed from dying to thriving areas. As such, individuals' ability to contribute across firm boundaries enables a region's economy to prosper. Thus, the movement of employees across organizational boundaries and their subsequent use of knowledge are fundamental links to maintaining a flourishing economy.

Empirical evidence supports the significance of employment movements as a building block of industrial activity. Researchers have shown that restrictions on interfirm job movements or employee mobility are linked to decreased levels of regional economic activity. In particular, Marx, Strumsky, and Fleming (2009) found that the enforcement of non-compete agreements lowers the level of mobility between firms. The evidence from regional comparisons has shown that non-compete enforcement impedes firm formation (Samila & Sorenson, 2011; Fallick, Fleischman, & Rebitzer, 2006).

The quintessential example of the benefits from free-flowing labor movements is the continued economic prosperity enjoyed in California's Silicon Valley. The state does not enforce non-compete clauses, and workers switch jobs at heightened rates compared to other technology hubs in the country (Fallick, Fleischman, & Rebitzer, 2006). Many firm founders in the region draw on knowledge they developed during their prior work experience and begin firms in areas they worked on at their prior employers (Cheyre, Klepper, & Veloso, 2015).

Although both theoretical and empirical research supports the importance of employee mobility across organizational boundaries, little research has been conducted on how to facilitate the process. Beyond removing legal barriers on where current employees can next work, our knowledge about factors affecting when employees' prior experiences can enrich their subsequent employers is limited.

This dissertation fills the gap in our understanding of the micro underpinnings of when employee mobility enables knowledge flow into the hiring organization. The dissertation is composed of three chapters, each relying on a different method to evaluate the factors that enable interfirm employment movements to provide valuable knowledge resources to receiving organizations. In doing so, I not only advance the academic literature on employee mobility and the micro-foundations of firm performance, but I also generate practical insights for individuals moving between firms and firms hiring individuals with prior organizational experiences.

More specifically, the dissertation examines the conditions at the hiring organization and the characteristics of individuals' prior experiences that enable employee movements to result in successful knowledge transfer. In the first chapter, I review and integrate the literatures on knowledge transfer, employee mobility, and dynamic firm capabilities. Next, I examine when knowledge transfer by employee mobility occurs in the context of the U.S. laser industry and show that the extent of knowledge transfer is contingent on the hiring firm's strategy and the new hire's match to it. Therefore, the second chapter of my dissertation indicates that ensuring a strategic match of experience and new employment opportunity facilitates the use of prior experience. In the third and final chapter, I examine how the structure of work with which individuals gain experience affects their ability to contribute when newly hired. The final chapter

indicates that certain structural dimensions can inhibit employees' ability to transfer knowledge to other organizations.

In all, the dissertation makes a significant contribution to our understanding of a consequential phenomenon—how individuals move knowledge across firm boundaries. I show the conditions under which new hires are likely to be successful conduits of outside knowledge. This understanding helps explain why new hires vary in the contributions they are able to make to their new organizations and shows how organizations can most effectively bring in significant outside knowledge through hiring.

The dissertation also provides numerous insights for practitioners. For policy makers who care about supporting vibrant clusters of industry activity, the research brings to light challenges that individuals face as they transfer knowledge across firm boundaries. For managers whose organizations require externally generated knowledge to quickly adapt to a changing environment, I show that characteristics of potential new hires can facilitate their ability to bring in outside knowledge. For employees looking to manage their careers across employers, the research identifies characteristics of contexts that enable them to gain relatively portable knowledge and be able to contribute after moving to a new firm.

Next, I describe the research in each chapter of the dissertation in detail.

Overview

Chapter 1: A review and integration of the literatures on knowledge transfer, employee mobility, and dynamic firm capabilities

The first chapter of the dissertation reviews and integrates the literatures on knowledge transfer, employee mobility, and dynamic capabilities. I outline how firms can best learn from the prior experiences of their employees and the role this learning plays in the development of dynamic capabilities that confer sustained competitive advantage. I identify the conditions under which this learning is most likely to occur and propose how characteristics of the organizational context and characteristics of the knowledge being transferred affect a firm's ability to learn from others. Related work has theoretically outlined when employees' knowledge or human capital contributes to firms' competitive advantage (Campbell, Coff, & Kryscynski, 2012) and when employee mobility relates to significant organizational outcomes (Mawdsley & Somaya, 2016), and empirically shown conditions under which the hiring of individuals with prior organizational experiences increases the hiring firm's performance (Dahl & Sorenson, 2014; Agarwal, Campbell, Franco, & Ganco, 2015). My review provides a distinct contribution with its micro perspective on individual- and group-level processes that inform how knowledge can be successfully applied or transferred across boundaries.

I advance understanding of how employee mobility can enable dynamic capabilities by drawing on the literature on knowledge transfer, which provides insights into the challenges employees face when applying knowledge gained during a prior organizational experience to a new organization. The research on knowledge transfer, a core stream of the organizational learning literature (Argote, 2012), examines the process by which a focal unit's knowledge affects another units (Argote & Ingram, 2000; Argote & Fahrenkopf, 2016). The movement of

individuals between units is a powerful mechanism by which the experience of a donor unit can benefit a recipient unit because individuals can transfer both explicit and tacit knowledge (Berry & Broadbent, 1987) and adapt the knowledge to the new context (Allen, 1977). The knowledge brought in by a new member, however, does not always transfer, even when it could benefit the recipient's performance (Kane, Argote, & Levine, 2005). Units adept at transferring outside knowledge have been shown to be less confident in their performance (Choi & Levine, 2004), to have the appropriate absorptive capacity (Cohen & Levinthal, 1990; Szulanski, 1996), to share a superordinate identity with the member transferring (Kane et al. 2005), and to have more numerous relationships with organizations from which to transfer (Darr, Argote, & Epple, 1995).

The literature on knowledge transfer describes when employee mobility relates to important organizational outcomes. The research suggests that individuals can successfully bring in knowledge from their prior organizational experiences, but that individual- and group-level factors condition the process and circumscribe the benefits. In all, the first chapter informs when and where individuals can bring knowledge with them across firm boundaries and shows a clear theoretical link on improved firm performance gained from new recruits' prior organizational experiences.

This first chapter makes several contributions. The review synthesizes results about how individuals use knowledge across boundaries to support subsequent performance. The review provides a distinct perspective by integrating research from different disciplines relying on multiple methods. In addition, the insights gleaned from the literature integration provide a roadmap for the rest of the dissertation to focus on areas of theoretical importance. The next two chapters of the dissertation examine issues found in this review that are of theoretical importance but lacking in empirical evidence.

Chapter 2: Knowledge transfer by employee mobility in the U.S. laser industry

The second chapter of the dissertation empirically examines knowledge transfer by employee mobility in the context of the U.S. laser industry. The study uses archival firm and patent data along with interviews with scientists and engineers specific to employment movements in the U.S. laser industry. The context allows me to examine the extent to which knowledge transfer by employee mobility occurs and is conditioned by individual- and firm-factors.

I propose that the fit between inventors' previously developed knowledge and the current firm's capability development relates to the transfer and reuse of the inventor's knowledge. Building on specific technological domains requires direct experience as exemplified in Agrawal's (2006) study of the transfer of technical knowledge from academic inventions. The study's results show that the success rate of transfer went from 13% to 84% when the academic inventor directly aided the recipient with more than 1,000 hours of his or her time as opposed to when the inventor was not directly involved. In addition, I expect that inventors employed at a focal organization who do not have direct experience in the area where the firm currently operates are not associated with increased levels of knowledge flow into the firm. When an inventor's effort and motivation in a new context are focused on tasks unrelated to knowledge acquired in his or her prior experience, I expect that knowledge transfer is unlikely to transpire. Stated conversely, I expect that the use of new hires' prior experiences increases when the new hires' prior experiences match the firm's technological focus. From this, I generate my central hypothesis.

Hypothesis: *Inventor mobility leads to more knowledge transfer when the inventor's background fits the technological strategy of the hiring firm than when his or her background does not fit.*

To test this hypothesis, I examine knowledge flows for a sample of inventors before and after they change firms and at times when they fit and do not fit the technological focus of their new firms. Thus, I use a sample of inventor movements where I can observe the match of individuals' experiences to that of the capabilities under development at the hiring firm.

The U.S. laser industry offers ideal characteristics to gain the detail needed for this analysis. I use multiple data sources covering characteristics of the firms and individuals within the industry. Laser research and development have been widely pursued in industry, and the area does not have strong professional norms against mobility out of academic or other basic research institutions.

I use U.S. patent and firm laser device production data from the U.S. laser industry since the industry's start in 1960 until 2005. All inventors with at least one U.S. patent with a laser classification who move to a U.S. firm that produces a laser device are included. Firm data were collected from industry buyers' guides (Bhaskarabhatla & Klepper, 2014). Information on entry and exit years of each firm into laser device production allows me to identify when firms engage in capability development in laser technology. Inventors' experience with laser technology is noted by categorizing the laser inventors by whether their prior patents had a laser classification or not.

The analysis is done on two selections of inventor movements. One sample comprises a more restrictive selection of moves, which allows me to use inventor-fixed effects; the other sample comprises all laser inventor moves. The first sample includes 185 movements to 37 different firms, and the second includes 1,833 individual arrivals at 174 hiring firms. Both samples yield consistent significant results.

I find evidence that inventors with technological fit to their new firms are able to add considerably more to their new employer's knowledge base than their peers. My results indicate that firm knowledge is not transferred across firm boundaries by the movement of inventors in isolation, but as a combined result of firm capability development and the presence of new employees with direct experience in the area. Thus, promoting mechanisms that increase the precision of the match of experience with new employment opportunity is likely to facilitate knowledge transfer by employee mobility.

To further explore the findings of the second chapter, I interviewed 19 scientists and engineers working in the laser technology industry. Individuals were recruited and interviewed during the Conference on Lasers and Electro‐Optics 2014. During the interviews, respondents were asked about their prior employer and current employer and the reasons for the job change between the two. The interviews provide further support for the empirical findings from the archival data analysis. Respondents indicated that they benefited a great deal in their current roles from the technical knowledge acquired at their prior employers. An example response:

> "The prior employer was really in that ultrafast game at the beginning and went through a lot of the pains of development so when I came over here I brought some good knowledge on what should and should not be done."

Those who switched employers to pursue better opportunities reported a higher use of their prior experience than those who switched employers to leave unfavorable conditions at their prior employer. Individuals appear to move for disparate reasons. Although all draw on their prior experience, those strategically pulled to the current organizations use their experience more than those who move because of factors pushing them out of their prior employer.

The empirical study of employee mobility in the U.S. laser industry adds to our understanding of knowledge transfer by employee mobility in multiple ways. First, the study presents empirical evidence on the prevalence and facilitators of knowledge transfer by employee mobility in an industry in which no prior work has examined employee mobility. Second, both the archival analyses and interviews provide external validity for the prevalence of individuals moving knowledge across employers even when the knowledge is protected with intellectual property rights.

Third, the interviews with those working in the U.S. laser industry not only substantiate that individuals in dynamic industries are required to use their expertise across firm and technological boundaries, but also bring to light issues that individuals face in transferring knowledge along their careers. In particular, interviewees highlighted the benefit of working across technological domains as generalists for their ease of moving across organizational boundaries. For example, as one interviewee mentioned,

> "I don't want to be narrow in my technology focus, I want to be very broad in my technology focus…I did not want to be one of only thirty people in the world that was a slab laser expert so I have actually made a conscience decision to work in different industries and different fields to get a broader background... [I]t allows better mobility. I have worked for a lot of startups. I have worked for half a dozen startups, and when you work for startups you are taking a lot of risk. So you got to be mobile."

The second study strengthens the external validity of knowledge transfer by employee mobility, but is unable to establish tight causal relationships in the movement of knowledge by individuals across organizational boundaries. This drawback can plague any study on observed employee movements because of the confounding effects of the selection of individuals who change firms,

the firms where they go, and the knowledge they bring. Thus, I complement the archival analysis from the second study, which has high external validity, with a laboratory study, which has high internal validity, because it allows for the control of the selection of movers, destinations, and the knowledge transferred.

Chapter 3: Enabling high performance for employee mobility by working as a generalist

The third chapter describes a laboratory study that permits the precise identification of causal relationships between employee mobility and knowledge transfer. Participants are randomly selected to move between groups of three, and the mobile participants are given distinct knowledge that is significant to their new group's performance. The setup allows me to isolate whether manipulated characteristics of the mover's experience in his or her first group affect the likelihood that the mobile participant provides his or her knowledge to the new group. The basic experimental procedure that I developed can be used to address many questions related to employee mobility and knowledge transfer across organizational boundaries. I focus on an area that is identified as theoretically significant in the literature and encountered in practice, as found in the dissertation's second chapter.

I compare the effect of working as a generalist versus working as a specialist on their contributions to a new group. I consider individuals with specialist experience to have experience in specialized work divisions in which each member concentrates on a particular component of the group's task and individuals with generalist experience to have experience in structures in which each member performs all components of the group's task. Specialists have worked interdependently with others and developed skills and knowledge related to these individuals. From this, they have more organization-specific knowledge (Becker, 1962) and I expect that their experience is less transferable to other contexts because their knowledge is more dependent

on the prior organization's context (Argote & Ingram, 2000). That is, I expect that specialist experience inhibits an individual's ability to contribute in a new group as opposed to those with experience in general structures. Therefore, receiving a new member with specialist experience is not as valuable to the receiving organization as receiving a new member with generalist experience. From this, I generate my first hypothesis in chapter 3.

Hypothesis 1: *Recipient organizations with specialist movers have worse post-move performance than recipients with generalist movers.*

Next, I examine the similarity in context between where the new member came from and the recipient organization. To develop this idea, I use the concept of work division fit to indicate when the degree of work specialization with which a mover has worked matches the recipient organization's division of work. Groups receiving members with experience in similar contexts have work division fit. Movers without work division fit are not only working within a new organization but also encountering a different social context for work.

I propose that the effect of receiving a new member with specialist experience operates differently when the new member has work division fit than when he or she does not. When an individual moves between dissimilar work divisions, an adjustment to the new routines is required and the knowledge embedded in his or her prior experience must be adapted. I expect that specialists who lack fit are less equipped to make adaptions than specialists who have fit. When individuals' experience is restricted in their range of activities, as is the case with specialists, individuals gain proficiency in their tasks, but lose out on knowledge breadth. Limited breadth of knowledge hinders a new member's ability to adapt knowledge gained in one context to another context, because the individual lacks information on other areas and

interrelationships across areas. Thus, I expect that the negative effect of specialist experience should be magnified for groups receiving new members from dissimilar contexts.

Hypothesis 2: *Post-move performance is more negative when specialists move to a mismatched work division (i.e., specialist mover enters into generalist work division) than when specialists move to a matched work division (i.e., specialist new member enters into specialist work division) or when generalists move to either type of work division.*

The experimental study manipulates the structures of work in which members new to a group worked previously and the structure of work of recipient groups. Individuals perform a production task in three-person groups and receive a new member who has experience in another group using a superior production routine. Participants work either on all components of the task (general structure) or in an assembly line where they work on particular components (specialist structure) and then receive a new member. A new member from a donor group replaces a departing member from the recipient group mid-study. Performance is measured by the count of ships made in post-move work periods.

Both the division of work in which the new member has worked and that of the recipient group are manipulated. Specialist mover conditions are those in which the new member works on only part of the production task in an assembly line before membership change. General mover conditions are those in which the new member works on all parts of the tasks before membership change. The recipient groups have a specialist or a generalist group work routine, so the new members begin working in groups mid-study with a work routine that either matches their prior experience (specialist or generalist) or does not.

The results support the hypotheses proposed and show evidence on how and when receiving generalist movers differs from receiving specialist movers. Recipients gaining

specialist movers performed worse than those gaining generalist movers. Recipients with generalist work divisions outperformed recipients with specialist work divisions. We also found evidence for our predicted interaction between recipient work division and mover type. Recipients suffered more when the recipient had a generalist work division and received a specialist than in the other three conditions.

The third chapter furthers our understanding of how groups can learn by incorporating individuals with experiences in other contexts. The experiment offers high internal validity and, as such, provides evidence on the causal effects of moving individuals across groups with varying characteristics on their ability to transfer knowledge into their destinations. Thus, the research advances our knowledge on employee mobility by providing causal evidence of the effects of mobility and the conditions under which it enables knowledge transfer.

In addition, the study offers practical contributions for how individuals can prepare to work across boundaries and how managers can identify individuals who would likely be effective new hires. The findings indicate that individuals who have previously worked as generalists as opposed to specialists are more likely to be successful additions when newly hired. Further, the findings suggest that when a potential hire has worked previously in an organizational structure that is similar to that of the hiring firm, the likelihood that the individual contributes significantly in the firm is greater compared to when the individual has experience in a dissimilar structure wherein the individual has worked previously as a specialist.

Conclusion

Across the dissertation, I examine the conditions under which employees draw on their prior experiences to provide organizations with knowledge resources. I contribute to the literature on employee mobility and firm capabilities by focusing on micro processes at the

individual and group level to inform how knowledge transfer by employee mobility relates to firm outcomes. I apply the literature on knowledge transfer to areas of interest to strategy and organizational theory researchers: employee mobility and firm capabilities. I use multiple methods to further our understanding on knowledge transfer by employee mobility, including an archival analysis and a laboratory study—new methods not commonly used in the area. In all, the dissertation's approach adds a novel and informative perspective on the relationship between labor flows and firm performance and advances our understanding on how employees' prior experiences provide vital resources to their employers.

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Personnel Movement and the Development of Dynamic Capabilities: An Organizational Learning Perspective

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May 7, 2015

Prepared for Teece, D., & Leih, S. (Eds.), Oxford Handbook on Dynamic Capabilities, Oxford University Press.

Abstract

We assess the role that organizational learning plays in the development of dynamic capabilities that confer sustained competitive advantage on firms. We argue that learning from the experience of others is a mechanism for developing dynamic capabilities. We examine how firms can learn from the prior experiences of their founders and other employees and identify the conditions under which this learning is most likely to occur. We develop how characteristics of the organizational context and characteristics of the knowledge being transferred condition a firm's ability to learn from others. The chapter concludes with a set of expectations that we hope will stimulate future research on the important question of how learning from the experience of others enables firms to develop dynamic capabilities.

Keywords: Organizational learning, dynamic capabilities, personnel movement, knowledge transfer

Introduction

Although dynamic capabilities have been defined in many different ways, a common definition ties them closely to the idea that organizations are composed of capabilities from which the organizations gain viability. By this view, a focal capability is an organization's ability to perform a task or activity and in collection, capabilities compose the routine operations that result in the delivery of a firm's product or service. Adept capabilities are at the center of an organization's ability to provide value and compete. Building on this view, dynamic capability scholars have attended to the limitations of capabilities for sustained performance and instead highlighted the need to change how firms provide value and compete.

Prior theoretical work gives a broad view of what is a dynamic capability. Dynamic capabilities are defined as higher-level competences that play into a firm's ability to integrate, build, and reconfigure internal and external resources that help deal with and shape a changing environment (Teece, 1997; Teece, 2007; Teece, 2012). Similarly, a dynamic capability has been defined as "the capacity of an organization to purposefully create, extend or modify its resource base" (Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, & Winter, 2007). Common to these views is that dynamic capabilities determine the speed and degree to which resources can be aligned to take advantage of new opportunities in the environment. Teece (2007, 2012) categorizes the underlying competencies into those used for sensing opportunities in the environment, seizing promising opportunities, and transforming resources for new endeavors.

We follow this line of research in assessing the role of organizational learning in developing dynamic capabilities for a firm's sustained competitive advantage. Dynamic capabilities and

organizational learning are both research areas with a common interest in organizations' abilities to make use of experience outside their boundaries. Helfat et al. (2007) argued that a dynamic capability's contribution to a firm's evolutionary fitness is only evident from how it positions the organization in its environment including its relative positioning compared to competitor firms. Effective dynamic capabilities require a firm to continually establish a correct and deep understanding of its environment and other organizations in the environment. Learning from the experience of others is a mechanism for establishing this deep understanding of the environment. Organizational learning scholars have illuminated how organizations can learn from the experience of other organizations, a phenomenon that has also been referred to as knowledge transfer or vicarious learning.

In this chapter, we explicitly connect dynamic capabilities and organizational learning by examining how firms can learn from the prior experiences of their founders and new members. While a broader overlap between the dynamic capabilities and organizational learning exists, we have chosen to focus on learning from others via personnel mobility because personnel mobility has immense potential to enable a firm to sense threats and opportunities in the environment and reconfigure correctly. We review work that informs understanding of firms' transfer of knowledge from other organizations in the environment and develop expectations on the conditions under which firms can ensure a heightened level of knowledge flow from these external sources. As part of this discussion, we describe how "there is nothing automatic about [] organizational learning" (Teece, 2014 p.337) by considering how organizational context and knowledge dependencies affect an organization's ability to learn from others.

Organizational learning

Organizational learning is a process through which organizational experience is turned into knowledge (Argote & Miron-Spektor, 2011). Organizational learning is a mechanism through which organizations develop capabilities. Past experience is stored in the organization and affects future performance. Organizational learning is also a mechanism through which organizations adapt to changes in their environments.

Organizations can either learn as a byproduct from activities that have alternative purposes or make opportunities to focus on learning. The distinction between the two types of learning opportunities can be described as emergent learning and intentional learning. Learning-by-doing is the quintessential example of emergent learning because it occurs while organizations accrue experience in production. The purpose of production activities is to generate the organization's output but learning to complete these activities more efficiently typically results from the organization repeating production procedures.

On the other hand, managers can intentionally put aside time and other resources to create opportunities for learning. Such activities might include internal training workshops, course reimbursement programs, and research and development (R&D) efforts. Activities with the sole purpose to foster learning do so by increasing the rate, extent, or breadth of an organization's exposure to experience. The experience could be simulated or generated through experimentation.

Organizations can engage in intentional learning with the intent of developing new capabilities either in areas distant from or similar to the organization's current operations. Building new capabilities distant from their knowledge base is challenging for organizations. The historical account of Du Pont's internal R&D points to the challenges the firm faced in diversifying

through new opportunities generated from its basic research investment. Du Pont was successful, however, in diversifying into new commercial areas based on internal R&D advancements, most notably its development of nylon. The areas Du Pont branched into as a result of its R&D investment were areas proximate to those in which the organization was already active (Hounshell and Smith, 1988).

Organizations can benefit from complementarities between engaging in intentional learning and an organization's ability to learn emergently (Bresman 2010). By investing in R&D, organizations can increase their absorptive capacity or their ability to learn from others (Cohen & Levinthal, 1990). Also, management can instill a more learning centric culture by engaging in intentional learning activities and thereby increasing the rate of emergent learning. Bunderson and Sufcliff (2003) found that teams with a learning orientation performed more effectively than those with a stronger focus on performance.

Organizations can learn from their own experience or the experience of others (Levitt & March, 1988). Although both types of learning are essential for sustained performance, learning through the experience of others is particularly important for developing dynamic capabilities.

Developing dynamic capabilities necessitates an understanding of the environment and the other organizations in it. These include customers, suppliers, institutions, regulatory authorities, standard-setting bodies, judiciary, and education and research organizations (Teece, 2009). Teece (2014, p.337) highlights that learning is a critical dimension of dynamic capabilities including learning "(i) what customers want, (ii) what new technologies might allow, (iii) what aspects of the business model are working, and (iv) whether the current strategy is effective and the company is on the path toward building a great business."

Organizations can learn from the experience of external parties by transferring knowledge through a number of different mechanisms. A firm can directly learn from the experience of another through dyadic behaviors such as alliances, joint ventures, multinational relationships, mergers and acquisitions and other firm-to-firm communications. Organizational knowledge can also be disclosed publicly through patents, industry or company reports and other generally accessible forums such as industry conferences. Other mechanisms through which one organization learns from another involve the transfer of knowledge unintentionally disclosed by the source. These include products (Mansfield, 1985), third parties such as suppliers, consultants, or investors such as venture capitalists and the movement of individuals between organizations (Corredoira & Rosenkopf, 2010; Song Almeida & Wu, 2003). Also, organizational knowledge can be transmitted by the adoption of the source's organizational routines.

Attempts to learn from others vary in their success and knowledge transfer is not always achieved (Argote & Ingram, 2000; Szulanski, 1996). Thus, facilitators of knowledge transfer have been examined in prior work. Such factors include characteristics of the source and recipient units, the source – recipient dyad and the nature of the knowledge transmitted.

Characteristics of an organization can affect the likelihood that it is the source of knowledge. Haunschild and Miner (1997) found that firms with exceptional performance and larger firms were more likely to be imitated than firms with average performance and smaller ones. Also, organizations that are high status (Sine, Shane & Di Gregorio, 2003) and successful (Baum & Berta, 1998) have been found to be copied more by other organizations than lower status, less successful organizations.

Recipients with the needed absorptive capacity (Cohen & Levinthal, 1990) are more likely to engage in successful knowledge transfer (Szulanski, 1996). Also, Galbraith (1990) found that prior experience with knowledge transfer improved a recipient's use of a newly transferred technology. Further, the recipient's ability to adapt knowledge in the new context has been shown to increase the amount of knowledge transferred (Williams, 2007).

Characteristics of the source – recipient dyad that are significant for the transfer of knowledge include a strong tie or relationship (Szulanski 1996; Zollo & Reuer, 2010), geographical proximity (Rosenkopf & Almeida, 2003), similarity (Argote & Ingram, 2000) and shared identify (Kane, Argote & Levine, 2005). Involvement in a superordinate relationship has been shown to be an important factor affecting knowledge transfer across organizations. Superordinate relationships significant here include franchise ownership (Darr, Argote & Epple, 1995), same chain membership (Baum & Ingram, 1998), alliances (Powell, Koput & Smith-Doerr, 1996) and regional institutions (McEvily & Zaheer, 1999). The benefits in transferring knowledge from a shared superordinate relationship may include both increased motivation to transfer knowledge and increased communication between the source and recipient.

Characteristics of the transfer process can also affect the extent of knowledge transfer. The time frame in which the transfer occurs is an important aspect of the transfer process. Baum and Ingram (1998) found that hotels were able to learn from the experience of other hotels at the time when they were founded, but learning from the experience of others stopped after the period in which they were founded (see also Argote, Beckman & Epple, 1990). This finding suggests that transfer early in an organization's life is more likely to be successful than during other windows of time. In contrast, Darr et al. (1995) found that pizza franchises learned continuously throughout the period that pizza production was observed. Here the knowledge gained was

primarily embedded in routines and individual employees, which might be easier to alter than knowledge embedded in technology and physical arrangements.

Characteristics of the knowledge transferred condition the extent of transfer. Knowledge that is high in "causal ambiguity" or knowledge that is not well-understood is harder to transfer than knowledge that is understood more clearly (Szulanski, 1996). Also, knowledge that is low in demonstrability (Laughlin, 1988) or cannot be easily explained and shown as appropriate has been found to transfer more readily when the source and recipient shared a superordinate relationship than when they did not (Kane, 2010). Knowledge can be explicit and able to be encoded or tacit and hard-to-articulate. Explicit knowledge is easier to transfer than tacit knowledge (Zander & Kogut, 1995) because explicit knowledge can be encoded and captured by reports or databases. On the other hand, the transfer of tacit knowledge requires deep interaction, and therefore, cannot be transferred by any mechanism of knowledge transfer.

The movement of individuals from source to recipient has many advantages for the recipient's ability to learn from others. Individuals are able to transfer both tacit and explicit knowledge when they move from one context to another (Berry & Broadbent, 1987). Even with other mechanisms of knowledge transfer in place, the movement of individuals from the source to the recipient facilitates additional knowledge transfer (Galbraith, 1990). Also, individuals are able to restructure the information being transferred to reflect the new context (Allen, 1977). Adaptation to the new context is especially important when transferring knowledge across organizational boundaries because the similarity between different organizations is typically less than the similarity within organizational boundaries. Therefore, we argue that the inclusion of individuals is a very powerful mechanism of knowledge transfer into the organization and therefore, essential to the organization's developing dynamic capabilities.

Literature review on knowledge transfer by personnel mobility

We focus our discussion on the movement of individuals across organizational boundaries and how new organizational members, both founders and other employees, can best support organizational learning. Organizational knowledge can reside within individuals in the organization and knowledge embedded within individuals can, and often is, a major part of organizational knowledge. Individuals gain knowledge through their organizational experiences by both learning on the job and by engaging in training and educational programs offered within the organizational context.

The effect of new members on an organization's ability to learn from others can be described using different outcome measures. Knowledge transfer can be measured by an increase in the use of knowledge embedded in the new member's prior experience by the recipient organization (Singh & Agrawal, 2011), by an increase in the recipient organization's performance after the arrival of the new member, or other observable changes at the recipient organization that can be closely linked to the inclusion of the new member such as changes in routines (Kane et al., 2005), increased participation in new industry norms (Lacetera, Cockburn & Henderson, 2004) or increased probability of innovation (Rao & Drazin, 2002).

Individual-level performance outcomes of the new member can also capture knowledge transfer by personnel mobility. If new members increase their performance compared to that obtained during their prior experiences, this may reflect successful knowledge transfer while decreases in performance may reflect knowledge loss, depreciation or misalignment to the new context (Groysberg, Lee & Nanda, 2008). Studies that focus on the effect of personnel loss to other organizations measure the increased chance of dissolution of the organizations from which

individuals leave (Wezel, Cattani & Pennings, 2006). This outcome implicitly measures performance increases at the hiring firm associated with the inclusion of these new members with organizational experiences.

The inclusion of new members into an organization does not always contribute to organizational learning. Organizational factors, such as the rate of socialization at the hiring organization, can impact the new member's effect. In March's (1991) well-known simulation of organizational learning, he found that the faster new members were socialized into the organization, the less the organization learned from them. Aggressive levels of litigiousness of the source organization have also been found to inhibit the new member's effect at the hiring organization (Agarwal, Ganco & Ziedonis, 2009).

The institutional environment also plays a role in the extent individuals draw on their prior experience across organizational boundaries. In particular, laws related to non-compete agreements (also known as non-compete covenants) and non-disclosure agreements are designed to restrict employees' use of knowledge gained at one organization in another. While the sole purpose of non-disclosure agreements is to restrict employees' future use of knowledge, non-compete agreements only limit individuals from working within the same industry because the employee can only be prohibited from taking a job that puts the prior employer's interests at risk. Interests at risk include customers, employer provided training, and broadly defined trade secrets (Stone 2002).

The restrictions on and legal enforcement of employee use of knowledge gained during employment illuminate the important strategic value such knowledge has for employees and their future employers. Non-compete agreements are enforced differentially across states providing a

means to examine the impact of limiting knowledge transfer by the movement of individuals across organizational boundaries. Limiting individuals' use of relevant knowledge has been shown to be detrimental to firm and industry activity, which underscores the importance of organizations learning through the prior experiences of both their founders and other employees. For example, Samila and Sorenson (2011) found that the enforcement of non-compete covenants reduced the impact of venture capital on innovation and the number of firm foundings. Researchers have furthered our understanding of the implications of laws regulating employee knowledge by examining non-compete covenants but our understanding of non-disclosure agreements is more limited and an area that would benefit from future examination.

Further characteristics of the hiring organizations have been found to relate to the amount gained from the experiences of their new hires. In a study of recruitment from competitors in the mutual fund industry, Rao and Drazin (2002) found that younger and poorly connected mutual fund families were more likely to gain from their new hires than those mutual fund families that were older and well-connected. Song et al. (2003) examined when semiconductor firms were more likely to transfer knowledge from the backgrounds of newly hired inventors and found that firms that exhibited low path dependency, measured by a low ratio of self-citations to all citations made by the firm's prior patents, were more likely to transfer knowledge than firms that exhibited high path dependency. The type of task engaged in also moderates the effect of new members. Groysberg and Lee (2009) found star security analysts suffered performance declines after arriving at a new firm. The decline was observed for analysts who performed both exploitive and explorative tasks at the new firms, but analysts working on explorative tasks suffered larger performance declines than those working on exploitative tasks.

A stream of research in social psychology examines groups' utilization of new members' knowledge (for a review see Rink et al. 2013). Utilization of new member's knowledge is more likely when recipient groups have a history of failure (Choi & Levine 2004), receive assigned work as opposed to self-chosen work (Choi & Levine, 2004), and when the new member acts assertively (Hansen & Levine, 2009).

The knowledge brought in by new members can be characterized by its content. Dokko, Wilk and Rothbard (2009) directly measured knowledge embedded in new hires' prior organizational experiences and delineated between related task knowledge and skill, on the one hand, and learned habits and norms, on the other, in a study of call center workers. The researchers found that the call center employees' prior experience affected their performance at the current call center positively through related task knowledge and skills and negatively through learned habits and norms. The researchers attributed the negative affect of prior experience to behavioral rigidities that slowed adaptation to the new context. Dokko and Gaba (2012) differentiated individuals' experience by either direct task experience or experience with the context in which the task is currently applied and found those with context experience were more likely than those with task experience to modify the task. Song et al. (2003) found that the hiring of individuals with experience in the hiring firm's core technological area resulted in less knowledge transfer than the hiring of those with experience in other areas.

Another characteristic of employee knowledge that has received attention by labor economists and strategy scholars is general versus specific human capital. The distinction between these two types of employee knowledge is its usefulness across contexts. Firm-specific human capital includes an individual's knowledge, skills and abilities that are useful within a specific firm, but limited in their usefulness outside the focal firm; general human capital includes knowledge,

skills and ability that are useful more broadly and not limited in applicability to one firm (Becker, 1964). Firm-specific human capital is not useful outside the focal firm while general human capital is. The separation of human capital into general and firm-specific relates closely to knowledge that is transferable across firm contexts and knowledge that is not. Research on the applicability of human capital across firms would benefit from considering the facilitators of knowledge transfer across contexts.

The distinction between firm-specific and general knowledge has received attention by strategy scholars because of its theoretical relation to a firm's ability to gain competitive advantage from its employees. First, firm-specific knowledge, as opposed to general knowledge, can help keep trained employees at the firm away from competitors because employees realize they would lose their ability to use their firm-specific human capital. Wang, He, and Mahoney (2009) found that firms with higher levels of firm-specific knowledge stocks were more likely to enact policies, such as employee stock ownership and firm-employee relationships, to entice their key employees to make firm-specific investments. The finding suggests that employees understand the limited applicability of firm-specific knowledge because firms appear to enact policies to compensate their employees for high levels of firm-specific knowledge. Firm-specific human capital can also contribute to a firm's competitive advantage when employees do leave, because they are unable to make use of their firm-specific human capital elsewhere.

Campbell, Coff, and Kryscynski (2012) examined the conditions under which human capital can provides a source of competitive advantage and showed that under the right conditions either general or firm-specific human capital can enable firms to capture value from their employees. Their framework highlights the importance of constraints on the movements of individuals from a firm to other competitors: when constraints on the supply of mobility from a firm are high, then

employees' knowledge is more likely to be a source of competitive advantage whether it be general or firm-specific. Closely related are constraints inhibiting employees' ability to transfer their knowledge elsewhere such as high level of path dependencies (Song et al., 2003) or fast rates of socialization (March, 1991) at the hiring firm.

Our main proposition is that organizations learn about the environment via the prior experiences of the individuals at the firm and that this process can help support dynamic capabilities. Nevertheless, the support of dynamic capabilities should be considered in junction with a firm's execution of its existing capabilities. Successful organizations must be ambidextrous (O'Reilly & Tushman, 2008; Raisch, Birkinshaw, Probst & Tushman 2009), effectively executing existing capabilities while developing new ones.

Individuals within organizations contribute to the organization's ability to be ambidextrous and achieve the dual goals of exploiting existing capabilities while exploring new ones. March (1991) models explicitly how employees with a diversity of knowledge can contribute to an organization's knowledge stock both by exploration and exploitation. Insights from March's paper are particularly relevant in understanding how organizational learning from employee prior experience can support an ambidextrous organization. March (1991) allows each individual to contribute to an organization's knowledge base by either exploring or exploiting. Exploring is done by those hired into the organization in the current period and exploiting is done by those with tenure in the organization. The organization's knowledge base remains relevant and achieves a higher level of knowledge in equilibrium when individuals bring in outside knowledge (explore). The benefit of new hires, however, does not rely on them having quality knowledge backgrounds. The new hires have on average lower quality knowledge, but provide value to the organization by the diversity in knowledge that they import. When new employees'

prior experiences overlap, however, with those already within the organization or provide only very similar knowledge, employees' prior experiences do not provide the diversity benefits.

Another pertinent finding from March's (1991) simulation is that employing individuals of two types, those who explore and those who exploit, provides the organization with a higher level of knowledge in equilibrium than do homogenous individuals with the same average level of exploration or exploitation. Experimental evidence suggests that a similar duality within individuals, where each employee is simultaneously given both goals of exploiting and exploring, can also benefit performance. Miron-Spektor and Beenen (2015) found that giving individuals simultaneously the joint goals of producing novel and useful products increased the novelty and usefulness of their products to a greater extent than giving individuals the joint goals sequentially.

Literature review on knowledge transfer by founder teams

Just as employees bring their prior experiences when newly hired, firm founders draw on their experiences to shape their firms. Entrepreneurship research has shown that the prior organizational experiences of founders are extremely important in establishing their new ventures. For a review on the ways in which founders can make use of their prior organizational experiences, see Sorensen and Fassiotto (2011). Although founders enjoy many benefits from their prior organizational experiences, we focus here on the knowledge gained through their prior experiences.

The jack-of-all-trades theory of entrepreneurship highlights how the knowledge gained through organizational experiences shapes the behavior of entrepreneurs. Lazear (2005) posits that individuals with competencies in many skills are better equipped to become entrepreneurs than

those with more narrow skillsets because of the breadth of tasks required by entrepreneurs. Thus, individuals who have organizational experiences that provide them with more general skillsets are more likely to become entrepreneurs (Lazear 2004) and be successful once they have founded their own firms than individuals with more narrow experiences. Sorensen and Phillips (2011) found that Dutch founders with prior experiences at large firms began firms that had lower levels of performance and shorter survival times than founders with prior experiences at small firms. The authors attributed the poorer performance of those with experience in large firms to the difficulties employees encounter in larger organizations in developing more general skillsets. The research supporting the jack-of-all-trades theory of entrepreneurship shows how the knowledge individuals acquire affects their outcomes moving forward and in particular, their ability to contribute to dynamic capabilities.

Founders bring knowledge gained during their prior experience and the effects have been captured with different measures. Heightened survival rates of spinoff firms, startup firms with founders who have prior experience in the same industry the firm enters, have been attributed, in part, to the founders' use of industry knowledge at their new firms (Phillips, 2000; Agarwal Echambadi, Franco & Sarkar, 2004; Klepper, 2002). New firm growth rates also have been attributed to the prior experience of firm founders. Eisenhardt and Schoonhoven (1990) measured new firms' rates of growth and how prior work affiliations of the founder teams relate to firm growth rates. Teams with at least three founders and at least 50% of the members who had joint prior experience and whose members had above average variability in their collective industry experience were found to have startups that exhibited significantly higher growth and survival rates than founder teams without these characteristics. Knowledge gained during founders' prior experiences also shapes the opportunities pursued by their new firms (Shane,

2000; Bhide, 2000). For example, Simons and Roberts (2008) found that entrepreneurs in the Israeli wine industry with non-local wine industry experience had firms with increased odds of producing non-kosher wine.

Another line of work on entrepreneurial firms indirectly measures knowledge transferred from founders' prior experiences by examining constraint in the behavior of their new firms. The underlying mechanism here is that the more limited the knowledge in the founders' backgrounds, the more limited the behavior of their new firms. Beckman (2006) found that the more common the prior affiliations of founding team members, the more likely the new firm would engage in exploitative behaviors while the less founding team members shared prior affiliations, the more likely the new firm engaged in explorative behaviors. Fern, Cardinal and O'Neill (2012) found diversity of founders' experiences lessens constraints on new firms' entry choices. Ding (2011) found young biotech firms with founding teams that have a high proportion of members with PhDs were more likely to adopt an open-science strategy than those with a low proportion of Ph.D.s.

The knowledge used by founders can be characterized by its content. Agarwal and Shah (2014) provided a review of studies examining founder backgrounds and a framework of how founders' knowledge shapes the types of opportunities their firms pursue. Research on spinoff firms has differentiated knowledge gained through prior industry experience into that on how to organize and that on technical and industry know-how. Several studies have shown that founders bring knowledge of how to organize their new ventures from their parent firms, where they gained experience. Founders draw on their experiences to design the initial structure of their new firms. Founders replicate their parents' routines so that their organizational blueprints tend to look like those of their parents (Phillips, 2002). Other studies have shown that founders bring technical

and industry knowledge from their parent firms to their new firms. Agarwal et al. (2004) found that spinoff founders benefit from access to product designs and production information, which suggests that founders bring technical and industry know-how to their new firms. Klepper and Sleeper (2005) found that spinoffs produced technologies that overlapped with those offered by their parent firms and Klepper (2002) found that a spinoff's level of success in the industry was predicted by the level of success of its parent in the industry. These studies can be interpreted as indication that the spinoff founders gained technical and industry know-how during their prior experiences.

The extent founders transfer knowledge from their prior experiences varies. Spinoffs founded by teams who had shared prior experiences outperformed those whose founders did not (Phillips, 2002). Founders who performed better during their prior organizational experiences also have been shown to found higher performing firms than those who had worse performance at their prior organizations. This relationship has been attributed to higher performing founders founding firms with teams of individuals with extensive experience of working together previously (Agarwal, Campbell, Franco & Ganco 2014).

The composition of founders' experiences can also affect new firm's ability to learn from experiences of others by means other than the founders' prior experiences. The experiences of founders relate to characteristics of the firm's employees. Dahl and Sorenson (2014) found that, compared to other startup founders, spinoff founders hired more experienced employees, which contributed to the spinoff performance advantage. Beckman and Burton (2008) found that the composition of experiences of the founding teams shaped the subsequent composition of their firm's top management team's functional expertise. Firms with founding teams composed of individuals with more diverse functional experiences subsequently built top management teams

with greater breadth of functional experiences than firms with founding teams with a limited range of experiences.

The connection between prior organizational experiences and an individual's ability to build new capabilities is particularly observable in the work on founders. The research provides strong empirical support for the notion that dynamic capabilities can lie in the mind of the organizational leader (Teece, 2014) and that this ability is tied to an individual drawing on his or her prior organizational experiences. Von Krogh, Nonaka and Rechsteiner (2012) discussed the interplay between leadership and organizational knowledge creation and provided a framework of how leadership orients an organization's knowledge creation activities.

While research shows that the knowledge background of founders shapes the opportunities they pursue and their methods of organizing their new firms, it remains unclear if the knowledge background of founders affects their organizations or if founders with certain innate characteristics are selected into particular organizational contexts providing them with the observable beneficial knowledge backgrounds. Untangling the underlying causal mechanism in how the knowledge context relates to founders' future outcomes is a promising area for future research.

Expectations

The movement of individuals with prior experiences across firm boundaries can bring knowledge into recipient organizations. The importance of this knowledge is likely to vary across recipients because of the individuals' ability to make use of their prior experiences and the receiving firms'

need of outside knowledge. We develop expectations about the conditions under which we expect new members to facilitate the hiring organization's learning from others.

What are the conditions under which a newcomer to an organization is likely to effect change in the new firm? We theorize that personnel movement would be more effective when individuals move with their teams rather than as solo individuals. Wezel, Cattani and Pennings (2006) found that personnel mobility across firms was most effective when collectives rather than individuals moved. Similarly, Groysberg and Lee (2009) found that the effectiveness of individuals moving to a new organization was enhanced by hiring other members of their previous teams. Also, Campbell, Saxton, and Banerjee (2013) find that co-mobility of athletes between teams in the National Basketball Association diminished the negative effect of receiving a new player, for both the mobile individual and receiving team.

We conjecture that the presence (or absence) of a well-developed transactive memory system could explain these results. When intact groups move from one organization to another, they can bring their transactive memory systems with them. Colloquially known as knowledge of "who knows what," a transactive memory system is a collective system for encoding, storing and retrieving information (Wegner, 1986). Members know who is good at what and assign tasks to the most qualified member. Members also know whom to consult for advice and how to coordinate their activities. Transactive memory systems, which develop as team members work together, have been found to improve team performance on a variety of tasks (Ren & Argote, 2011). The effectiveness of transactive memory systems is negatively affected by membership change (Moreland, Argote & Krishnan, 1996; Lewis, Belleveau, Herndon & Keller, 2007). Because individuals differ in their knowledge and skills, a transactive memory system developed with one group of colleagues is not likely to be relevant for another. Thus, when individuals

move with their group intact, they can continue to benefit from their transactive memory system. By contrast, when individuals move alone, the transactive memory system that developed in their previous group is not likely to fit the skills and expertise of new group members.

Several other factors are likely to affect the extent to which a new member is able to bring about change in an organization. Because new members are likely to have different knowledge and perspectives than members of the organization that they join, studies conducted by social psychologists on the conditions under which an individual with a minority viewpoint is likely to change a majority are relevant for understanding when personnel movement is likely to lead to knowledge transfer. A critical factor affecting the extent to which a minority is influential is credibility (Wood, Lundgren, Ouellette, Buscene & Blackstone, 1994). Thus, we expect that the credibility of new members would affect the extent to which they are able to influence an organization. Demonstrating concern for outcomes at the new organization rather than for their personal outcomes also increases the influence of new members (Eagly, Wood & Chaiken, 1978). Support from other group members also increases the influence of a minority (Penrod & Hastie, 1980). New members who share a social identity with members of the organization that they join are more likely to effect change in the new organization than those who do not (Kane, Argote & Levine, 2005). New members who offer "demonstrably correct" suggestions are more likely to be influential than those who provide information that is not as obviously correct (Laughlin, 1988). Groups whose primary objective is to learn are more open to minority ideas than those whose primary objective is to perform (Smith, Tindale & Dugoni, 1996).

The organizational context is likely to affect new members' experience enacting change. New members' knowledge can be highly dependent on the context of their prior employer. The ability of a new member to use his or her knowledge could depend on other employees, routines,

tools or other components of the organizational context at the prior employer. This dependency poses challenges when individuals move across contexts because the complementarities that enabled them to be effective at their previous firms might not exist at their new firms. Huckman and Pisano (2006) provide an example of this phenomenon. The researchers found that the outcomes of surgeons who performed the same operation in different hospitals differed significantly across the hospitals. We expect that new members who relied on organization-specific resources and routines during their prior experiences will find it problematic to achieve similar outcomes at their new organizations. Another example of this phenomenon is found from the examination of the likelihood an inventor engages in entrepreneurship. Gambardella, Ganco and Honore (2014) found that an inventor's likelihood to transition to entrepreneurship decreases the more interdependent the patent is with other patents at the inventor's firm. Inventors rated a given patent's level of interdependence by the extent to which "focal patent belonged to a group of patents that 'crucially depend on each other in terms of their value, or in a technical way.'"

We expect the similarity between the context of the prior employer and the current organization moderates the extent to which the interdependence of a new hire's experience conditions his or her ability to enact change. Similarity of context between two organizations reflects similarity in their basic elements including members and tools and similarity in organizational characteristics such as structure and culture. Certain organizations have more similar contexts than others and we expect individuals moving between them to face fewer challenges than individuals moving between different contexts.

Organizations that are likely to share similarities in context include organizations under similar isomorphic pressures or those designed by using the same organizing principles. Spinoff founders often use organizing principles identified during their experiences at the parent

organizations (Phillips, 2002). Steve Jobs said of his experience at Hewlitt Packard "What I learned there [HP] was the blueprint we used for Apple" (Overfelt, 2003). Also, spinoff founders heavily recruit from their parents (Cheyre, Klepper, & Veloso, 2015). Both factors increase the similarity in contexts between the parent and spinoff organizations. Thus, individuals who are recruited from the parent organizations move between more similar contexts than those recruited from other firms and, we argue, are more able to transfer knowledge from the parent into the spinoff organization. Consistent with this expectation, Philips (2002) found that the success of newly formed law firms was greater when a high proportion of their members came from the same firm rather than from different firms.

Spinoff founders may also have the ability to recruit employees more effective at transferring knowledge because of the composition of their experience compared to other startup founders. Spinoff founders are likely to have relationships with individuals who have industry experience and also have the experience needed to evaluate which potential recruits possess needed skills. Prior industry experience should enhance founders' ability to recognize and choose those with the backgrounds necessary for their startups' operation because of their familiarity with what employees did at the parent firm and their backgrounds.

We have discussed when we expect new members' should be able to make use of their prior experiences and now turn to our expectations on when the prior experiences of founders and employees should be particularly important for firms' dynamic capabilities. The importance of the prior organizational experiences of new member is likely to be greater when there are fewer substitutes for the knowledge embedded in them and when the new members are more central to the performance of the hiring organization.

The extent of possible substitutes for the knowledge embedded in new members varies across organizations. When industry knowledge is highly tacit or yet to be codified, such as at the beginning of an industry or after significant technological changes, the movement of individuals is an especially effective transfer mechanism because individuals can bring tacit as well as explicit knowledge when they move. Other mechanisms of knowledge transfer, such as tools or documents, are unlikely to substitute for the movement or engagement of individuals with direct prior experience. Consistent with this conjecture, Agrawal (2006) found that firms developing technologies invented by academics were much more likely to commercialize the technologies successfully when the academics themselves were involved in the process than when they were not. Having individuals with direct experiences involved in the process provides knowledge apparently unavailable through other means. In cases where direct experience provides access to unique knowledge about new technologies or procedures, the hiring of individuals should be especially important for the firm's success in responding to these new developments.

Other factors also limit the extent to which substitutes exist for hiring individuals with prior organizational experience. For example, when industry experience provides knowledge and skills unavailable through training at the focal firm or at academic institutions, firms must rely on hiring individuals with the appropriate organizational experiences. These individuals with the right experiences should play an important role in firm's development in the area.

Once the constraints limiting alternative mechanisms of knowledge are removed, the importance of new hires' prior experiences should diminish. For example, when the related knowledge base is encoded and transferrable by other mechanisms, such as blueprints or templates, the importance of personnel mobility should decrease.

The knowledge embedded in new hires' experiences can also vary in its importance to the firm's performance or ability to create value. If collaborations with other organizations are particularly important for an organization's performance, then bringing in members with experiences at those organizations will be important. Carnahan and Somaya (2013) found that suppliers lost business when buyers hired employees with prior experiences at competitor supplier firms.

It is unlikely that all new hires will bring experiences important to the firm's ability to create value and moreover, prior organizational experience may be detrimental at times. For example, if the experience is not relevant for the new context, relying on it can be harmful. Individual's prior experience influence their future behavior by shaping the range of behaviors and cognition (Gavetti & Levinthal, 2000), which can have a negative impact on performance when newly hired (Dokko et al., 2009). New organizational members requiring only the potential to grow and offer flexibility in how they contribute are unlikely to be important sources of knowledge from the environment and their ability to add value should be irrelevant to, and possibly hampered by, their prior organizational experiences.

Conclusion

Learning from others via inter-organizational personnel movements has significant potential to enhance a firm's understanding of and response to its environment. Because dynamic capabilities can only provide a source of sustained competitive advantage when they reflect a deep understanding of the firm's environment and allow the firm to continuously adapt, personnel mobility is especially relevant when considering the development of a firm's dynamic capabilities. We have shown that individuals can be powerful sources of external information and believe that the inclusion of individuals with the right prior experiences is essential to firms'

ability to change and adapt appropriately. The overview in this chapter covers the scholarship on firms' ability to transfer knowledge from the prior experiences of their founders and new members. We also offer our expectations on further areas that could benefit from research. We see a tremendous opportunity for research to more closely examine how and when firms can gain important insights from the prior experiences of their members.

In this chapter we focus on how one type of organizational learning, learning from others via the movement of individuals between firms, can support a firm's dynamic capabilities. We believe, however, the overlap between the dynamic capabilities framework and organizational learning is vast. Both areas are built on the same fundamental assumption that organizations change. The dynamic capabilities framework showcases the importance of change in organizational life for firm survival and success and describes the steps by which organizations can change for increased survival and success. Organizational learning examines the process by which organizations improve their performance and provides empirical evidence on how organizations can best learn and improve. Thus, organizational learning informs how firms can effectively enact dynamic capabilities.

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INVENTOR MOBILITY AND HIRING FIRM STRATEGIC FIT IN THE U.S. LASER INDUSTRY

Abstract

Building upon the literature on knowledge transfer, employee mobility and firm capabilities, I argue and find that the inward employee movements of those whose backgrounds fit with the hiring firms' strategic focus result in more learning-by-hiring. As such, my results show that the rate of interfirm knowledge flow associated with employee mobility depends on factors occurring within the hiring firm. The study focuses on the U.S. laser industry, using patent and firm production data. The analyses examine the mobility of inventors with laser patents to laser device producing firms. The results suggest that firm knowledge does not transfer equally across firm boundaries by the movement of inventors, but depends on the movement of an individual with a particular set of experiences. Implications for the literature on employee mobility and firm capability development are discussed.

Keywords: employee mobility, firm capabilities, laser industry, knowledge transfer, knowledge flows

Management scholars have shown interest in furthering our understanding of employee mobility, in part because the phenomena is a mechanism through which interfirm knowledge transfer occurs (Mawdsley & Somaya, 2016). Interfirm knowledge transfer by employee mobility refers to the movement of knowledge between firms, from one source firm to another recipient firm, occurring because an individual changes jobs or because of affiliation between the source and recipient firm. In other words, knowledge transfer by employee mobility captures the phenomena that occurs when a focal firm hires an individual with experiences at other firms and that focal firm not only gains the individual as a new hire but also gains knowledge related to the individual's prior firm experiences.

Scholarship shows the significance of job movements that result in the hiring organizations gaining knowledge. From an agglomeration economy perspective, knowledge flow by employee movement is central because it allows all firms within a locale to produce at better points on the "production function," as they can quickly receive information about industry improvements (Krugman, 1991). Firm-level benefits have also been shown empirically. These benefits include the hiring firm breaking into new areas (Song, Almeida, & Wu, 2003; Tzabbar, 2009), overcoming resource constraints (Rao & Drazin, 2002), and heightened performance in the current areas under pursuit (Somaya, Williamson, & Lorinkova 2008; Herstad, Sandven, & Ebersberger, 2015). The importance of knowledge transfer by hiring for the hiring organizations appears to be generally important for firm success. Discoveries and advancements relevant to a focal firm are often times made elsewhere, and while this knowledge may derive from outside the firm, the knowledge is significant for the focal firm to retain its performance and survive. Thus, firms often need to bring in outside knowledge, and hiring those with relevant experiences can be an effective strategy.

Although hiring can be an effective strategy for the hiring firm to bring in outside knowledge, gaining knowledge by moving individuals with prior experiences appears not to be automatic. First, individuals who change jobs may not possess knowledge particularly relevant to their new employer. A mover may be switching into a new breakthrough area and hoping to learn the latest advancements. Or the mover may have made the transition because the new opportunity is a match on attributes unrelated to specific knowledge background, e.g., reduced commute time and general science education.

Second, now assuming that the employee moving does possess knowledge significant to the performance of his or her new employer, barriers to transfer appear to be common at potential recipients. Researchers examining the transfer of superior knowledge found many failed transfer attempts (Szulanski, 1996), and rates of success hover around 60% even when the knowledge is observably superior (Kane, 2010). Potential knowledge recipients may see knowledge brought in by new hires as inferior or prioritize the new hire's attention towards areas not favorable to transfer. Furthermore, the hiring firm is likely to endure a cost to fully complete the process of learning new information (Teece, 1977; von Hippel, 1994). In all, knowledge transfer is unlikely to occur at constant high rates, even for those new hires with the "right" backgrounds. Instead, hiring firms may have particular intervals during which the barriers to transfer are lower.

In the current research, I study when inward employee mobility results in learning from the new hire's background in a sample of inventor moves in the U.S. laser industry. I take into account when the new hire has a background relevant to the hiring organization, by allowing inventors to either have strategic fit or not. Further, I examine firm level dynamics—periods of capability development and whether the firm is new or established—to condition when employee mobility enables interfirm knowledge flow. I rely on a novel dataset that combines industry wide

firm production data to measure new hire strategic fit and firm changes across time with patent data to measure mobility and knowledge flows. The approach allows me not only to investigate variation in instances when individual hiring provides knowledge sources, but additionally to uncover the contribution of dynamic internal firm factors that condition inventor mobility and interfirm knowledge flow.

The study's results extend our understanding of when inventor mobility is likely to result in interfirm knowledge flow. I show that new hires with strategic fit engender significantly more knowledge flow than others. Accordingly, I find that not all inventor movements between firms are equal in their relationship to interfirm knowledge flow.

The findings indicate that knowledge transfer by employee mobility is not automatic, but requires investment by the hiring firm. The findings draw attention to a concerted effort required by both inventors and the organization receiving the knowledge to build on and make use of it. The study also adds to the literature on employee mobility more generally by addressing an under-studied area: the attributes of the destination or hiring firms (Mawdsley & Somaya, 2016).

To examine how the temporal dynamics in firms' technological strategies condition the relationship of inventor mobility to interfirm knowledge flows, I draw from the literature on knowledge transfer and firm capabilities. The literature on knowledge transfer examines empirically what facilitates and hinders the transfer of knowledge across boundaries and outlines theoretically the difficulties individuals face in moving knowledge across firm contexts (Argote & Ingram, 2000). The literature on capability development provides insight into what occurs as firms enter into new areas (Helfat & Peteraf, 2003), and thereby allows us to gain a deeper understanding of when knowledge transfer from employees' prior experience is likely.

The empirical context of the study is the U.S. laser industry. My quantitative analysis includes firms that produce laser devices and inventors who create laser-related inventions. I complement the quantitative analysis with 20 interviews conducted with scientists and engineers working in the laser technology industry. I find that more knowledge flow is associated with inward mobility when the individual's experience matches the firm's strategic focus. The findings help explain the pattern of mobility in high-tech industries and call into question inventor mobility as a mechanism of costless spillovers.

Several contributions follow from the study. For the literature on inventor mobility and interfirm knowledge flow, I integrate research on knowledge transfer and firm capabilities to show that inventor mobility is more strongly linked to interfirm knowledge flow when matched to simultaneous strategic focus occurring at the hiring firm. For the literature on employee mobility more generally, I illuminate the differentiated characteristics employees have in regard to the strategic processes at hiring firms and how hiring firm factors condition individuals' outcomes after they move. In addition, the distinction between new hires with strategic fit and those without brings to light the dynamic nature of individuals' careers, especially those in innovative industries facing the effects of technological change. For the literature on firm capabilities, I show how the patterns of employee mobility relate to the more aggregate firm-level processes of capability development, and further the work on the more micro- or individual-level factors occurring behind the firm level processes of capability development. Finally, the study underscores the role of inventor mobility in the laser industry and furthers understanding of how individual learning relates to firm outcomes in the development of laser technology.

The study also provides practical contributions. The findings suggest that a firm's knowledge could diffuse to other firms via employee mobility, but that such diffusion is limited to the paths of those who move to other firms with similar technological pursuits. From the point of view of firms looking to engage in learning-by-hiring, the findings imply that hiring inventors with backgrounds in knowledge areas on which the hiring firm is strategically focused is a productive means by which firms can acquire externally generated knowledge.

Theoretical Framework and Hypotheses

Why does employee mobility create an opportunity for a hiring firm to gain knowledge? Employees accrue knowledge through their job experiences, and the knowledge gained reflects what they do—the tasks completed—and the attributes of where they work—the characteristics of their organizational context (Argote & Miron-Spektor, 2011). When a given employee switches firms, the knowledge he or she accrued can travel too. At the hiring organization, the job mover must then share the learned knowledge in such a way that it not only transmits to the destination via his or her head, but also becomes embedded at the superordinate organization level (Argote & Miron-Spektor, 2011). Argote (2013) provides a thorough discussion of organization-level learning. For the purposes of this study, I consider organization-level learning to occur when we can see evidence that the mobile employee's knowledge is absorbed (such as being used and built on) by others in the destination firm.

For scientists and engineers working on developing technologies, organizational experiences provide task experience that generates knowledge specific to the technologies with which they work. When these high-tech workers change employers, they can carry knowledge specific to the technologies with which they have previously worked.

At hiring firms, when we compare all hires with prior organizational experiences, there is a range in the similarity between the previously developed technical knowledge of new hires and the work they do as new hires. Newly hired scientists and engineers vary in how similar their previously developed knowledge is to their current work because of the landscape of high-tech industries. High-tech workers may face institutional barriers to continuing work in the same technical domain when they switch employers, because of enforcement of non-compete clauses or non-disclosure agreements of their prior employers. Marx (2011) finds that the inventors take "career detours" from their established technical fields in the face of potential lawsuits from their prior employers. Further, an established technical field may become obsolete in the face of industry trends or technological advancements. Technological change can advance with discontinuities and leave older technologies irrelevant (Anderson & Tushman, 1990). Individuals with experience in outdated methods, or not in the dominant design, may not find opportunities to continue in their direct areas of expertise. Finally, high-tech workers may change the technical domain of their work because other dimensions of the new job opportunity—besides continuation within a technical domain—make it a good match. Individuals select employment and hiring managers select employees across a wide range of attributes (O'Reilly III, Chatman, & Caldwell, 1991). In all, the evidence shows that high-tech workers frequently make job changes that coincide with changes in the mover's technical domain of work.

We can also see this pattern of cross-domain job changes if we examine the aggregate firm and individual participation in the U.S. laser industry. Figure 1 shows the extent of firm laser device capabilities and inventor mobility into these firms across the industry's lifespan. The extent of industry participation and the employment movement into these firms follow similar

trends across time. The figure illustrates how individuals without laser experience continually begin work in the industry, as noted by moving to laser firms, across the industry's lifespan.

Insert Figure 1 about here

I next turn to the impact of high-tech workers gaining and applying industry related experiences across organizational and technical boundaries from the perspective of the hiring firm in its pursuit of capability development. I focus on those employees working directly with technologies and those who have prior organizational experiences—thus, those with the potential not only to contribute their attention and abilities at the hiring firm, but also to bring relevant knowledge and contribute to the hiring firm gaining knowledge from outside its boundaries. In particular, I aim to answer the following question: What does hiring those both with and without experience in the domain of pursuit mean for these potential learning-by-hiring benefits?

Strategic Fit

I propose a dimension that may inhibit or facilitate the extent to which individuals are able to contribute knowledge to their destination firms: inventor strategic fit. Inventor strategic fit occurs when new hires have direct experiences in the firm's technical area of strategic focus and is absent when those hired lack any direct prior experiences in this area. I refer to a firm as strategically focusing on the industry when it develops industry related capabilities. In other words, new hires have strategic fit when their work at other organizations is in the domain of their current firm's strategic focus. I build on prior work showing factors that reduce the expect new hires contribute at their destination firms, including firm-specific human capital (Becker

1964), behavior reflective of internal routines and norms (Bidwll & Mollick, 2015; Dokko, Wilk, & Rothbard, 2009), and the mover's relationship with others at the origin firm (Campbell, Saxton, & Banerjee; 2014, Groysberg & Lee, 2009, Huckman & Pisano, 2006).

I expect that inventor strategic fit enables knowledge transfer by employee mobility because the inclusion of those with prior direct experience into a firm focused on this area gives these hires the opportunity to contribute something they uniquely offer. Prior direct experience provides knowledge and skills unavailable through other means of gaining relevant knowledge. Individuals gain both knowledge that is tacit—not articulated—and knowledge that is explicit. Since tacit knowledge remains in individuals' minds and is not captured elsewhere, moving individuals, as opposed to other mechanisms of knowledge transfer, provides the recipient with both explicit and tacit knowledge (Argote & Ingram, 2000). Not only are individuals able to move both tacit and explicit knowledge resources, but they are also able to adapt the knowledge to the new context (Allen, 1977).

The benefits of knowledge transfer by the inclusion of individuals with direct experience—both access to tacit knowledge and ability to adapt the knowledge—appear to be very useful in the technology development process. Prior work shows that many of the steps and nuances related to the task of developing technologies is not codified, or at least, not codified in documents available to potential knowledge recipients such as in patents or publications (Agrawal, 2006). Thus, individuals can bring in unique knowledge that hiring firms are unable to access through most sources of technical knowledge. Two studies on invention highlight the importance of the addition of tacit knowledge sources for technological development. Almeida, Song, and Grant (2002) found that recipients struggle to build on inventions without the richer knowledge sources available through firsthand experience. And, Agrawal (2006) found that

firms that licensed inventions from academics but did not engage with inventors had a 13% rate of commercialization, whereas firms that engaged the inventors for more than 1,000 hours had a rate of 84%.

I propose theoretical reasons that the inclusion of an individual with direct experience should increase the extent of knowledge transfer by hiring; related empirical evidence supports this line of reasoning. Studies in psychology examine the extent to which individuals use knowledge gained in a prior task on the task to which they are currently assigned. Findings from such experiments show that the rates of attempted transfer between tasks increase as the two tasks, the prior and current, become more similar (Barnett & Ceci, 2002). In other words, the likelihood of transferring knowledge developed in participants' prior experiences increased when their work appeared similar in domain or they had direct experience in that same area.

A stream of the entrepreneurship literature examining spinoffs or spinouts depicts entrepreneurs as transferring knowledge from their direct prior experiences into their newly established firms (Klepper, 2001; Helfat & Lieberman, 2002; Agarwal, Echambadi, Franco, & Sarkar 2004; Stuart & Ding, 2006, Dencker, Gruber, & Shah, 2009; Agarwal, Campbell, Franco, & Ganco, 2015). Spinoff founders are founders who establish firms in the same industry in which they have prior direct experience. The central finding, which is robust across many industries, is that founders who have direct prior industry experience are able to establish more successful firms than those founders who lack the industry experience themselves. Thus, founders are able to leverage their prior experiences when they enter markets in which their prior experiences are related to the strategic focus of their new ventures. A direct test of whether founders transfer knowledge or enjoy other benefits of their prior industry experience has not been done, but observed patterns are consistent with founders benefitting from knowledge

resources gained through prior experiences when entering the same industry (Klepper & Sleeper, 2005).

In sum, I expect that the transfer of knowledge from prior experiences and further use of this knowledge should increase only when new hires' prior experiences match the strategic focus at the hiring firm. My first hypothesis explicitly states this expectation:

> *Hypothesis: Inventor mobility leads to more knowledge transfer when the inventor's background fits the technological strategy of the hiring firm than when his or her background does not fit.*

Method

I use established methods to measure inventor mobility and interfirm knowledge flows and develop measures of firm capability development and inventors' fit with this by isolating inventor movements of those who gain industry experience and move to hiring firms where the capabilities under development can each be observed. With this sample of employee mobility, I am able to measure how individual- and firm-level changes across time relate to the likelihood of knowledge flow following inventor employment change.

U.S. Laser Industry

I focus on the U.S. laser industry, a context offering ideal characteristics to examine employment movement, interfirm knowledge flow, and firm strategic focus. Laser development has been pursued by numerous industrial research laboratories and firms. Theodore Maiman of Hughes Laboratories built the first working laser in 1960 using ruby crystal as the laser medium. The next two lasers invented were the uranium laser out of IBM's Watson Research Center and then the Helium Neon laser out of AT&T's Bell Laboratories. A plethora of commercial opportunities using laser technology have been identified since the laser's invention in 1960.

Inventors working on laser technology in industrial laboratories have not been pressured by the strong professional institutions to stick to academic or other research institutions. Further, the broad range of uses that laser devices support provides a large sample of firms and individuals with experience in the industry (Klepper & Thompson, 2006).

I use U.S. patent and firm laser device production data from the U.S. laser industry since the industry's start in 1960 to 2005. I include all inventors with at least one U.S. patent with a laser classification primary or secondary class code 372 who move to a U.S. firm that produces a laser device[i]. Firm data were collected from industry buyers' guides. The information was collected using the annual Buyers' Guide published by Laser Focus from the start of the industry in 1960 to 2007 (Bhaskarabhatla & Klepper, 2014). Information on entry and exit years of each firm by laser type produced allows me to identify when firms produce laser devices and engage in capability development in laser technology.

I capture the entirety of the U.S. laser industry that exists at the intersection of product commercialization and novel technological innovation by analyzing all firms that produce at least one laser device and inventors who have at least one laser classified patent. The laser-device producing firm names were matched to patent assignees, so individuals inventing at the laser producer firms in the laser domain are identified. Inventors' experience with laser technology is noted by whether their prior patents had a laser classification or not. My theorizing is focused on employment movement, so I select all laser inventors who, I infer, first worked elsewhere and then moved to a laser producer, by selecting those inventors who have at least one patent assigned to a laser producing firm preceded by at least one patent assigned elsewhere. I choose to include all moves by laser inventors to capture the full population of inventor movement in the U.S. laser device industry measurable with the patent data.

Estimation Methods

The hypothesis examines changes in the rate of knowledge transfer across time, which is measured by the hiring firm's patents that cite the mobile inventor's pre-move patents. Citation rates call for count models, so I use negative binomial regressions. I examine the period after the individual's move date to the firm until the individual either moves to another firm or, if the individual never shows up patenting at another firm, until the application year of the individuals' last patent at the firm. If an individual shows up at the firm after 12 years, I drop all following observations.

I follow the assumptions used in prior work to identify inventor employment changes and year of change (Singh & Agrawal, 2011; Cheyre, Klepper, & Veloso, 2015). Inventor employment moves and year of moves are measured as follows: All of an inventor's patents were sorted ascendingly by the patent's application date to construct the inventor's patent history. Then, the movement of an individual from one firm to another was determined when his or her consecutive patents were assigned to different firms. The movement date is inferred to occur at the beginning of year

$$(B+A)/2 \quad (1)$$

Where the application year of the last patent at the origin firm is A and the application year of the first patent at the hiring firm is B.

All analyses exclude observations occurring prior to the hiring firm's founding. In all, the analyses cover a set of 1,708 individual arrivals at 186 hiring firms. Figure 1 shows the number of moves by the firm and inventor characteristics under study.

Insert Figure 2 about here

Variables

Summary statistics are in Table 1.

Dependent variable. The dependent variable measuring knowledge transfer is constructed to reflect a firm's use of knowledge developed outside its boundaries. To measure knowledge transfer specific to the arrival of a newly hired inventor, I count only the citation rate to the newly hired inventor's prior patents made by patents invented by others besides the inventor him or herself and his or her prior collaborators at the hiring firm. *Post-move cites* is the annual count of citations to all the patents invented by a mobile inventor applied for prior to hiring by other laser inventors at the hiring firm. This measure includes only citations made by those who have not collaborated previously with the respective mobile inventor and not by the individual him or herself.

Insert Table 1 about here

Independent variable. The main independent variable under investigation is inventor strategic fit, which is theoretically developed as occurring when newly hired inventors have direct experience in the area of hiring firm's strategic focus. I measure this variable in the context of the U.S. laser industry by assuming that inventors who move to laser producers and have prior patents with a laser classification have inventor strategic fit. Thus, *inventor strategic fit* equals one if the mobile inventor's move occurs after the inventor's first laser classified patent and zero otherwise.

Control variables. I include inventor characteristics likely to impact the citation rates to movers' prior work. *Inventor prior patents* is the logged number of patents on which the inventor is previously listed as an inventor. For the knowledge transfer analysis, the number of patents attributed to the inventor at the move year is used. *Inventor pre-move cites* is a count of the number of patents assigned to the hiring firm that cite any of the hire's patents applied for prior to his or her move to the firm. This captures variability in how citable the individual's prior experience is and the hiring firm's familiarity with the mobile inventor's work before the move. Time varying controls are included in all specifications. *Inventor age*, a control for a linear temporal pattern associated with the aging of inventors, equals the t minus the application date of the individual's first patent.

The last set of control variables captures firm variation across time. Firm capability development is captured by laser device production. Firms are assumed to engage in laser capability development during the years they produce at least one laser device and two years prior to when they began this production[ii]. Thus, *firm laser development period* equals one for all the years a firm engages in laser capability development and zero otherwise. *Hiring firm new* equals one if the hiring firm is five years or less from its founding year and zero otherwise. And *hiring firm age* captures linear variation as the hiring firm gets older. *Hiring firm age* equals t minus the firm's founding year. Time fixed-effects are included at five year intervals and hiring firm fixed-effects are included.

Results

Table 2 shows results from analysis testing the Hypothesis. All columns are the coefficient results from negative binomial regressions.

All columns in Table 2 include control variables and hiring firm fixed-effects and time fixed-effects. The fixed effects are added unconditionally. The hiring firm fixed-effects specification allows for an examination of how individuals within firms vary in the knowledge transferred from their prior experiences. Column (1) shows the results when only control variables are included and the variables' coefficients are in all in the expected directions. The coefficients on the inventor level control variables, *inventor pre-move patents* and *inventor pre-move cites*, are both positive. New hires who were more prolific and whose work received more attention by the hiring firm before their move into the firm are associated with more post-move learning. The coefficient on the new hire's age is negative, showing that as inventors gain time since the beginning of their patenting careers, the less post-move learning associated with their hiring reduces.

The coefficients on the hiring firm control variables shown in Column (1) are also in the expected direction. The positive coefficients on hiring firm age and hiring firm new show a non-continuous effect of firm changes across time, as young firms compared to established ones show more learning, and within these stages there is a linear negative effect of firms aging. The positive coefficient on firm capability development shows that during periods of capability development or when the firms produce laser devices, their new hires result in more post-move firm learning than at other times.

Insert Table 2 about here

Column (2) includes the *inventor strategic fit* variable and shows the test of Hypothesis 1. Inventor strategic fit captures the effect of a new hire who has prior laser experience and equals

one if a new hire had a laser patent prior to being hired. The coefficient is positive and significant, indicating that new hires with prior laser experience are associated with more knowledge flow into the firm than those new hires without prior laser experience. The significant and positive coefficient on inventor strategic fit provides support for Hypothesis 1.

Robustness Checks

The main analyses above provide evidence in support of the significant relationship between inventor strategic fit and knowledge transfer into the hiring firm post-move. However, the movement examined may suffer from a confounding of characteristics related to the mobile inventors' background that may be responsible for the results. The increase in citations by those at the hiring firm to newly hired inventors' prior patents when the new recruit has strategic fit could, first, be driven by the recruit's background being of particular significance to the hiring firm or, second, be of uncaptured importance to the development of laser technology generally. If either of these two possibilities is true, e.g., the patents in mobile inventors' backgrounds have characteristics that make them uniquely significant to either the inventor's hiring firm or laser development across the industry, then the main analysis may be faulty.

I first tackle the issue of new recruits' prior patents being of special importance for the particular development of laser technology at the firms in which the recruits are hired. I use the hiring firm's citation rate before an inventor's move to control for the unique invention's relevance to the hiring firm. By including control observations for the rate of a hiring firm's pre-move use of a new recruit's background, I rule out the alternative explanation that characteristics of the mobile inventor's background that are of specific interest to the hiring firm are generating the observed results.

To do this, I use a difference-in-difference approach following the method used in Singh and Agrawal's (2011) analysis of learning-by-hiring. Singh and Agrawal (2011) provide a method that isolates the change in knowledge use by a hiring firm after an individual's arrival for a set of inventors who move and have a prior solo invented patent to which the hiring firm's citation rate is observed. The dependent variable used here, *Hiring firm cites,* matches Singh and Agrawal's (2011) first dependent variable and is the annual count of citations to an inventor's pre-move patent made by a single firm, either the hiring firm or another laser producing firm. The effect of mobility is captured by the variable *post-move,* which equals one in the years following the inventor's move for observations specific to the hiring firm and zero otherwise. The independent variable of interest again is *inventor strategic fit,* which equals one if any of the mobile inventor's prior patents have at least one laser classification in year t and zero otherwise.

Table 4 presents a series of specifications controlling for the attributes of inventors and the hiring firms' combinations by including inventor-move fixed effects, year dummies, and age dummies. To compare my estimate of the mobility-knowledge flow relationship in the U.S. laser industry to the results found across a sample of inventors from all industries in Singh and Agrawal (2011), I present a baseline model in column (1), and the post-move coefficient at .027 closely matches Singh and Agrawal's .0306. In column (2), I include observations back to 1960 that are included in the main analysis but not in Singh and Agrawal (2011).

Insert Table 4 about here

In the rest of Table 4, I update the specification to measure the post-move effect more precisely. In column (3), I include a post-granted indicator variable. The coefficient is positive

and slightly significant, in line with the expectation that patents receive more citations once they are issued. In column (4), I restrict to only movements by laser inventors to laser producing firms, and the post-move coefficient more than doubles in size compared to the post-move coefficient found in column (3). The post-move coefficient's increase seems reasonable if we consider that the selected sample focuses on inventors and firms relevant to each other. The sample included in column (4) further includes individuals and firms within one industry domain, those individuals who have worked or will work in laser technology, and firms that produce in the industry. It follows that these firms would cite each other more than a sample of firms and inventors more randomly aggregated and, thus, contribute to a larger post-move coefficient.

I next update the analysis to address the possibility that factors related to mobile inventors' backgrounds that affect their importance to laser development across the laser industry generally may be conditioning hiring firms' use of their new recruits' backgrounds. I address the potential confound by including the use of mobile inventors' pre-move patents by not only those at the hiring firms, but also by those at other laser producing firms. These supplemental observations control for the use of a mobile inventor's pre-move patents by similar firms to that of the hiring firm to capture any general changes in the relevance of an inventor's background to laser production taken by other firms in the industry.

Column (5) of Table 4 includes these additional laser producer observations. I now include inventor-firm fixed effects because observations for citations to an inventor's pre-move patent made by different laser producing firms are included. While remaining significant, the post-move coefficient reduces from .062 to .0085 or to 14% of its size from column (4) to column (5). It

appears that the relevancy of the mobile inventor's background to the laser producing firms has an impact on the post-move coefficient.

Finally, I add the conditioning effect of inventors with prior laser experience and the effect of firm focus on laser technology by including an inventor fit variable. The regression in column (6) measures whether the mobile inventor's background matches the capabilities under development at the hiring firm, with the inventor strategic fit variable included as a main effect and interacted with the post-move variable. The post-move coefficient becomes insignificant when the inventor fit variable and the post-move and inventor fit interaction term are included. The insignificant post-move variable indicates that there is no subsequent increase in the hiring firm's citation rate for mobile inventors lacking strategic fit, which provides evidence that the move alone does not result in an increase in the use of the inventor's previous ideas by the hiring firm. The inventor strategic fit coefficient is also insignificant, indicating that there is no change in the firm's citation rate as inventors who gain strategic fit if they are not hired into the firm.

However, the interaction term of inventor strategic fit and post-move is significantly positive, indicating that the citation rate increases significantly after the hiring of an inventor with strategic fit. Hiring firm cites increase by .013 after a new hire arrives at hiring firms that focus on the area of the individual's experience. In all, the robustness check provides further evidence that an inventor's strategic fit to the hiring firm's technological strategy significantly conditions the relationship between inventor mobility and later knowledge flow.

I look further for support for the study's central finding by directly asking those who have changed jobs about their experiences using knowledge gained at the former job during their time at the latter. And in addition, I investigate whether the movers attribute the extent they used knowledge gained during prior experiences post-move to the extent of similarity in technical

domains across jobs. I conducted interviews with scientists and engineers working in the U.S. laser industry. The interviews covered the interviewee's latest job changes across organizations with a focus on their experience using what they learned at prior jobs since they had been at their current. The interview included both closed and open ended questions. As part of the interview protocol, scientists and engineers covered the similarities in regard to technological focus of their work across the two employers and the extent that, subsequent to a move, their work focused on building upon their prior experience. The extent to which the individual mover used his or her prior experience post-move is an essential aspect of how much the mover contributed to the current organization's learning from his or her prior experience.

I conducted 20 interviews with individuals recruited during the Conference on Lasers and Electro-Optics 2014. I approached conference attendees with firm names listed on their badges and asked if they would be interested in participating in an interview. If interested, I then asked if they worked directly with technologies and had worked in at least two different companies. If an individual answered in the affirmative then I proceeded to the interview.

During the interviews, I asked about knowledge use across employers. I asked how much of the knowledge they gained at their prior employer they used at their current for different topic areas. The topic areas included knowledge related to end product technologies, which I focus on here because this aligns with the study's theoretical setup.

Respondents expressed diverse experiences in the extent to which they used technical product knowledge gained at their prior employer at their current. Some respondents explained using knowledge across employers.

"A lot of the offerings at [current organization] provides to its customers touch on lasers, optics which is very big at my previous company. So my knowledge at how the industry looks

at this has been able to map over to help [current organization] understand how their customers need to see that information parsed out in the offerings."

"The endoscopes I'm building now are a lot smaller than the catheters I was building for my previous employer. So I've taken the knowledge, what I would call a "non-textbook" knowledge and have scaled that, used it to help me scale the size of the devices down."

Other respondents indicated they used little knowledge from their prior employer.

"Not much of what I did in that one job previous am I leveraging now."

Next, I examine whether the variation in the extent to which respondents used their prior product knowledge across employers varies based on whether their prior work and current employers' strategic focus match up. Respondents explained how similarity in technical domain impacted their use of previously developed technical knowledge.

"Actually yes, in a beneficial way. Just, many of the technologies are similar, I was able to expand on existing knowledge for new systems."

"We use the same positioning technology."

Interviewer: Did these influence your ability to make use of what you learned at your prior employer?

"Why, yeah, I already knew the working principles and I only had to learn a few things to do my job now. My start was better this way. "

"Yes, what I'm doing now is very similar to what I was doing there so the experience that I had and the skills I developed in the prior position are highly relevant and without them I probably would not have been hired."

Others commented on how the dissimilarity in the technical domain of work between employers impacted their post-move knowledge use.

"If I chose a different industry that didn't require photonics or electronics or materials, wouldn't be able to take advantage of these skills, immediately"

"I learned a lot about micromachining and material processing but I am not currently using it in any significant way. It is market specific knowledge and because I do not participate in those markets it has only a secondary or tertiary application to the things that I do."

"It is like when I went to my immediate prior company the whole thing there was what I guess would be called a subfield of optics call illumination…I really had not worked in that. I had been more concentrated in lasers and fiber optics and optical communication stuff for most of my career so illumination was something brand new to me. I even had to learn the terminology things like CRI—color rending index—I did not know things like that before. So I had to learn things like that from scratch."

The experiences of scientists and engineers working in the U.S. laser industry substantiate that employment movement between firms varies in the extent of subsequent knowledge flow and that we should expect more knowledge flow when the mover has strategic fit. The evidence supports my central theoretical prediction that direct experience in the area of the hiring firm's strategic focus facilitates such learning at the hiring firm.

Discussion

Interest in employee mobility stems in part from the recognition that employees with prior knowledge can make significant contributions to their hiring organizations. The current study examines how the fit between individual experience and the strategic focus of hiring firms affects the extent to which individuals contribute to their new firms. The empirical results

indicate that firm-level factors condition when new hires import knowledge generated outside the hiring firm.

I find that inventor fit with the hiring firm's strategic focus conditions the use of its new hires' prior experiences and subsequent knowledge flow into the firm. The results indicate that inventor mobility is linked to more knowledge flow into the firm when the inventor's background fits the firm's area of strategic focus. In addition, the robustness results show that there is little, if any, knowledge flow without an inventor movement to the hiring firm, even when a firm is strategically focused in areas relevant to the externally generated knowledge.

The study's findings have several implications. First, I show that not all employee movement ends with the hiring organization learning equally from the mobile individual's prior employer, and instead, factors in addition to the job movement facilitate any subsequent knowledge flow. From the point of view of the origin firm, the findings suggest that its knowledge could diffuse to other firms, but the diffusion would be stronger along the paths of inventors who move to other firms with similar technological interests and at particular points in time.

Second, the findings suggest that hiring inventors with backgrounds in knowledge areas that the hiring firm is pursuing is a productive means by which firms can acquire externally generated knowledge. Further, the robustness results demonstrate that the disclosure of firm knowledge itself has little effect on the subsequent use by other firms without the firms taking further steps, including hiring, to support its use. Thus, firms hoping to shield others from using their knowledge might gain more protection by redirecting resources away from means that restrict the disclosure of knowledge, such as non-disclosure agreements, and instead by increasing their

efforts to ensure that individuals with first-hand experience in these areas are not likely to move to those organizations that are actively involved in these areas.

I find that when new hires' experiences match the area in which a firm is developing capabilities, the firm increases its use of the knowledge embedded in the new hires' background, but I leave unanswered what process within the firm contributes to this change. Future study of employee mobility would greatly benefit from methods using complementary data sources to help address the generalizability of findings using data on naturally occurring employee mobility that suffer from a selection of movers and moves. Employing alternative methods that enable a greater internal validity of studies on employee mobility would complement the understanding development using archival sources such as patent data and thus extend our understanding.

The study's findings highlight the dynamic environment scientists and engineers working in high-tech industries experience as the organizations where they work continually update their strategic focus to keep pace with technological change. Better understanding the strategic choices scientists and engineers make to ensure their relevancy and career longevity against technological change is an area with many unanswered questions.

Conclusion

The study advances our understanding of employee mobility and interfirm knowledge flows by showing that internal firm factors contribute to when individuals who move between firms add knowledge at the hiring firm. The study contributes to the literature on employee mobility and the literature on firm capabilities. I further our understanding of how factors at the hiring organization relate to job movement between firms, an area yet to receive much attention in the employee mobility literature (Mawdsley & Somaya, 2016). I also extend the literature on employee mobility by conceptualizing and measuring a varying effect of employee mobility,

where mobile inventors at times have experiences aligned with a firm's strategy and at other times, do not. This examination furthers our understanding of how patterns of employee mobility relate to the more aggregate firm-level processes of capability development and provides an examination of the micro- or individual-level factors occurring behind firm-level strategies.

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Figures and Tables

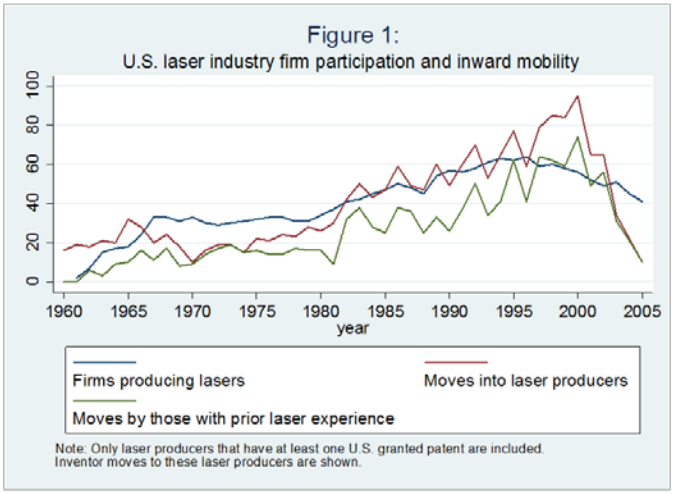

Table I: Characteristics of sample

Number of hiring firms		186
	Count	Share of inventors with strategic fit
Number of inventors	1,708	66%
	Count	Share of observations with inventor strategic fit
Number of observations	11,853	63%

Table II. Descriptive statistics for knowledge transfer analysis

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9
1. Postmove cites	0.067	0.462	0	23	1								
2. Inventor strategic fit	0.633	0.4821	0	1	0.09	1							
3. Laser capability development period	0.542	0.4982	0	1	-0.01	0.02	1						
4. Hiring firm new	0.17	0.3756	0	1	0.07	0.06	0.14	1					
5. Inventor age	11.28	7.2827	0	52	0.04	0.17	-0.09	-0.03	1				
6. Hiring firm age	49.96	38.109	0	178	-0.06	-0.09	-0.33	-0.56	0.044	1			
7. Ln(inventor prior patents)	1.488	1.2193	0	5.838	0.12	0.17	-0.10	-0.02	0.56	0.098	1		
8. Ln(inventor premove cites)	0.184	0.6145	0	5.375	0.24	0.12	-0.10	-0.05	0.19	0.05	0.34	1	
9. Year	1990	11.376	1960	2005	0.09	0.20	-0.19	0.24	0.06	-0.06	-0.04	0.114	1

Note: 11,853 observations included.

Table III. Regression analysis: Conditioning effects on hiring firm's use of new hires' prior knowledge

Model	(1)	(2)
Inventor age	-0.025***	-0.027***
	(0.007)	(0.007)
Hiring firm age	0.11***	0.099***
	(0.037)	(0.037)
Ln(inventor prior patents)	0.78***	0.72***
	(0.063)	(0.065)
Ln(inventor premove cites)	0.44***	0.44***
	(0.061)	(0.061)
Laser capability development period	0.67***	0.61***
	(0.150)	(0.150)
Hiring firm new	0.65**	0.71**
	(0.290)	(0.300)
Inventor strategic fit		1.20***
		(0.170)
Hiring firm fixed effects	x	x
Time fixed effects	x	x
N	11853	11853
LL	-1852	-1820

Notes: Dependent variable is annual hiring firm cites which excludes cites with the mobile inventor's prior collaborator listed as inventor. Excludes observations prior to firm foundings. Time fixed effects are indicator variables for each five year interval. Robust standard errors are used in all models with fixed effects added unconditionally. *p<.05; **p<.01.

Table IV. Regression analysis: Robustness analysis of mobility-knowledge flow relationship

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Hiring firm cites					
Sample	All laser inventor moves 1975 onward	All laser inventor moves 1960 onward	All laser inventor moves 1960 onward	All laser inventor moves to laser producing firms	All laser inventor moves to laser producing firms with other laser producers citation rates	
Post issue			0.0058^{+}	-0.0052	0.00076*	0.0014***
			(0.003)	(0.01)	(0.00)	(0.00)
Postmove	0.027**	0.025**	0.024**	0.062**	0.0085*	(0.00)
	(0.004)	(0.004)	(0.004)	(0.02)	(0.00)	(0.01)
Inventor strategic fit						0.00
						(0.00)
Postmove*						0.013*
Inventor strategic fit						(0.01)
Inventor fixed effects	x	x	x	x		
Inventor-firm fixed effects					x	x
Year and Age fixed effects	x	x	x	x	x	x
R2	0.346	0.345	0.345	0.484	0.171	0.189

Notes: Following Singh and Agrawal (2011) linear regression models used where column (1) replicates their work. Standard errors clustered on inventor in columns (1) - (4) and clustered on inventor-firm in columns (5) - (6). *p<.05; **p<.01.

[i] Details available from author upon request including use of Li et al. (2014).

Personnel Mobility and Firm Performance: The Effect of Specialist vs. Generalist Experience and Work Group Structure

Erin Fahrenkopf, Linda Argote, and Jerry Guo

Abstract

The study advances our understanding of the conditions under which incorporating a new hire improves organizational performance. We study specialist or generalist movers, where specialists have worked in organizations structured with a high division of work across members. A specialist concentrates on a particular component of the group's task whereas a generalist performs all components of the group's task. We argue that the extent to which movers have experience working as specialists or generalists is a critical factor in explaining group performance. We predict that specialist new hires, especially when they join groups with a generalist work division, cause greater performance disadvantages as compared to their generalist counterparts. We test our hypotheses using a laboratory study in which we manipulate the extent to which movers and those in their recipient organizations have worked as specialists versus generalists. Participants work as generalists or specialists in three-person groups and receive a new member who has experience as a specialist or generalist in another group. We find support for the hypotheses and provide evidence on dimensions of potential hires' backgrounds that enable them to contribute significantly to their recipient firms.

Keywords: new hires, employee mobility, group performance, group learning; routines, knowledge transfer

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Although management scholars have shown that performance penalties often result from cross-organizational job movements, the rate at which individuals are switching jobs, often referred to as job-hopping, appears to be rising. A recent Gallup poll showed that 21% of millennials surveyed had changed jobs within the past year, a rate 3 times that reported by non-millennials (Gallup, 2016). A research team using LinkedIn profiles showed the same upward trend in job changes by comparing the number of companies at which different cohorts of LinkedIn users worked during their first five years out of college: for those graduating from 1986 to 1990, the average number of companies was half that of users graduating from 2006 to 2010 (Berger, 2016). These moves are often made under the assumption that changing jobs will lead to performance gains for both the mover and for the recipient organization. Organizations frequently hire individuals with the intention of acquiring new knowledge or skills, and individual movers seek to improve their on-the-job performance by contributing positively to a new organization.

Yet, scholarship shows that both the individual moving and the recipient organization often suffer performance attenuations after a cross-organizational move (Dokko, Wilk, and Rothbard, 2009; Groysberg & Lee, 2009; Bidwell, 2011; Campbell, Saxton, & Banerjee, 2014). These performance decrements lead to fundamental questions to which management scholars can contribute useful answers: How can organizations structure work to enable performance gains from cross-organizational job movements? Similarly, how can individuals shape their careers to accrue comparable gains? Our study addresses these questions and provides causal evidence on the attributes of work roles and job structures that enable individuals (whom we refer to as a mover or new hire) to succeed soon after joining an organization.

We focus on movers who have either specialist or generalist work experience and examine the post-move outcomes of recipient organizations that gain either a specialist or generalist newcomer. We define specialists as those who have worked in organizations with a high degree of specialization—or division of work across individuals—and generalists as those who have worked in organizations with more limited or no specialization across individuals. Our conceptualization of specialists versus generalists follows prior work examining the extent of task concentration in individuals' prior experiences (Narayanan, Balasubramanian, & Swaminathan, 2009; Wang & Murnighan 2013; Melero & Palomeras 2015). Specialists concentrate on a particular component of the group's task, whereas generalists perform more components of the task.

We focus on movers who have specialist or generalist backgrounds, because prior research suggests that the distinction has important implications for cross-organizational work. Lazear (2005) showed that individuals who have generalist backgrounds benefit from cross-organizational moves more than individuals with specialist backgrounds. Other scholars found that individuals who have gained a wider range of experiences, analogous to generalist experience, have an increased likelihood of entering into entrepreneurship and being successful entrepreneurs relative to their counterparts with more narrow expertise (Elfenbein, Hamilton, & Zenger, 2010; Sørensen & Phillips, 2011). One explanation to these findings is that generalists find it easier, relative to specialists, to draw on and to make use of their prior organizational experiences. Further, Groysberg (2008) found that individuals who have lower work interdependence with their current colleagues did not suffer the same performance penalties when switching firms as those with higher interdependence. Thus, generalist movers who have

less firm-specific knowledge may also find moving easier than do specialists, as judged by better post-move performance.

In this study, we bring the phenomenon of personnel mobility into the controlled setting of the experimental laboratory to examine the causal effects of the movement of individuals on the performance of recipient groups. We study the effects of employee mobility at the group level, because groups are the basic building blocks of organizations and the level at which considerable learning occurs (Argote, 2013). Many of the same processes, such as influence and coordination, take place in groups as in organizations. Thus, groups have been used as laboratories to study organizational processes (e.g., Cohen & Bacdayan, 1994; Kane, Argote & Levine, 2005).

We examine how specialist versus generalist movers to groups affect the recipients' post-move performance both when the recipient group is itself made up of specialists and when it is composed of generalist members. We argue that groups receiving specialist movers experience worse post-move performance than those receiving generalist movers. We also argue that receiving a specialist mover is especially detrimental to recipient post-move performance when the mover must adjust to work with generalists.

Theory and Hypotheses

Individuals frequently move between organizations in job changes. We refer to these individuals as movers, and the organizations to which they move as recipient organizations. The organizations from which these individuals originate are donor organizations. Movers might join recipient organizations for multiple reasons. Recipient organizations might seek to hire movers to acquire specific knowledge or skills. Movers themselves might wish to join organizations

because they believe they can contribute to organizational performance. In both cases, movers join recipient organizations under the assumption that the recipient organization's performance will improve after a move.

However, recipient organization performance can suffer after a move (Groysberg et al., 2008). Why might this be the case? Even though movers might possess knowledge, they might not be able to use their knowledge for the benefit of the recipient organization. One important factor determining whether movers will be able to use their knowledge is their prior organizational experience, and whether that experience matches the recipient organization. Organizational context—specifically, work context—plays a large role in shaping a mover's work experience (Dokko et al., 2009). The context in which a mover acquired experience could in turn influence the ability of a mover to use his or her knowledge in the service of a recipient organization.

Recognizing the importance of learning across organizational boundaries, scholars have established a body of evidence on the transfer of knowledge in the organizational context (Argote & Ingram, 2000). One key finding is that the movement of individuals from source to recipient is an important mechanism of knowledge transfer because individuals are able to adapt knowledge across contexts (Allen, 1977) and transfer both explicit and tacit knowledge (Berry & Broadbent, 1987).

Researchers have investigated factors that facilitate the transfer of knowledge across groups (see Argote & Fahrenkopf, 2016, for a review). Of particular relevance for the current study is previous research on the effect of similarity on transfer. Lane and Lubatkin (1998) examined inter-organizational learning and found that similarity in two firms' knowledge bases and organizational structures positively related to the transfer of knowledge between them.

Similarly, Darr and Kurtzberg (2000) found that transfer was facilitated when source and receiving units were following similar strategies.

Division of Work and Extent of Specialization

The division of work within a group shapes the extent of task specialization among its members. Our study's focus is on the division of work across employees in a group, the same idea recognized by Adam Smith's (1776) application of the division of labor (work) across individuals making pins. For example, we can consider two similar groups that differ in their division of work but produce the same product, device, or service. The first group has a specialist division of work across individual employees, so that each employee works on only a narrow range of tasks. The second group has a low or no division of work across employees, so that each employee completes a wider range of the tasks or all the tasks within the group. The second group has a generalist work division.

In the first group with the specialist work division, employees work more as specialists because their work experience is concentrated on a few tasks. On the other hand, in the second group with the generalist work division, employees work more as generalists because their work experience has a lower degree of concentration in any particular task and employees have experience with a greater number of tasks. Thus, how a group's work is divided across its employees can affect the extent of specialization of its employees, with some groups providing individuals with specialist experiences and others with generalist experiences. We refer to those with experiences at each end of the specialization spectrum as specialists and generalists.

Holding constant all other factors, what differs between these two groups, one with a specialist division of labor and one with a generalist division of labor? Adam Smith (1776) and subsequent work highlighted the production gains from a specialist division of labor that enables

increased efficiency because each worker or country operates further down the learning curve on the specialized task. Scholars have also proposed that the increases in interdependence between individuals resulting from the specialization affect the relative productivity gains. Steiner (1972) discusses how increased work interdependence between individuals from division of work can enable productivity gains by increasing individuals' motivation. On the other hand, Becker and Murphy (1994) theorize that the resulting coordination costs from specialization limit increased productivity to situations in which coordination costs are smaller than the learning benefits of specialization.

We argue that, in addition to the production differences from differing degrees of work specialization within groups, the social context within the groups differs because of two distinct features between generalist and specialist work divisions. First, in groups with specialist work divisions, each employee makes a contribution that is more concentrated on certain tasks that differ between employees as compared to an employee's contribution under a generalist work division. Second, relative to generalist groups, in organizations with specialist work divisions, employees' efforts are reliant upon a greater number of other employees' efforts to achieve a finished outcome. Thus, specialists' efforts require greater connections with others in the group, which, we propose, makes more of the knowledge gained through group experiences firm-specific. Our interest in the division of work is only in circumstances in which the extent of work division impacts how much employees concentrate on certain tasks and the extent to which employees must work together. In other circumstances, we do not expect our theorizing to be applicable or informative.

Movers obtain at least two types of knowledge from their work experience in donor groups. First, they obtain direct task knowledge that is contingent on the type of task. This

knowledge is tied to the characteristics of whatever task the mover performs. Movers coming from a specialist work division are expert in a narrower range of tasks than movers coming from a generalist work division. Second, movers obtain knowledge about how to perform tasks within a given group context, including its particular division of work and its other members also working within the group. Movers coming from a specialist work division acquire knowledge about other specialists with whom they work, whereas movers coming from a generalist work division acquire less knowledge about other members.

We expect that experience in a specialist work division versus experience in a generalist work division has implications for individuals moving to work outside the focal group. Newcomers who have worked as specialists as opposed to movers who have worked as generalists differ in the extent that their knowledge is transferrable to work in other groups. Knowledge can be transferred to other groups when the mover is able to apply what he or she knows and others within the group benefit from the knowledge. Movers may not be able to apply their prior knowledge in a new group because the knowledge is irrelevant to the new group's context and/or task. For example, Dokko et al. (2009) found that habits, routines, and norms learned at a mover's prior employer negatively affected the individual's performance after arriving at a new employer because the habits, routines, and norms were mismatched with those used at the new employer.

Movers who have worked as specialists have gained more firm-specific knowledge from their pre-move experiences and have narrower task knowledge than generalists. Specialist movers compared to their generalist counterparts have more group-specific knowledge that might not be relevant when they move to a new context, so the knowledge generated through their prior experiences is less transferrable to their new groups. Specialists might not feel

comfortable or confident in being able to contribute to their new groups because so much of their prior knowledge was idiosyncratic to their prior group.

In sum, we expect that recipients gaining specialist movers face more hurdles in their post-move work than recipients gaining generalist movers, because the prior experiences of specialist movers have provided less knowledge that is transferrable to work in other contexts. Stated more explicitly, we expect that the higher degree of firm-specific knowledge specialists have generated from their work with their prior colleagues makes a larger share of the knowledge they gain through their work experiences non-transferable to work in new groups and thereby reduces specialist movers' confidence when beginning work in new groups. As such, we expect to see relatively poor performance after receiving specialist movers compared to receiving generalist movers. We state this expectation explicitly in our first hypothesis.

> H1: *Recipient organizations with specialist movers have worse post-move performance than recipients with generalist movers.*

Work Division Fit

We next propose that the negative post-move effect of specialist movers is heightened when movers encounter a division of work different from the one they worked in previously. To develop this idea, we use the concept of work division fit to indicate when the degree of work specialization with which a mover has worked matches the recipient group's division of work.

Because groups receiving movers also vary in their division of work, movers enter into recipients with divisions of work that are more or less similar to their previous experience. Specialist movers moving to groups with specialist work division and generalist movers moving to groups

with generalist work division have work division fit with their new groups. Movers with work division fit continue to work within similar work divisions across groups and find similarities in the social context of their prior and new groups. Movers can apply knowledge accrued on how to contribute in the specific (generalist or specialist) division of work to their new group.

We expect that mover work division fit makes up one aspect of person-job fit. Person-job fit is defined as the match of the skills and abilities of a job holder with the demands and responsibilities of the job (Edwards, 1991). The better the person-job fit or the more appropriately the new employee's skills align with the demands of the job, the more the individual should use his or her prior experience. Strong person-job fit is more likely when the new hire continues work in the same type of organization and/or with the same responsibilities as he or she did previously. The more similar the type of work done at the new organization compared to that done before, the more opportunities to use what the new hire knows.

On the other hand, specialist movers moving to organizations with generalist work divisions and generalist movers moving to groups with specialist work divisions lack structural fit. Movers without work-division fit are not only working within a new group but also encounter a different division of work. Generalist movers perform fewer tasks than they performed previously but perform a task that they performed in their previous group. Specialist movers without fit find the opposite changes between their prior and new groups and, thus, begin working on tasks for which they do not have much experience. Without work division fit, movers must make additional adjustments in how they contribute to group performance when working in new groups and, thus, take more energy and attention away from successful task completion. We expect that the changes experienced by specialist movers lacking work division fit—shifting to completing a broader range of tasks with which the individual may have little

experience and must complete more independently—should leave these movers to require the largest post-move adjustment and thereby amplify the post-move specialist mover disadvantage expressed in Hypothesis 1.

Given the conditions of work division misfit, specialist movers find little of the knowledge generated in their prior experiences useful in their new groups and, thus, struggle to contribute in their new groups compared to specialist movers who have work division fit. Thus, we expect that the negative effect of receiving a specialist mover should be magnified for recipients with a generalist work division. In other words, we expect that specialist and generalist movers are not equally equipped for movements in which they lack structural fit. We expect that the specialist disadvantage is larger when the recipient group is a generalist than when it is a specialist.

> H2: *Post-move performance is more negative when specialists move to a mismatched work division (i.e., specialist mover enters into generalist work division) than when specialists move to a matched work division (i.e., specialist new member enters into specialist work division) or when generalists move to either type of work division.*

Figure 1 provides a summary of the hypotheses.

Insert Figure 1 about here

Method

Participants and Design

Three hundred and twenty-eight subjects volunteered and were compensated for their participation in the study with either a cash payment or extra course credit. Individuals were randomly assigned to single gender three-person groups and to positions within those groups. The groups were split into donor or recipient groups, with 62 recipient groups on which the outcomes were measured. The donor groups were those in which movers gained their pre-move experiences. The recipient groups received the movers and were the groups from which the outcomes were measured. Fifty-three percent of the recipient groups were female.

Procedure and Manipulation

The study has a 2 x 2 mixed design in which mover type (specialist/generalist) and recipient group work division (specialist/generalist) are manipulated as between-subjects factors and performance trial as a within-subjects factor. Three-person groups built origami figures. A new member from a donor group replaced a departing member from the recipient group mid-study. We used small groups to proxy organizations, following other literature that studies organizations through experimental studies (see Camerer & Weber, 2013, p. 3, for a discussion on the validity of studying groups to further organization-level research). The task was adapted from prior studies on teams and membership change (Argote, Insko, Yovetich, & Romero, 1995; Kane, Argote, & Levine, 2005). The participants were instructed to build as many products as possible as a team and informed that the top performing team would receive a monetary bonus.

Prior to membership change, all participants in the study were trained to build the products with an initial work routine. New members across all conditions were trained with a superior routine for the production task that enabled more efficient product construction. The superior routine or the routine given to the recipient groups could be used for production post-move.

Participants in the specialist group work routine conditions were instructed to work in an assembly line in which each group member worked on only one part of the production task, whereas participants in the generalist group work routine condition were instructed to assemble the products individually. Figure 2 shows the experimental procedure, and further details on the experimental method are in the Appendix. We measured knowledge transfer by the recipient group's adoption of the mover's routine and measured learning by the number by which the products increased from the first to the second post-move work period. We administered a survey at the end of the experiment to measure mover confidence and experience of work division fit.

Insert Figure 2 about here

In the first phase of the experiment, participants were randomly assigned to either recipient or donor groups and trained to make origami ships from instructions administered via a video recording and then from practicing making the ships individually. All individuals in the experiment practiced making ships individually. Groups were told they were going to compete as a group by making as many origami ships as they could. After two periods in which they made ships, the second phase of the experiment began, in which group membership change occurred. One member of each recipient group was replaced with a member of the donor group and the member leaving the recipient group exited the experiment. The new member and recipient member who were being replaced were both chosen at random prior to the beginning of the experimental session. Once the new member was settled, the third phase of the experiment began, in which the recipient groups, with their new members, built ships for two more periods.

Finally, the participants finished the experiment by filling out a survey, were debriefed with a handout, and were then thanked for their participation. Performance was measured by the count of ships made in a post-move work period.

Specialist mover conditions were those in which groups received a new member who, at the start of the experiment, worked in a group with a specialist work routine. Generalist mover conditions were those in which groups received a new member who worked previously in a group with a generalist work routine. The recipient groups had worked with either a specialist or a generalist group work routine, so the new members began working in groups mid-study with a work routine that either matched their prior experience (specialist or generalist) or did not. In sum, the four conditions were: specialist new member entering a group with a specialist group work routine, generalist new member entering a group with a specialist group work routine, specialist new member entering a group with a generalist group work routine, and generalist new member entering a group with a generalist group work routine. Summary statistics are presented in Table 1, including pairwise correlation coefficients and their respective significance levels.

Insert Table 1 about here

Results

Manipulation Checks

Table 2 presents mean responses to survey questions by participants after working in a group with a specialist or generalist work division. The results comparing experiences in

specialist work divisions to generalist work divisions with t-tests are presented, along with the resulting p-values. The sample of responses presented in Table 2 is from participants exiting the experiment once membership change occurred and was not part of those performing post-move and captured in the experiment's outcome data. Participants reported experiencing significantly different levels of specialized skills and working together with their groupmates—those working in specialist work divisions used more specialized skills and found it more necessary to work together with their groupmates. In addition, those in specialized work divisions who exited the experiment before membership change occurred were surprisingly more confident in their ability to meet any responsibilities when working with a new group. The specialist-generalist work division manipulation effectively caused a difference in the extent to which participants used specialized skills and experienced interdependence with their fellow groupmates.

Insert Table 2 about here

Performance

Insert Figure 3 about here

Insert Figure 4 about here

After the arrival of the new member, the recipient members, with their mover, worked together during two separate work periods. In each post-move work period, the groups—in addition to choosing to use the mover work routine or the recipient work routine—started up production and then after four minutes stopped work and collected their finished products into a bag that was picked up by the experimenter. The two-work period setup allowed us to identify more closely at which stage post-move the effects of the specialist mover are observed, because we can see if differences between conditions appear in the first period after membership change when the groups are focused on the logistical adjustments of having a mover as opposed to the second period once familiarity has been established. Further, using the two periods of post-move work design, we can examine the extent of improvement from the first to the second period to understand the extent to which the effect of the specialist mover is a static initial post-move adjustment effect or engenders performance disadvantages in later group work.

We examine the effects of specialist movers across the two post-move work periods using a repeated measures ANOVA and a regression including work period effects. The repeated measures ANOVA on mover type (specialist or generalist) by recipient work division (specialist or generalist) by post-move work period yielded significant main effects of post-move work period ($F(58,1)=113.99$, $p<.001$), recipient work division ($F(58,1)= 19.88$, $p<.0000$), and mover type (($F(58,1)=7.78$, $p=.0078$). The analysis also yielded significant interaction effects between recipient work division and mover type ($F(58,1)=6.97$, $p<.0106$), post-move work period and recipient work division ($F(58,1)=6.98$, $p=.0106$), and post-move work period and mover type ($F(58,1)=10.67$, $p=.0018$), and a three-way interaction between post-move work period, mover type, and recipient work division ($F(58,1)=12.55$, $p=.0008$).

We can see the direction of the significant differences shown by the repeated-measures ANOVA analysis by examining Figure 3 and 4. Figure 3 shows the average number of products produced by condition in the first post-move work period, and Figure 4 shows the average number of products produced by condition in the second post-move period. The mean number of products in each condition increases from the first to the second post-move period, as seen by the increase in average products from Figure 3 to Figure 4. We also see that recipients with generalist work divisions produced more products than those with specialist work divisions. In support of Hypothesis 1, we see that the conditions with specialist movers produced fewer products than the conditions with generalist movers, as can be seen from the regression presented in Table 3, which shows the effects observed in the experiment.

Insert Table 3 about here

We run an ordinary least squares linear regression including the manipulations on number of products, the results of which are shown in Table 3 with standard errors clustered on each group. The regression includes an indicator variable for post-move work period (=1 for the second period and =0 for the first) interacted with the manipulations in a regression in Table 3, Column 1. We see that the main effect for recipient structure (=1 for specialist work division and =0 for generalist work division) is significant and negative, which indicates that recipient groups with specialist work division had worse post-move performance compared to the post-move performance of recipient groups with generalist structures. In addition, the interaction between recipient structure and work period is also negative and significant, which shows that recipients

with specialist work divisions performed even worse in the second post-move work period as compared to the first post-move work period.

Next, we examine the coefficients on specialist mover and, thus, the evidence for Hypothesis 1. The main effect for specialist mover (=1 for specialist mover and =0 for generalist mover) is negative but not significantly different from zero in this model. However, the interaction between specialist mover and work period is negative (B= -6.55) and significant (P<.001), indicating that the performance of groups with specialist movers was worse in the second than in the first post-move work period. We have support for Hypothesis 1 and see that the negative effect of specialist mover on post-move performance comes through in the second post-move work period. This is shown by the significant negative coefficient on the interaction between specialist mover and work period.

Proceeding to the evidence for Hypothesis 2, we examine the interaction between specialist mover and specialist work division. A positive coefficient on this interaction or the three-way interaction with work period would support Hypothesis 2. A significant interaction would reveal a significant difference between the difference in specialist movers arriving at groups structured similarly (specialist work division) compared to differently (generalist structure) than the difference in generalist movers arriving at groups structured similarly (generalist work division) compared to differently (specialist work division) controlling for the main effects such that the difference between work division fit and misfit is greater for specialist movers. The coefficient on the interaction term is positive and not statistically significant, but the three-way interaction has a positive and significant coefficient (B=6.82, p<.001). The significantly positive coefficient on the three-way interaction between post-move work period, specialist mover, and recipient structure indicates that the interaction between mover expertise

and recipient structure becomes stronger in the second post-move period. In particular, the significant and positive interaction coefficient indicates that the difference between fit and misfit is greater for specialist newcomers than for generalist newcomers, which provides support for Hypothesis 2.

The results show support for the two hypotheses and, in particular, show that the impact of specialist movers on their recipient performance occurs after initial post-move adjustments. We next look into the process that is contributing to the different performance results across conditions in the second post-move work period.

Learning

Figure 5 shows the average number that products increased by condition, which also can be considered as the rate of learning by each condition. We see that the pattern in rate of increase in products across conditions follows the pattern proposed in the hypotheses, with the specialist mover conditions improving less than the generalist mover conditions and the specialist mover entering a generalist recipient having the lowest rate of improvement, with an average of roughly three products in the last post-move performance period. It appears that the performance differences incurred by receiving a specialist mover occur most strongly in the second post-move performance period, because groups receiving specialist movers improve less than those receiving generalist newcomers.

Insert Figure 5 about here

In Table 3, Column 2, the dependent measure is the increase in the number of products groups produced from post-move work period 1 to post-move work period 2. The dependent measure is the difference in the number of products groups produced from the first post-move work period to the second post-move work period (no groups produced fewer products in the second period than in the first). The regression results show a similar picture in which the effect of specialist mover negatively affects the rate of increase in production, with a negative and significant coefficient on specialist newcomer, and thereby results in those groups with specialist movers suffering more in the second post-move work period. This examination of groups' performance dynamics shows that specialist movers impede performance through their task contributions when groups are working together, because the groups with which they work learn more slowly than those working with generalist newcomers. Further, the positive and significant coefficient on the interaction between specialist mover and specialist structure supports that moving to recipients with similar structures has a larger effect on specialist movers than on generalist movers. The learning analysis shown in Table 3, Column 2 reinforces the analysis on the total production by post-move work period presented in Table 3, Column 1.

Mover Experience of Work Division Fit

Next, we examine the extent to which similarity or fit in work division experienced by the mover mediated the performance results. We use a survey measure to estimate work division fit experienced by the mover. The survey administered at the end of the experiment for the mover participants included "To what extent, did you perform different tasks in your first group as you did in your second group?" We then reverse coded participants' answers to capture work division fit. Table 4 shows the regressions testing the mediating effects of work division fit and Figure 6 shows the average level of mover experience of work division fit by condition.

Insert Figure 6 about here

Once again, we see the consistent pattern across conditions, with specialist movers having lower levels of fit than generalist movers and specialist movers at generalist recipients having the lowest levels of work division fit of the four conditions. In the regression predicting mover experience of work division fit, the specialist mover has a negative coefficient that is statistically significant ($B = -2.14$, $p < .001$), and the interaction effect between specialist mover and specialist recipient is positive and significant ($B = 2.01$, $p < .01$).

A "moderating mediation" occurs when the mediating effects vary by levels of a third moderating variable (Baron & Kenny, 1986). Because we found that the effect of specialist movers is stronger when the recipient has a generalist structure than when it has a specialist structure, we examine whether recipient work division moderates the mediating effect of work division fit. To test whether recipient structure moderates the mediating relationship between specialist mover and post-move performance, we examine whether the mediating effect of work division fit varied based on whether the recipient had a specialist work division or a generalist work division, by including an interaction term between recipient structure and work division fit in the regression predicting post-move performance in the second period along with the main effects of these variables.

As described above and shown in Table 4, Column 1, mover experience of work division fit is lower for specialist movers and especially for those moving to generalist recipients. Thus, the first condition for mediation of mover work division fit is met. In Column 2 of Table 4, we

present the main performance results as a function of the manipulations on the sample for which we have the survey results of mover fit[1] and compare the coefficient on specialist mover and that on the interaction between specialist mover and recipient work with those in Column 3, which also includes the variables of mover fit and its interaction with recipient work division. The size of the coefficient on specialist mover reduces in magnitude by roughly 3.5 products and becomes marginally significant. The coefficient on the interaction term between specialist mover and specialist recipient also reduces in magnitude by about 3.5 products but is no longer significant. The PROCESS bootstrapping procedure shows a significant mediation of mover fit between specialist mover and performance when the recipient has a generalist work division, but no significant mediation when the recipient has a specialist work division. The bootstrapping 95% confidence interval for the indirect effect of specialist mover through mover fit is (-5.7361, -.2677) when the recipient has a generalist work division and is (-1.9426, 1.0291) when the recipient has a specialist work division. Thus, the extent to which mover fit mediates the relationship between specialist mover and post-move performance depends on recipient structure, and we find evidence for a significant moderated mediation model.

Knowledge Transfer Mediation

To better understand the variance across conditions supporting the hypotheses, we investigate the extent to which different mechanisms explain why conditions with specialist movers had worse post-move performance in the second post-move work period. To test for whether a given factor mediates the relationship between specialist mover and second post-move work period performance, we need to observe—in addition to the statistically significant

[1] We excluded four mover participant surveys from the analysis. One mover survey was lost and three were excluded because the participant did not satisfy the survey attention check.

relationship already observed between specialist mover and post-move performance—that the specialist mover predicts the mediating variable and that once the mediating variable is added along with the specialist mover variable in predicting post-move performance, the coefficient on the specialist mover changes in magnitude. If the mediating variable explains the entire path through which the specialist mover affects post-move performance, then we would observe that the specialist mover no longer is significant in the regression predicting post-move performance. Instead, if including the mediating variable only reduces the size of the coefficient on the specialist mover, then we conclude that the mediating factor only partially mediates the effect. Then we examine whether this interaction coefficient is significantly different than zero by examining whether bootstrapped 95% confidence intervals do not include zero (MacKinnon et al., 1998). For this bootstrapping interval test, we run the 10,000 bootstrap confidence intervals via PROCESS as proposed by Hayes (2009) and Hayes (2012).

First, we examine whether specialist mover affects knowledge transfer. Movers were given knowledge that enabled better performance in the experiment and, thus, a greater likelihood of transfer from generalist movers over specialist movers could help explain why we observe lower post-move performance for the specialist mover conditions. To investigate whether knowledge transfer from the mover's background is a mechanism underlying the performance differences across conditions, we examine the extent to which the transfer of the new member's superior routine mediated the performance results observed. Participants were made aware that production routines differed between the old timers and the new member right after the new member arrived and just before the group worked together. Participant groups were informed by instructing them that only one production routine could be used. Knowledge transfer occurred when the groups adopted the mover's production routine in either of the post-move

work periods. Therefore, our measure of knowledge transfer can take the value of 0 (no use of mover routine), 1 (use of mover routine in either post-move work period) or 2 (use of mover routine in both post-move work periods). We use a weighted least squares method for analyzing knowledge transfer (Stokes, Davis, & Koch, 2000) which follows prior work (Kane et al., 2005).

Figure 7 shows the average number of knowledge transfer occurrences by condition. The mean occurrence of knowledge transfer is lowest for groups that receive specialist movers, which shows a specialist mover disadvantage operating in line with Hypothesis 1. Further, we can see that the differences between specialist movers and generalist movers arriving in groups with and without work division fit is much greater for specialist movers, which shows a magnified specialist mover disadvantage under conditions of structural misfit. This pattern is consistent with Hypothesis 2. The regression analysis presented in Table 5, Column 1, predicting knowledge transfer occurrences, shows a negative effect (B=-1.28) that is marginally significant ($p<.10$) for the specialist newcomer. The main effect of recipient structure and the interaction effect are not significantly different than zero, but the interaction effect is in the direction aligned with Hypothesis 2.

Insert Figure 7 about here

We then add knowledge transfer into the regression predicting post-move performance in the second post-move work period, along with the study's manipulated variables. Column 2 of Table 5 predicts post-move performance with both the manipulated variables and knowledge transfer. The coefficient on knowledge transfer is significant and positive, which shows that

adoption of the mover's superior production routine did increase the number of completed products that groups were able to complete. Groups that used the mover's production routine in an additional post-move work period increased their production by 2.43 products on average in the second post-move work period, holding all else constant. The size of the coefficients on specialist mover and the interaction term slightly decrease in magnitude by roughly 1 completed product, but both coefficients remain significant. The results from the PROCESS bootstrapping method yield a 95% confidence interval (-3.7024, -.0308), which does not include zero, indicating that a statistically significant negative partial mediation relationship exists. As such, we have evidence that knowledge transfer partially mediates the relationship between specialist mover and worse post-move performance and that the specialist mover is affecting performance above and beyond his or her effect through knowledge transfer. Thus, we see that that the means by which specialist movers inhibit post-move performance at their recipient is in part through reducing the extent to which recipients use beneficial knowledge brought in through their newly incorporated members.

Insert Table 5 about here

New Member Confidence Mediation

Our theoretical framework states that the main effect of specialist mover on knowledge transfer occurs, in part, because specialists have less transferable knowledge and thus experience less confidence as they begin work with their recipients. As such, we investigate the extent to which mover confidence serves as a mediator to help explain the lower levels of knowledge

transfer occurrences in the specialist mover conditions. We rely on a survey measure of the mover's confidence in regard to his or her work with the recipient group.

At the end of the post-move work periods, we administered a survey to all participants. Participants who served as movers were asked for their agreement with this statement on a five-point scale: "I was confident in the suggestions I made on how my second group could perform better.[2]" Mean levels of mover confidence by condition are presented in Figure 8. We again see the same pattern in means across conditions, with specialist movers at generalist recipients having the lowest levels of confidence.

Insert Figure 8 about here

In the regression predicting mover confidence, the specialist mover has a negative coefficient that is marginally statistically significant (B =-.9, p=.0820), as shown in Table 6. Then we add mover confidence into the regression predicting knowledge transfer, along with the manipulated variables, and our sample size drops because we have mover confidence for only 40 movers. The size of the coefficient on the specialist mover decreases in magnitude and is insignificant. The PROCESS bootstrapping test yields a 95% confidence interval for indirect mediating effect of (-1.1514, -.0274), indicating that mover confidence mediates the relationship between specialist mover and knowledge transfer from the mover's background. All together, we have evidence that the means by which specialist movers inhibit post-move transfer of mover knowledge is

[2] We have responses to the question from 40 newcomers because the question was not given to the first 14 groups run in the experiment, 1 newcomer survey was lost, 3 newcomers failed an attention check question on the survey, and 4 newcomer participants skipped the second half of the survey, including this question.

through reducing the extent to which movers feel confident in their ability to contribute to their new organizations.

Insert Table 6 about here

Discussion and Conclusion

The results support the hypotheses proposed and show evidence on how and when receiving generalist movers differs from receiving specialist movers. Recipients gaining specialist movers performed worse than those gaining generalist movers. Recipients with generalist work divisions outperformed recipients with specialist work divisions. We also found evidence for our predicted interaction between recipient work division and mover type. Recipients suffered more when they had a generalist work division and received a specialist than in the other three conditions.

Results of the mediation analysis provide insights on the process through which specialist movers affected the observed outcomes. We found evidence that lower levels of important knowledge transfer from the mover's background help explain why recipients gaining specialists underperform compared to those gaining generalists. Further, our mover surveys show that specialist movers are less effective conduits of outside knowledge because those who have worked as specialists are less likely to have confidence in contributing to their recipients; the survey also shows that the reduced confidence helps explain the relationship between mover type and post-move likelihood of knowledge transfer. For the particularly detrimental combination of

specialist movers entering generalist recipients, we found that the mover's experience of work division fit also explained why these specialist movers engendered worse performance for their recipients. Our further analysis into the experiment's main findings help illuminate why recipients gaining specialist movers are at a disadvantage compared to when they gain generalist movers.

We find that the specialist mover disadvantage is magnified from the first to the second post-move work periods. Thus, rather than diminish over time, the effect becomes larger over time, which suggests that differences between hiring specialists and generalists might occur at a larger scale in real organizational settings. For those movers who move into permanent positions in organizations, we expect that the effects will become more pronounced over longer time frames than what we have been able to measure in our laboratory setup.

Our study furthers the understanding of why we see variance in individuals' performance when they move across organizational boundaries and shows how social processes that individuals encounter working in different organizational structures, such as the organization's division of work, affect their individual behavior moving forward. We do so by studying how group-level manipulations affect individuals who then go on to affect group-level outcomes. In essence, our findings showcase a quintessential example of the macro-micro connects described by Coleman's boat (Coleman 1990). And as such, the findings shed light on the more micro-processes shaping the aggregate performance of organizations. In addition, we show how characteristics of an individual's human capital can affect the learning occurring once individuals cross organizational boundaries.

We see many fruitful opportunities for research examining potential contingencies that would heighten or diminish the study's central findings. For instance, our results show

significant differences between working as a specialist versus a generalist for an individual's ability to contribute moving forward. We speculate that one boundary condition of this difference may be the co-mobility of prior colleagues. If a specialist moves along with another specialist, then the effects of receiving two specialists compared to receiving two generalists may be less pronounced because the specialists can still make use of firm-specific knowledge developed in their working relationship. We expect that another boundary condition happens when the distinctions between generalists and specialists do not include differences in the extent of firm-specific knowledge generated through prior experiences. Without substantial differences in the extent of firm-specific knowledge between generalists and specialists, we would not expect to find as significant differences in how transferrable movers' knowledge would be once they began work in new organizations.

While we make substantial contributions to our understanding on the implications of specialist versus generalist newcomers, our study has limitations. We do not manipulate the isolated components that differentiate specialists from generalists on the individual level, including the extent of firm-specific knowledge and extent of knowledge breadth. We focused on a group-level construct to manipulate and with that, individuals within the groups may have experienced multiple facets of the manipulation. We encourage future work to examine how particular aspects of the group-level factors such as the extent of firm-specific knowledge impact the individuals. A study setup could use technology or routines to keep the extent of close work between group members constant while allowing individuals to vary in their knowledge breadth. Such a setup would allow us to study the effects of differences in knowledge breadth experienced by those in organizations with specialist work divisions versus generalist work divisions, while holding the extent of firm-specific knowledge constant.

We want to note details of our study that may have implications for the findings' general application. Our study included only movers who had more superior knowledge than their recipient organizations. We expect that this condition is necessary for our findings to be observed elsewhere. New hires are often recruited because they can bring in superior outside knowledge, and, therefore, we assume this necessary condition to generally occur. Thus, we expect our results to hold in many organizational contexts.

Our study advances theory on movers and the division of work within organizations by empirically demonstrating a significant link between the two areas. We show how structural characteristics of the work within organizations affect individuals' ability to contribute when entering a new organization. Thus, we advance understanding of how groups can perform well under conditions of membership change.

From a practical perspective, the findings provide evidence on the causal effects of moving individuals across groups with varying characteristics in their ability to be productive within their recipient contexts. In addition, the study offers actionable insights into how individuals can prepare to move across organizational boundaries and how managers can identify individuals who would likely make positive contributions after arriving. These findings provide practical insight into how groups and organizations can operate with movers who arrive in organizations with varying amounts of similarity between the extent of specialization in the movers' backgrounds and that within the recipient organization. For example, individuals who have worked as generalists previously may be more desirable to recipients than their specialist counterparts, especially under conditions of work specialization mismatch. The results also further our understanding of the relative advantages of generalists.

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Tables

Table I. Descriptive statistics

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8
Performance in 1st post-move WP	5.887	3.446	1	18	1							
Performance in 2nd post-move WP	11.081	6.634	1	34	0.77***	1						
Specialist recipient	0.500	0.504	0	1	-0.46***	-0.44***	1					
Specialist mover	0.500	0.504	0	1	-0.18	-0.34**	0.03	1				
Knowledge transfer	0.887	0.925	0	2	0.26*	0.40**	0.05	-0.19	1			
Learning	5.194	4.569	0	23	0.36**	0.87***	-0.29*	-0.36**	0.39**	1		
Mover experience of work division fit	1.897	1.575	0	4	0.04	0.34**	-0.11	-0.35**	0.29*	0.45***	1	
Mover confidence	3.825	0.958	1	5	0.26	0.24	0.19	-0.25	0.51***	0.15	0.29+	1

Notes: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Table II: Participant survey responses by group structure

Question	Generalist member	Specialist member	Generalist - specialist mean	t-stat	p-value	N
Each member of the group of people I performed the performance trials with used specialized skills to make origami ships during the performance trial.	**2.87**	**3.93**	**-1.06**	**-4.70**	**>.000**	**113**
It was necessary for me to work together with the other participants in my group to make the origami ships during the performance trial.	**3.00**	**4.19**	**-1.19**	**-5.42**	**>.000**	**114**
Aggregate identity questions	3.81	3.88	-0.07	-0.58	0.56	114
I can teach a new group to build the origami ship I built in my group 1= yes	0.85	0.94	-0.09	-1.09	0.28	57
I can successfully compete in performance trials making origami ships on my own 1= yes	0.88	0.91	-0.02	-0.26	0.79	58
I could help a new group perform well in making origami ships. 1= yes	0.85	0.94	-0.09	-1.09	0.28	57
I am prepared to function effectively with a new group making origami ships because of my past experience.	4.10	4.11	-0.01	-0.05	0.96	85
My previous experience has taught me that I can meet responsibilities given to me in a new group making origami ships.	**3.90**	**4.24**	**-0.34**	**-2.16**	**0.03**	**85**
My past experiences and accomplishments increase my confidence that I can perform successfully in a new group making origami ships.	4.08	4.22	-0.14	-0.92	0.36	85
Prior training and experience give me assurance that I can accomplish work given to me in a new group making origami ships.	4.08	4.17	-0.10	-0.66	0.51	85
I could just as easily work with another group to make origami ships as work with my prior group again.	3.97	3.91	0.06	0.38	0.70	85
If you joined together with another group to compete in another performance trial, would you like to be the leader of your group?	0.62	0.60	0.02	0.17	0.86	69
If you were to be the leader of a group building origami ships, would you organize the group to work in an assembly line?	0.78	0.74	0.03	0.31	0.75	66
Do you want to work alone in another performance trial in which you would compete against other individuals	0.54	0.43	0.10	0.82	0.42	65
How successful do you think you would be if you worked alone in another performance trial and competed against the other individuals?	3.10	3.24	-0.14	-0.59	0.56	71
Under which of the following conditions would you be willing to compete working alone in another two performance trials against other individuals? For the chance to win an additional $20? 1 = yes	0.93	0.78	0.16	1.76	0.08	69
Under which of the following conditions would you be willing to compete working alone in another two performance trials against other individuals? If you were assisted with the help of a prior groupmate? 1= yes	0.83	0.87	-0.04	-0.40	0.69	68
Under which of the following conditions would you be willing to compete working alone in another two performance trials against other individuals? If you were assisted with the help of another participant in the room? 1 = year	0.76	0.60	0.16	1.34	0.18	64
Under which of the following conditions would you be willing to compete working alone in another two performance trials against other individuals? If you had to give up the opportunity to fill out another survey for which you would be paid $5? 1 = year	0.61	0.47	0.13	1.07	0.29	66
Year in school - 1= undergrad	0.78	0.77	0.02	0.23	0.82	124
Level of experience with origami 1= new to origami	0.45	0.36	0.09	1.02	0.31	124

Table 3: Regression coefficient results showing post-move recipient performance across post-move work periods

Dependent Variable	Total product count	2nd work period product count - 1st work period product count
Specialist work division	-3.97***	-5.95***
	(1.14)	(1.36)
Specialist mover	-2.04	-6.55***
	(1.25)	(1.36)
Specialist mover * Specialist work division	1.760	6.82***
	(1.54)	(1.93)
Post-move work period	9.69***	
	(1.41)	
Post-move work period * Specialist work division	-5.95***	
	(1.63)	
Post-move work period * Specialist mover	-6.55***	
	(1.54)	
Post-move work period * Specialist mover * Specialist work division	6.82***	
	(1.91)	
Constant	8.44***	9.69***
	(0.99)	(0.95)
N	124	62
R^2	0.497	0.347

Notes: Standard errors are in parentheses. Standard errors are clustered on recipient group in Column 1. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Table 4: Regressions testing the moderated mediating effects of mover work division fit on recipient 2nd postmove period performance

Dependent Variable	Mover task fit	Performance	
Model	(1)	(2)	(3)
Mover work division fit			1.65*
			(0.790)
Mover work division fit * Specialist work division			-1.96+
			(1.020)
Specialist work division	-1.34*	-9.30***	-3.57
	(0.520)	(1.980)	(3.350)
Specialist mover	-2.14***	-8.07***	-4.54+
	(0.530)	(2.010)	(2.590)
Specialist mover * Specialist work division	2.01**	8.20**	4.630
	(0.740)	(2.800)	(3.210)
Constant	3.14***	17.5***	12.3***
	(0.380)	(1.420)	(2.840)
N	58	58	58

Notes: Standard errors are in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Mover work division fit measured by mover's survey response to: "To what extent, did you perform different tasks in your first group as you did in your second group?"

PROCESS bootstrapping yields a 95% CI (-5.7361, -.2677) for generalist recipient and (-1.9426, 1.0291) for specialist recipient indicating significant indirect effect for generalist recipient

Table 5: Regressions testing the mediating effect of knowledge transfer from specialist mover on performance in 2nd post-move period

Dependent Variable	Knowledge transfer	Performance	
Model	(1)		
Knowledge transfer			2.43***
			(0.680)
Specialist work division	-0.26	-9.93***	-9.62***
	(0.700)	(1.890)	(1.720)
Specialist mover	-1.28+	-8.59***	-7.15***
	(0.720)	(1.890)	(1.770)
Specialist mover * Specialist work division	1.050	8.58**	7.44**
	(0.990)	(2.670)	(2.450)
Constant		18.1***	15.4***
		(1.310)	(1.420)
N	62	62	62
R2		0.405	0.51
LL	-60	-189	-182.4

Notes: Standard errors are in parentheses. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

PROCESS bootstrapping yields a 95% CI (-3.7024, -.0308) indicating significant indirect effect

Table 6: Regressions testing the mediating effect of mover confidience between specialist mover and knowledge transfer occurances

Dependent Variable	Mover confidence	Knowledge transfer	
Model	(1)	(2)	(3)
Mover confidence			1.49**
			(0.500)
Specialist work division	-0.1	2.4E-16	0.13
	(0.400)	(0.830)	(0.920)
Specialist mover	-0.90*	-0.68	0.45
	(0.410)	(0.870)	(1.020)
Specialist mover * Specialist work division	0.900	0.680	-0.37
	(0.580)	(1.200)	(1.350)
Constant	4.10***		
	(0.290)		
N	40	40	40
R2	0.147		
LL	-51	-41	-34.7

Notes: Standard errors are in parentheses. Mover confidence measured by mover's survey response to: "I was confident in the suggestions I made on how my second group could perform better." + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Figures

Figure 1: Hypothesis summary

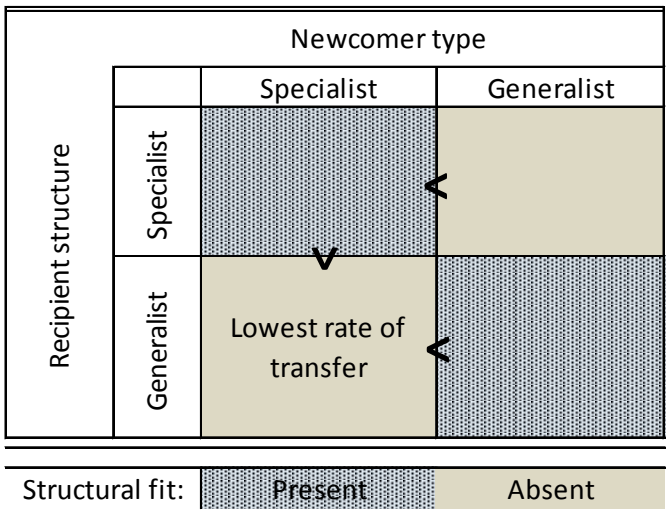
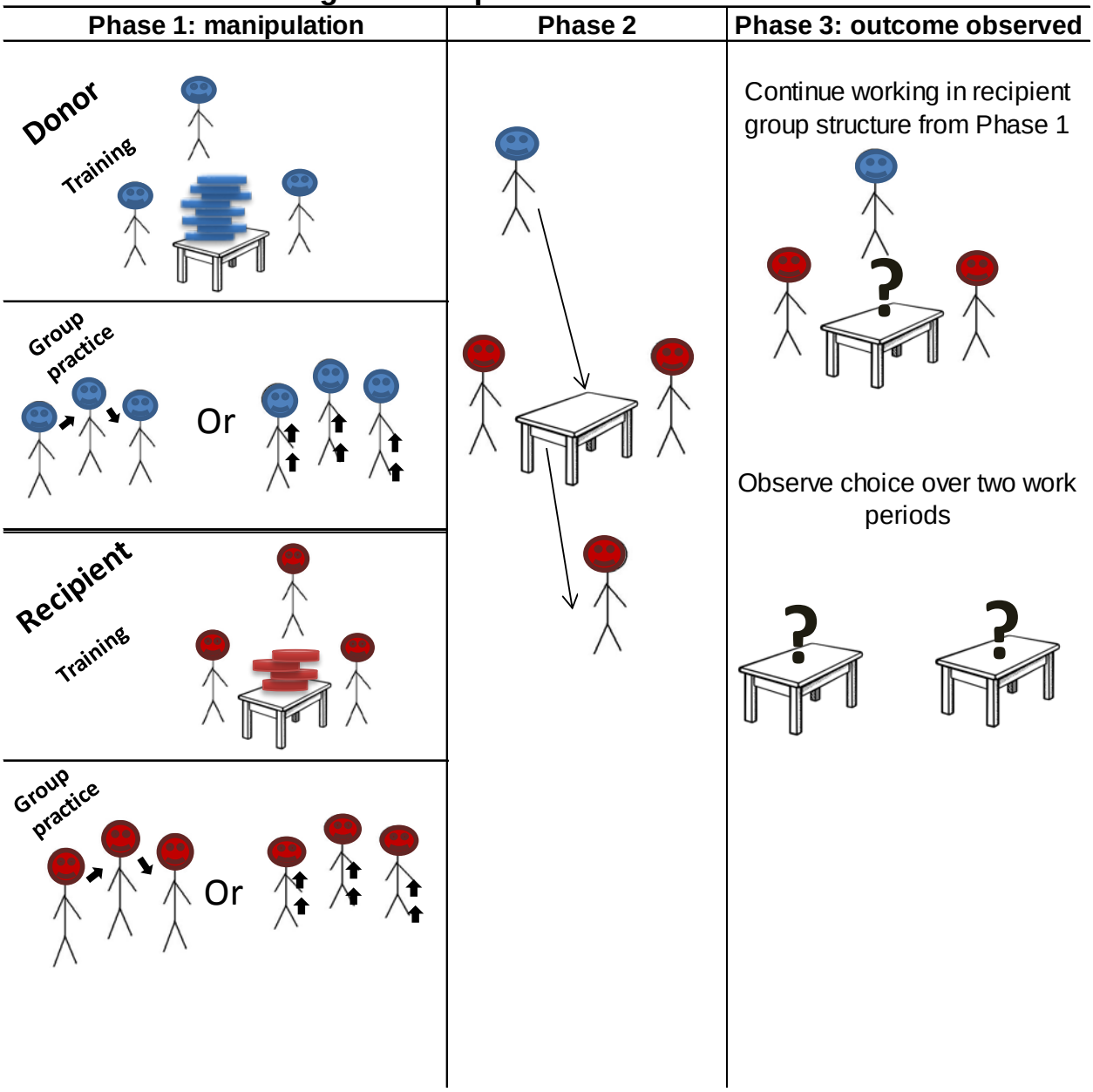


Figure 2: Experimental Procedure



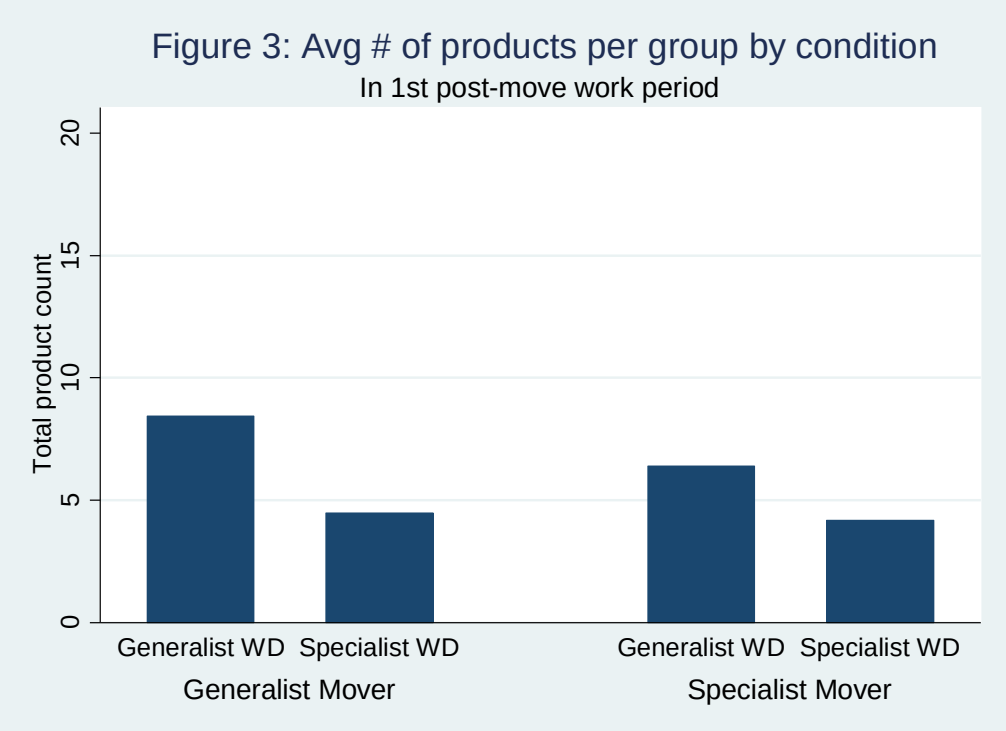


Figure 3: Avg # of products per group by condition
In 1st post-move work period
Total product count
0
5
10
15
20
Generalist WD
Specialist WD
Generalist WD
Specialist WD
Generalist Mover
Specialist Mover

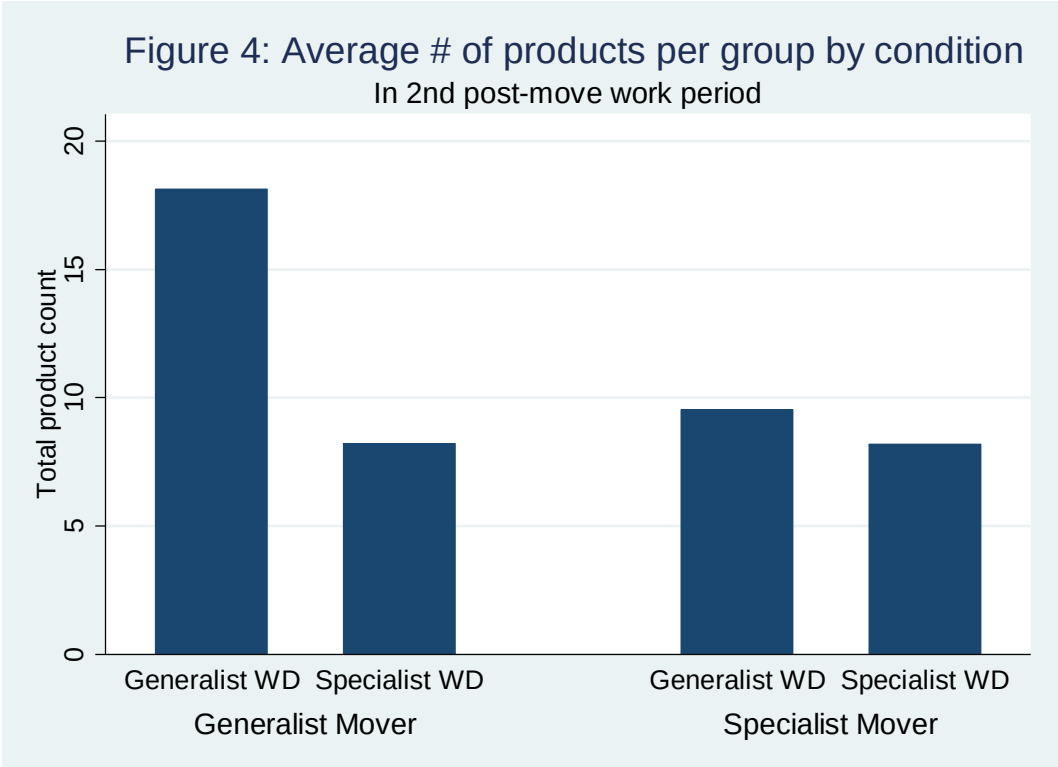
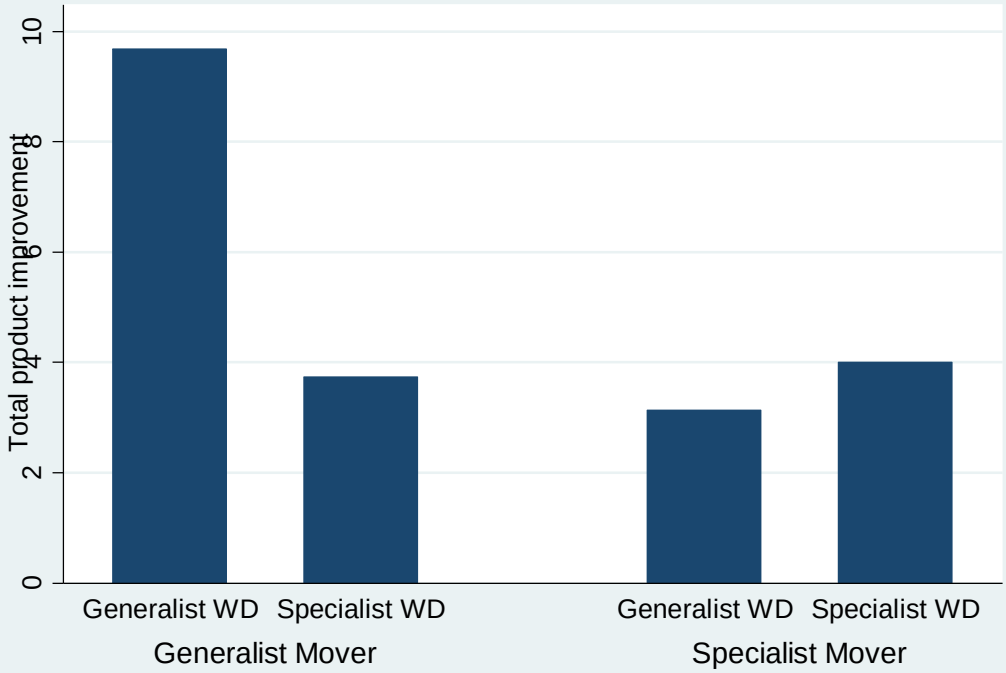


Figure 4: Average # of products per group by condition
In 2nd post-move work period
Total product count
0
5
10
15
20
Generalist WD
Specialist WD
Generalist WD
Specialist WD
Generalist Mover
Specialist Mover

Figure 5: Avg # of products improved from 1st to 2nd post-move WP



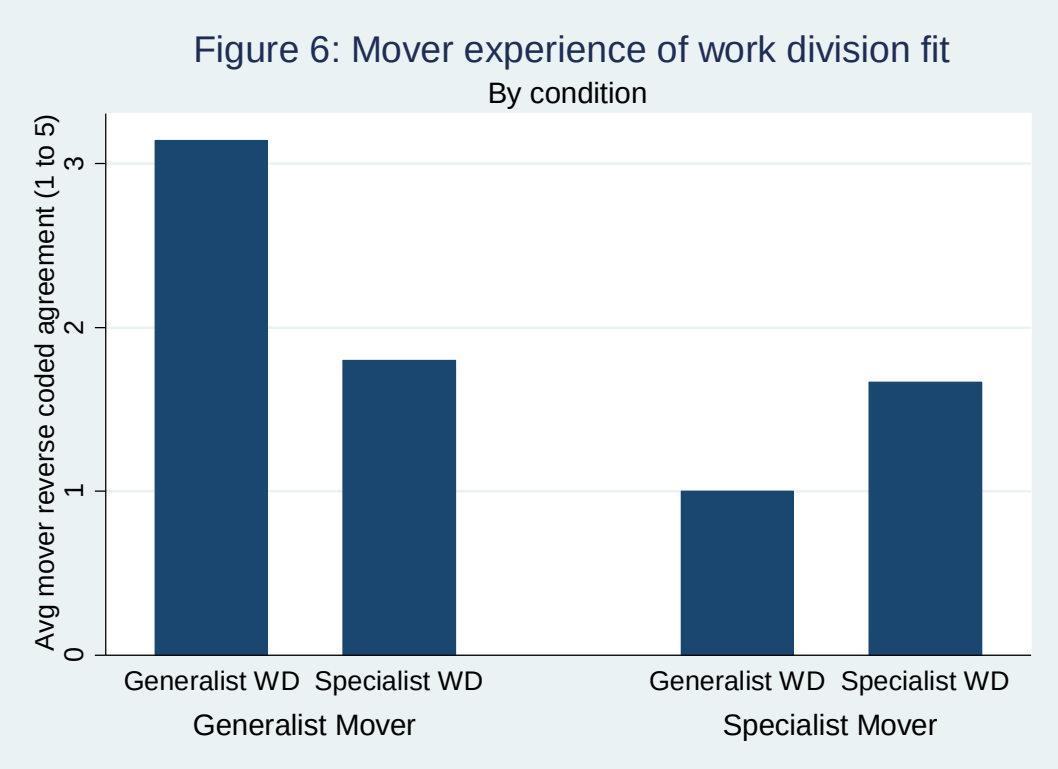


Figure 6: Mover experience of work division fit
By condition
Avg mover reverse coded agreement (1 to 5)
0
1
2
3
Generalist WD
Specialist WD
Generalist WD
Specialist WD
Generalist Mover
Specialist Mover

Figure 7: Avg. occurrence of knowledge transfer by condition

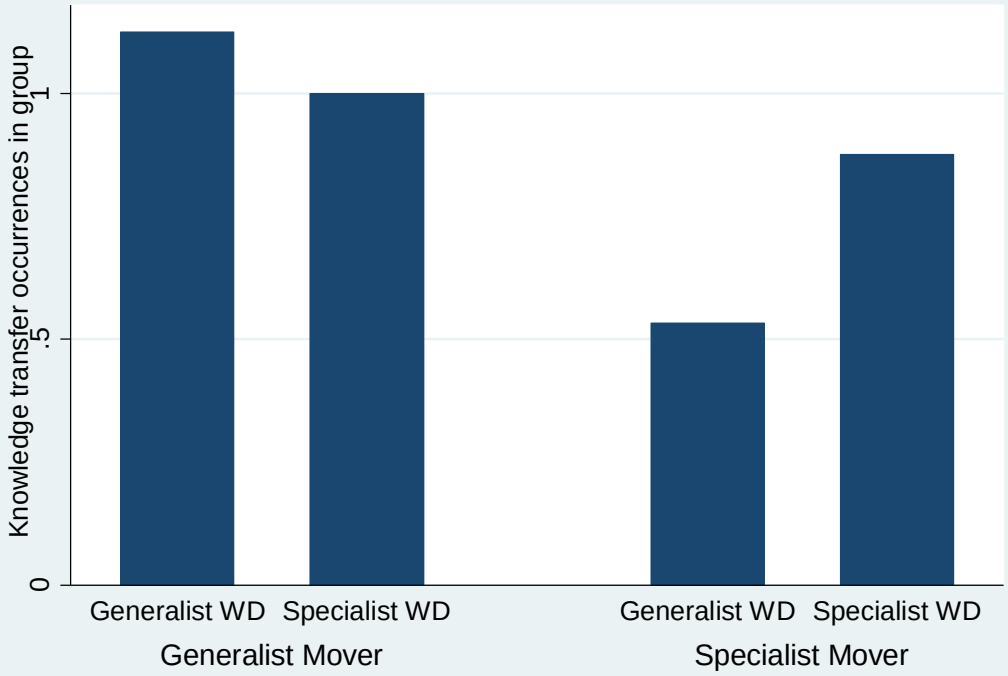
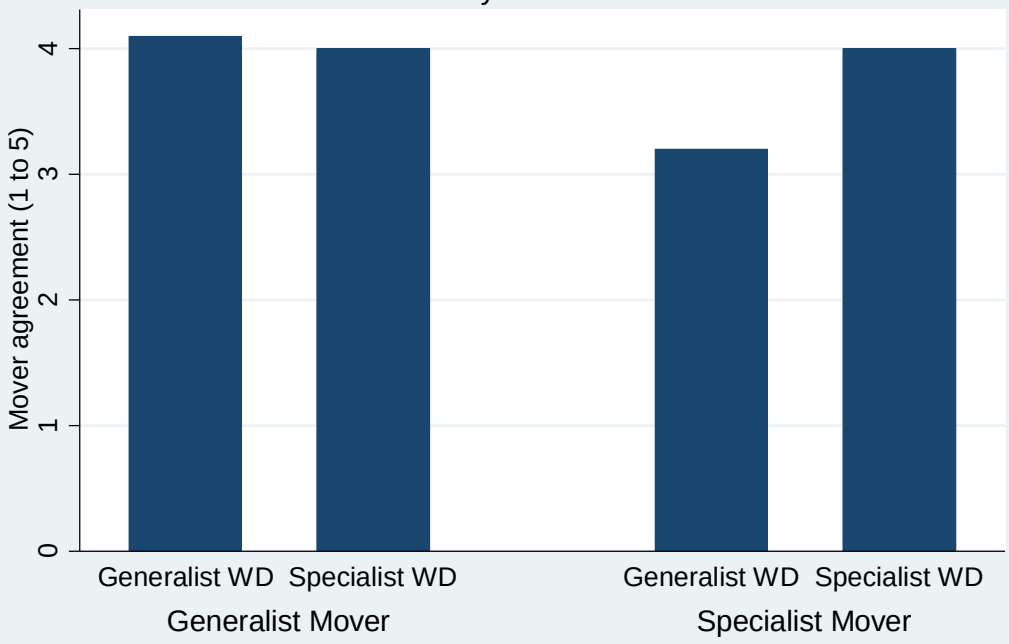


Figure 8: Mover confidence

By condition



Appendix: Further details on experimental procedure

Experiment procedure outline

Pre – experiment – prep materials (30 - 45 minutes with 2 people /45 minutes - 1 hour with 1 person)

1. In each room using place the following
    a. On the table place four small ziplock bags with the group name, (which is based on room: Scotties in D, Andrews in A, Pittsburghers in B, Carnegies in C) performance trial, and date on them
    b. At each chair place three pieces of origami paper for training (all origami paper must be white on one side)
    c. Four product cards with a space for groups to fill out how many ships they made
    d. 3 post-experiment surveys face down in each room using (make sure the surveys match who is in the room: recipient surveys are for those from a recipient room, donor survey are for the new members, stayer surveys are for those that stay in the same room for the whole experiment)
    e. On the computer place a ziplock bag with “practice ships” and 3 pens
    f. Start the video recorder and test to make sure it is working
        i. Place camera so group can be recorded
    g. Turn on noise maker in room B
2. Look at condition order worksheet and identify which condition will be run in the 4 rooms
    a. Place materials in each room according to condition – either origami paper at all chairs (Ind) or only at first chair three (Inter)
    b. Label 3 chairs in each room with task expertise (all or initial, structural, and finishing)
    c. At each chair a name tag on the chair with the group name and task expertise listed and a blank space for the participant to put their name
    d. Place computer facing the chairs and prep video to be played according to condition

i. Video on YouTube and can be found by googling “Erin Fahrenkopf YouTube”
ii. For all recipient groups set up videos “r t train & p 1 2” and “pt 3 4 t” for interdependent conditions and “r d train & p 1 2” and “pt 3 4 d” for independent conditions
iii. For donor group set up video “d t train & p 1 2” for interdependent condition and “d d train & p 1 2” for independent condition

3. Where greeting participants have the following set up
    a. Open CBDR’s system, roster workbook, and set out cards that have roles and rooms on them ordered randomly, consent forms and pens

Experiment – initial steps until the performance trials (15 minutes)

4. As participants come into the lab
    a. Check their ID
    b. If they are needed, have them pick a card with their assigned role, give them a consent form and pen and ask them to go to sit, sign the form and wait until we begin
    c. For those that arrive after all the groups are filled, give them $5/.5 credits and ask them to sign up again another session
        i. If they are credit participants, then ask if they would like to sign up again and say that will send email about the chance to sign up again
        ii. If they are $$ participants, then mark them as excused in the SONA system
    d. Mark the participant roster as participants enter by filling in as follows
        i. Room/seat number on roster indicates participated
        ii. Showed up indicates participant showed up but is not needed
            1. If credit participant mark “email” if they want to be contacted about participating in another session of the experiment
        iii. No show indicates participant did not show up for the study

5. Once all participants have arrived (up to 10 past experiment start time) asked participants to go to their assigned rooms and take their assigned seats, write their names on the nametags and put them on
6. Then go to recipient groups first and begin experiment and then start donor group
    a. Give experiment intro
    b. Start training video
7. Participants watch a training video on a computer (10 minutes)
    a. They are told that they will make origami sailboats
    b. They learn to make origami sailboats
    c. Make sure we do not watch the groups during training because we want them to feel as comfortable as possible
    d. Go into each room and grab practice ships in the bag marked for them once the training is over

Experiment – performance trials (15 minutes)

8. The video introduces groups to the performance trials and how they must work together during the trials
    a. Also participants are told not to speak in the breaks between PTs
9. Participants perform the first performance trial for 4 minutes
    a. After it ends they are asked to fill out a sailboat card and place their completed figures into the bag for PT1
    b. As soon as it ends, go into room to ensure they stop making ships
    c. If groups do not fill out product inventory cards correctly, ask them to do so
    d. Experimenters come around and examine the bag for PT1 and take it away
        i. This must be done as soon as PT1 ends
        ii. Mark anything of note on the experimental outline sheet
    e. If recipient groups are unable to make the ship at this point, stop video and demonstrate to groups until they are able to make the ships
        i. Mark this on the experimental outline sheet
10. Participants perform the second performance trial for 4 minutes

a. After it ends they are asked to fill out a sailboat card and place their completed figures into the bag for PT2
b. If groups do not fill out product inventory cards correctly, ask them to do so
c. Experimenters come around and examine the bag for PT2 and take the away
    i. This must be done as soon as PT2 ends
    ii. Additional important language is used here, see script
    iii. Mark anything of note on the experimental outline sheet

11. Participants are told they will experience membership change
    a. One member from each recipient group will be asked to leave the room and head into the donor room
        i. The participant that should move is marked on the experimental outline
        ii. For inter structure groups, either the first or second position (initial tasks or structural tasks) is asked to leave
    b. Corresponding members of the donor group are asked to each go their recipient group (look on experiment outline sheet)
        i. After they arrive in their new group, experimenter gives the membership change dialog
    c. Participants from the recipient groups that are now in the donor group room are given surveys
        i. Stop the video recording in room D and save file as “Scotties date”
        ii. Once participants in room D are finished with the survey, debrief them and have them leave through the other door close to room D

Experiment – post membership change performance trials (20 minutes)

1. The video introduces groups to how they must work together during the trials
    a. Also participants are told not to speak in the PT breaks and that only one type of ship will be accepted
2. Participants perform the third performance trial for 4 minutes
    a. They are asked to fill out a sailboat card and place their completed figures into the bag for PT3
    b. Experimenters come around and examine the bag for PT3 and take it away

        i. This must be done as soon as PT3 ends
        ii. Mark anything of note on the experimental outline sheet
    c. Remind groups that only one type of ship can be accepted for their performance if they are making two ships and tell them the extra ship will be counted as scrap
    d. If groups do not fill out product inventory cards correctly, ask them to do so
3. The video explains that only one type of ship can be accepted here on out so they must decide which ship they will submit
    a. If participants end up making multiple types remind them that only one can be accepted
    b. Check to make sure they have enough paper
4. Participants perform the forth performance trial for 4 minutes
    a. The video reminds that only one ship can be accepted
    b. After it ends they are asked to fill out a sailboat card and place their completed figures into the bag for PT4
    c. If groups do not fill out product inventory cards correctly, ask them to do so
    d. Experimenters come around and examine the bag for PT4 and take the bag away
        i. This must be done as soon as PT4 ends
        ii. Mark anything of note on the experimental outline sheet

Experiment – final steps (5 minutes)

5. Participants are asked to fill out the post-performance survey (5 minutes)
    a. Manipulation checks
    b. Demographics
6. While participants fill out survey, start to clean up materials
    a. Mark the number of ships build on the experimental outline sheet
    b. Stop video recordings and save file with group name and date
7. Participants are debriefed (with a handout) and thanked

Time total =15+15+20+5 = 55 minutes

Post – experiment

8. If have not done so yet, stop the video recordings and save the files with the group names and dates
9. Write the number of ships in each bag on the outside of the bag
10. Make sure filled out surveys have the correct date and seat # info on them
11. Finish filling out the experimental outline with number of items made and any other notes on the groups
12. Pay participants – mark them as participated and send gift cards

Notes:

- Check on groups right when PTs end to make sure they stop making ships at the appropriate time
- Talk to groups if there is any indication that they do not understand the directions
- Keep an eye out for groups that that to change their means of organizing and stop this before it happens

PARTICIPANT TRAINING VIDEO SCRIPT

Experiment intro

In this experiment, you will make origami ships *together as a group*. First you will learn how to make origami ships and each practice making the ships. Then as a team you will make origami ships for four performance trials in which you will compete with other groups for $30. Your performance in each performance trial will be judged on how many ships you are able to make as a group. Here is exactly how your performance will be judged during *each* performance trial:

You need to make as many origami ships as you can where each ship can stand up on its own and has at least one sail. Other than these requirements your ships can look as you like. Groups that do well in the experiment focus on making a lot of ships quickly and helping each other out improves how well groups perform.

Now that you know how your performance will be judged during the experiment, let's begin the training on how to make origami ships that stand up on their own and have a least one sail.

To begin your training, I'll show you how to make an origami ship by explaining the steps and you should practice along with me. After that you'll have 2 chances to practice making the ships on your own. There are three general steps to make the origami ships: first are the initial folder tasks, then the structural tasks, and then the finishing tasks.

Donor: In total, the ship you will be trained to make has 5 folds.

Recipient: In total, the ship you will be trained to make has 9 folds.

Training intro 2 – 3 minutes/ 1.5 minutes for donor

Now make one ship on your own with these models on the screen. Next you'll make one on your own without the models so take a look at them now. You have a few minutes to practice. Please begin making your second practice ship now.

Training intro 3 – 3 minutes / 1.5 minutes for donor

Now make one on your own without the models. You have a few minutes to practice. Please begin making your third practice ship now.

PT 1

Next will be your first performance trial. You will have 4 minutes for the performance trial and you will be competing for the chance to win $30. Please place all the ships you made in the training session aside on the area marked for them and grab the materials marked for the performance trial. In the breaks between the performance trials, please do not talk with your group mates but feel free to speak with each other during the performance trials.

Independent: During the performance trial, you must each complete all the tasks for each ship that a member begins. Therefore, each member of your team must complete the initial tasks, the structural tasks, and the finishing tasks on each ship that that member begins. So if one member starts making a ship, that same member must finish making that ship. You are free to show each other how to make the folds and discuss what you are doing, but remember, the member that begins a ship must complete all the tasks for that ship.

Interdependent: During the performance trial, your team must work in an assembly line to construct each ship. Therefore, the member sitting in seat 1 will complete the initial tasks. The initial tasks are making the initial folds that prep the paper for the harder structural folds. And then the member in seat 1 passes the paper to the member sitting in seat 2. The person in seat 2 will do the structural tasks. The structural tasks are making the harder folds, the ones until the ship lays flat on the table. Then the person in seat 2 passes it to the person sitting in seat 3 who will do the finisher tasks. The finisher tasks are popping the ship up. The person sitting in seat 2 and seat 3 will have to wait for the product to come through the assembly line before they begin their task. You can show each other how to make the folds and discuss what you are doing, but remember, each of you must only work on your assigned tasks.

The criteria that each ship must meet will be on the screen during the performance trial. Do not begin folding more ships than your group can finish because there is a penalty for any partially constructed ships. Make sure to stick to your assigned work during the performance trial and I will tell you when you have one minute remaining in the performance trial. You have 4 minutes, please *begin*.

You all have 1 minute left in the performance trial.

Time is now up. Please put down all your materials.

Please place all the ships your group made in the first performance trial in the bag marked for them. Also, please fill out the performance trial 1 product inventory card with the number of products your group made and place it in the bag along with the completed products.

PT 2

Next will be your second performance trial. You will have 4 minutes for the performance trial and you will be competing for the chance to win $30. Make sure to stick to your assigned work during the performance trial and I will tell you when you have one minute left. You have 4 minutes, please *begin*.

You all have 1 minute left in the performance trial.

Time is now up. Please put down all your materials.

Please place all the ships your group made in the second performance trial in the bag marked for them. Also, please fill out the performance trial 2 product inventory card with the number of products your group made and place it in the bag along with the completed products.

PT 3

Next will be your third performance trial. You will have 4 minutes for the performance trial and you will be competing for the chance to win $30.

Independent: During the performance trial, you must each complete all the tasks for each ship that a member begins. Therefore, each member of your team must complete the initial tasks, the structural tasks, and the finishing tasks on each ship that that member begins. So if one member starts making a ship, that same member must finish making that ship. You are free to show each other how to make the folds and discuss what you are doing, but remember, the member that begins a ship must complete all the tasks for that ship.

Interdependent: During the performance trial, your team must work in an assembly line to construct each ship. Therefore, the member sitting in seat 1 will complete the initial tasks. The initial tasks are making the initial folds that prep the paper for the harder structural folds. And then the member in seat 1 passes the paper to the member sitting in seat 2. The person in seat 2 will do the structural tasks. The structural tasks are making the harder folds, the ones until the ship lays flat on the table. Then the person in seat 2 passes it to the person sitting in seat 3 who will do the finisher tasks. The finisher tasks are popping the ship up. The person sitting in seat 2 and seat 3 will have to wait for the product to come through the assembly line before they begin their task. You can show each other how to make the folds and discuss what you are doing, but remember, each of you must only work on your assigned tasks.

Only one type of origami ship can be accepted by your retailor so you will need to choose only one ship to produce and to count towards your group's performance. Just as before, the criteria that each ship must meet will be on the screen during the performance trial. Do not begin folding more ships than your group can finish because there is a penalty for any partially constructed ships. Make sure to stick to your assigned work during the performance trial and I will tell you when you have one minute remaining. You have 4 minutes, please *begin*.

You all have 1 minute left in the performance trial.

Time is now up. Please put down all your materials.

Please place all the ships your group made in the third performance trial in the bag marked for them. Also, please fill out the performance trial 3 product inventory card with the number of products your group made and place it in the bag along with the completed products.

PT 4

Next will be your fourth performance trial. You will have 4 minutes for the performance trial and you will be competing for the chance to win $30. Make sure to stick to your assigned work during the performance trial and remember that only one type of origami ship can be accepted for your group's performance. I will tell you when you have one minute remaining in the performance trial. You have 4 minutes, please *begin*.

You all have 1 minute left in the performance trial.

Time is now up. Please put down all your materials.

Please place all the ships your group made in the fourth performance trial in the bag marked for them. Also, please fill out the performance trial 4 product inventory card with the number of products your group made in the trial and place it in the bag along with the completed products.

DETAILED EXPERIMENTAL SCRIPT

Initial greeting and organizing

"This is the Collective Innovative Capabilities study. It will take about 1 hour and once you complete the session, you will receive 1 course credit ($10) and then, at the end of the semester, if your group is one of the better performing groups, you will receive an additional $30 for your performance. Therefore you could potentially earn $30 over the next hour and will definitely get 1 course credit ($10)."

"Please pick a card. Take a seat in room __ and on the chair marked with an __. Please sign the consent form on the chair and put on the nametag you will find there. We will begin the experiment shortly."

Turning participants away from the study

"I am sorry. Not enough participants showed up to run today's session. We will give you .5 course credits ($5) and would like you to sign up again for the study. Here are the next few times we are running the study. Are you available any of these times? If not, would you like to be emailed about participating in future sessions at different times?"

"Thank you for showing up today, but unfortunately we already have enough participants for this session. We will give you .5 course credits ($5) and would like you to sign up again for the study. Here are the next few times we are running the study. Are you available any of these times? If not, would you like to be emailed about participating in future sessions at different times?"

Introduction

"We are going to begin now. Please put away your phones now and keep them out of sight unless you are told it is OK to use them. This is an experiment examining group performance. These are your group mates and you all should write your names on the nametags in front of you and put them on if you have not yet done so. [Pause for group to put on name tags] You are the __ group and your nametags should indicate this. You will be making origami ships as a group and the video will explain the exact criteria on how your group's performance will be judged. I will now start the video on the computer. Please follow its instructions and do not stop or rewind the video at any time. The video

should provide all the instructions you need to complete and do well in the experiment but to make sure all the directions are followed the experimenters will be walking in and out of the room throughout the experiment."

Grabbing completed products

From recipient groups after pt 2

"Your group is doing well. It looks like there is more than the average amount of ships in here"

From all groups at all times

"Let me take these."

Member change

Get new members

"Now you will be joining a new group that has been chosen for you randomly. Will the person sitting in seat __ please follow me. [walk to new group] Please remove your nametags."

Remove departing members

"New members often enter into organizations and begin working with those that have already been working there. Now one member of your group has been selected randomly to leave. Can the member in seat __ please go into room D and wait for an experimenter to provide further instructions."

"Here is your new group member. Would you please put on this nametag with the group name on it and write your name? You three are now working together as a group and your group is called ____. New members can have different backgrounds and can decide to bring in what they know. Now that you three are a group, you must all build the same type of ship. And which one you decide to build should depend on considering whether the new member feels he/she can effectively supply something useful for your group to meet the performance goal. Remember all completed ships must meet the product specifications, having at least one sail and standing on their own, to count for your team's

performance and you must build the ships with each member completing the different tasks as described in the video."

Final logistics and thanks

"First, thank you so much for coming. We will update the system to give you credit or send you the Amazon gift card. If you do not receive anything from us within the next few hours, please email Erin. Here is a debriefing form with some information about today's study as well as the experimenter's contact information. If you have any questions, feel free to email the experimenter. Are there any questions about the study?

The best performing groups will be determined once we have finished running 48 groups. Your group's performance will be judged against 12 other groups. If your group is one of the best performing groups, I will be in contact with you via email to arrange collecting your award."

PARTICIPANT SURVEY – STAYER

1) Which tasks did your new member perform in
   a. his/her *first group*?
      _____ Initial tasks
      _____ Structural tasks
      _____ Finishing tasks
      _____ Don't know
   b. *your group*?
      _____ Initial tasks
      _____ Structural tasks
      _____ Finishing tasks
2) Did your new member work in an assembly line with his/her first group?
   YES / NO / DON'T KNOW
3) To what extent, did your new member perform the same tasks in his/her first group as in your group?

Not at all	A little	Moderately	Quite a Bit	Extremely

4) Describe why your group chose to make the ship you did in the third performance trial.

5) Describe why your group chose to make the ship you did in the fourth performance trial.

Please mark how much you agree or disagree with the following statements.

6) I identify with the other members of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

7) I see myself as a member of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

8) I am glad I am a member of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

9) I feel strong ties with the other members of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

10) It was helpful that our new member had experience in his/her first group before he/she began working with our group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

11) Our new member was able to help our group perform better.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

12) It was easy for our new member to complete the tasks he/she was assigned in our group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

13) Mark strongly disagree if you are reading this question.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

14) It was easy to work smoothly with our new member.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

15) It was difficult for my group to have a new member.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

16) Please indicate how frequently your new member spoke up with ideas or proposals to help your group function more efficiently

Never	Little	Somewhat	Much	A Great Deal

17) Our group listened to the suggestions, ideas and opinions on our group's performance that our new member made.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

18) I was confident in the suggestions our new member made on how our group could perform better.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

19) Our new member easily *adapted* what he/she had learned in his/her first group to help our group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

20) Our new member used knowledge and skills that he/she gained in his/her first group in our group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

21) Our new member could have performed better in our group if another member of his/her first group moved together with him/her.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

22) Was the ship your new member learned how to build in his/her first group quicker to build than the ship you were trained to build? YES / NO /DON'T KNOW

23) What is your gender? M / F

24) Did you know any of your teammates before you began the experiment? YES / NO

25) Please circle your ethnicity: White, Hispanic or Latino, Black or African American, Asian / Pacific Islander, Other

26) What year were you born? _____

27) Please circle your year in school: Freshman, Sophomore, Junior, Senior, Masters, Other
28) What is your major in school: _____
29) Is English your first language? YES / NO
    a. If not what is your first language?
30) Please circle how much experience you have with origami: None, A little, Some, A lot
31) Please include any comments that you would like to include about this study.

PARTICIPANT SURVEY – DONOR

1) Which tasks did you perform in

a. your *first group*?

_____ Initial tasks

_____ Structural tasks

_____ Finishing tasks

b. your *second group*?

_____ Initial tasks

_____ Structural tasks

_____ Finishing tasks

2) The distribution of tasks across team members in my first group was the same as the distribution of tasks in my second group. YES /NO

3) To what extent, did you perform different tasks in your first group as you did in your second group?

Not at all	A little	Moderately	Quite a Bit	Extremely

4) To what extent did switching groups impact your performance in the experiment.

Not at all	A little	Moderately	Quite a Bit	Extremely

5) Describe why your group chose to make the ship it did in the third performance trial.

6) Describe why your group chose to make the ship it did in the fourth performance trial.

Please mark how much you agree or disagree with the following statements.

7) I identify with the other members of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

8) I see myself as a member of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

9) I am glad I am a member of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

10) I feel strong ties with the other members of this group of people I performed the last 2 performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

11) It was helpful that I had experience in my first group before I began working with my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

12) I was able to help my second group perform better.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

13) It was easy for me to complete the tasks I was assigned in my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

14) It was easy to work smoothly with my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

15) Mark strongly disagree if you are reading this question.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

16) It was hard for me to perform in my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

17) Please indicate how frequently you spoke up with ideas or proposals to help your second group function more efficiently.

Never	Little	Somewhat	Much	A Great Deal

18) My second group listened to my suggestions, ideas and opinions on our group's performance.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

19) I was confident in the suggestions I made on how my second group could perform better.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

20) I easily *adapted* what I had learned in my first group to perform in my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

21) I used knowledge and skills that I gained in my first group in my second group.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

22) I could have performed better in my second group if another member of my first group moved with me too.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

23) The ship I learned how to build in my first group was quicker to build than the ship my second group knew how to build. YES / NO

24) What is your gender? M / F

25) Did you know any of your teammates before you began the experiment? YES / NO

26) Please circle your ethnicity: White, Hispanic or Latino, Black or African American, Asian / Pacific Islander, Other
27) What year were you born? _____
28) Please circle your year in school: Freshman, Sophomore, Junior, Senior, Masters, Other
29) What is your major in school: _____
30) Is English your first language? YES / NO
    b. If not what is your first language?
31) Please circle how much experience you have with origami: None, A little, Some, A lot
32) Please include any comments that you would like to include about this study.

PARTICIPANT SURVEY – OUT OF EXPERIMENT

1) Which tasks did ___ perform in the performance trials?

a. *you*

_____ Initial tasks
_____ Structural tasks
_____ Finishing tasks

b. *your group mates*

_____ Initial tasks
_____ Structural tasks
_____ Finishing tasks

Please mark how much you agree or disagree with the following statements.

2) Each member of the group of people I performed the performance trials with used specialized skills to make origami ships during the performance trial.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

3) Each member of the group of people I performed the performance trials with performed a different task during the performance trial.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

4) It was necessary for me to work together with the other participants in my group to make the origami ships during the performance trial.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

5) I identify with the other members of the group of people I performed the performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

6) I see myself as a member of the group of people I performed the performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

7) I am glad I am a member of the group of people I performed the performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

8) I feel strong ties with the other members of the group of people I performed the performance trials with.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Please circle yes or no indicating your agreement with the following statements and choose the % certain you are of the following statements.

9) a. I can teach a new group to build the origami ship I built in my group. YES / NO

b. ___ % certain I could teach a new group to build the origami ship I built in my group.

10) a. I can successfully compete in performance trials making origami ships on my own. YES / NO

b. ___ % certain I can successfully compete in performance trials making origami ships on my own.

11) a. I could help a new group perform well in making origami ships. YES / NO

b. ___ % certain I could help a new group perform well in making origami ships.

12) How would working as a group with the other participants in this room compare to working with your first group?

Please mark how much you agree or disagree with the following statements.

13) I am prepared to function effectively with a new group making origami ships because of my past experience.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

14) My previous experience has taught me that I can meet responsibilities given to me in a new group making origami ships.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

15) Mark strongly disagree if you are reading this question.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

16) My past experiences and accomplishments increase my confidence that I can perform successfully in a new group making origami ships.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

17) Prior training and experience give me assurance that I can accomplish work given to me in a new group making origami ships.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

18) I could just as easily work with another group to make origami ships as work with my prior group again.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

19) If you joined together with another group to compete in another performance trial, would you like to be the leader of your group? YES / NO

20) If you were to be the leader of a group building origami ships, would you organize the group to work in an assembly line? YES / NO

21) Do you want to work alone in another performance trial in which you would compete against other individuals? YES / NO

22) How successful do you think you would be if you worked alone in another performance trial and competed against the other individuals?

Not at all	A little	Moderately	Quite a Bit	Extremely

23) Under which of the following conditions would you be willing to compete working alone in another two performance trials against other individuals? Please indicate YES or NO.

a. For the chance to win an additional $20? YES / NO
b. For the chance to win an additional $30? YES / NO

c. If you were assisted with the help of a prior groupmate? YES / NO
d. If you were assisted with the help of another participant in the room? YES / NO
e. If you had to give up the opportunity to fill out another survey for which you would be paid $5? YES / NO
f. What conditions would make you want to perform two more performance trials? _____

24) What is your gender? M / F

25) Did you know any of your teammates before you began the experiment? YES / NO

26) Please circle your ethnicity: White, Hispanic or Latino, Black or African American, Asian / Pacific Islander, Other

27) What year were you born? _____

28) Please circle your year in school: Freshman, Sophomore, Junior, Senior, Masters, Other

29) What is your major in school: _____

30) Is English your first language? YES / NO

c. If not what is your first language?

31) Please circle how much experience you have with origami: None, A little, Some, A lot

32) Please include any comments that you would like to include about this study.

DISSERTATION SUMMARY

In this dissertation, I examine the conditions under which employees draw on their prior experiences and provide knowledge to organizations to which they move. I contribute to the literature on employee mobility and firm capabilities by focusing on micro processes at the individual and group levels to inform how knowledge transfer by employee mobility relates to firm outcomes. I review literature from psychology and from organizational behavior, organizational theory, and strategy to build a theoretical and empirical foundation for the dissertation's research. I use multiple methods to further our understanding, including an archival analysis and a laboratory study. The archival analysis provides the research findings with high external validity, and the laboratory study provides high internal validity, enabling causal conclusions from the research. The dissertation's approach adds a new and informative perspective on how employees' prior work experiences help firm performance improvements and thereby advances our understanding on the micro-foundations of labor flows and economic prosperity.

The dissertation is composed of three separate chapters. The three chapters examine the conditions at a hiring organization and the characteristics of individuals' prior experiences that enable employee movements to result in successful organizational learning specific to a new hire's background. In total, the dissertation helps pinpoint the circumstances in which new hires can help their hiring organizations bring in new knowledge and succeed.

In the first chapter, I review and integrate the literatures on knowledge transfer, employee mobility, and dynamic firm capabilities. The chapter provides a theoretical link between how firms can benefit from their employees' prior experiences and the individual-level factors that facilitate or hinder these benefits.

In the second chapter, I examine when knowledge transfer by employee mobility occurs in the context of the U.S. laser industry. Results show that the extent of knowledge transfer is contingent on the hiring firm's strategy and the new hire's match to it. The study uses both U.S. patent and firm production data focused on the U.S. laser industry to examine inventor mobility to firms where alignment of the inventors' backgrounds and the hiring firms' capability development can be inferred. The study furthers our understanding of how firm and employee characteristics condition interfirm knowledge flows.

In the third chapter, I compare the effect of the division of work in which individuals have previously engaged on their contributions to a new organization. I hypothesize that experience in specialized work divisions inhibits individuals' contributions moving forward because specialists gain a larger share of firm-specific knowledge which is not transferrable to other organizations or contexts. The experimental study manipulates both the division of work in which members new to a group worked previously and the division of work in the recipient group. I find that recipients perform worse when they receive specialist movers and that this specialist disadvantage is worse when the recipient uses a generalist work division. The study furthers our understanding of how groups can learn from individuals with experiences in other contexts by providing evidence on the causal effects of moving individuals with varying characteristics on their ability to transfer knowledge to their destinations. As such, the research advances our understanding on the conditions under which employee mobility enables knowledge transfer. In addition, the findings can help explain why entrepreneurs may be more likely to have prior organizational experiences at small firms as opposed to large firms, as found by Elfenbein, Hamilton, and Zenger (2010), because employees at small firms gain experiences through more generalist divisions of work.

DISSERTATION CONCLUSION AND CONTRIBUTION

The dissertation makes significant contributions to both the micro and macro management literatures and provides insights for practitioners. For the micro literature—the body of work in organizational behavior—the dissertation brings to the surface how aspects of an individual's experience can affect his/her moving forward once hired into a new organization. The third chapter's findings show how differences in structure of the current group work, particularly the group's division of work, affect behavior in groups to which the new member moves. In addition, the experimental setup used in the third chapter could be used to further study variables of interest to scholars examining task concentration and firm-specific knowledge within groups, because the generalist-specialist work division manipulation effectively impacts these factors. The manipulation of instructing groups to work either in an assembly line or individual assembly is shown to affect the extent to which individuals within the groups experience task concentration and dependence of work contribution on the other group members. Future work interested in these aspects of group work structure could use the third chapter's task and manipulation.

For the macro management literature covering the areas of strategy and organizational theory, the dissertation's studies show how knowledge embedded in employees' prior organizational experiences can support firm competitive advantage. The third chapter's findings help illuminate the causal antecedents of employee mobility that leads to heightened post-move performance. The experimental setup also provides a method to study employee mobility. In addition, the findings show how social processes that individuals encounter while working in organizational structures, such as the organization's division of work, affect them moving forward to other organizational structures.

The practical implications from the research in the dissertation include informative insights for policy makers, managers, and individuals navigating their careers. For policy makers who care about supporting vibrant clusters of industry activity, the research brings to light some of the challenges that individuals face as they transfer knowledge across firm boundaries. For managers whose organizations require externally generated knowledge to adapt quickly to changing environments, I show that characteristics of potential new hires can facilitate their ability to bring in outside knowledge. For employees looking to manage their careers across employers, the research identifies characteristics of contexts that enable them to gain relatively portable knowledge and be able to contribute after moving to a new firm. For example, the third chapter's findings indicate that working more as a jack-of-all-trades may enable an individual to more successfully contribute at different employers sequentially.

The research in the dissertation opens future directions for research. Moving forward, research building on the ideas in the dissertation will further our understanding of when organizational factors can be a source of competitive advantage and provide insights into the micro underpinnings of strategy and entrepreneurship. For example, understanding of the jack-of-all-trades theory of entrepreneurship (Lazear, 2005) can be advanced using knowledge generated in the dissertation. Using the experimental setup in which participants gain experience as specialists or generalists, a study could provide causal evidence on the effect of specialization on potential entrepreneurs' entry decisions. I would expect that the propensity to engage in entrepreneurial activity is increased for generalists.

Further, future work could tease apart whether breadth of knowledge or the extent of firm-specific knowledge is more significant in determining the difference between the effectiveness of specialist verses generalist movers. The extent of firm-specific knowledge

generated from working more closely with collaborators could be held constant using routines or tools to coordinate the work of groupmates so that participants would vary only in the breadth of knowledge in their backgrounds. A study with such a design could help further our knowledge on the particular aspect of specialists that impacts their contributions across organizational boundaries.

In closing, the dissertation reveals that not all moves result in equal amounts of knowledge transfer and performance improvements at recipient firms. The findings show which moves are more likely to result in successful knowledge transfer and improved performance for the recipient organization. I show that movers who go to recipients that have similarity to the movers' prior organizations and movers who have worked more as generalists are more likely to be new hires with successful post-move outcomes. I hope that these results not only spark future related research but also help prospective movers make more informed decisions regarding where and when to move and managers make more informed decisions on whom to hire.

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