# Essays on Firm Strategy and Human Capital

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*Document Version*
Final published version

*Publication date:*
2021

*License*
Unspecified

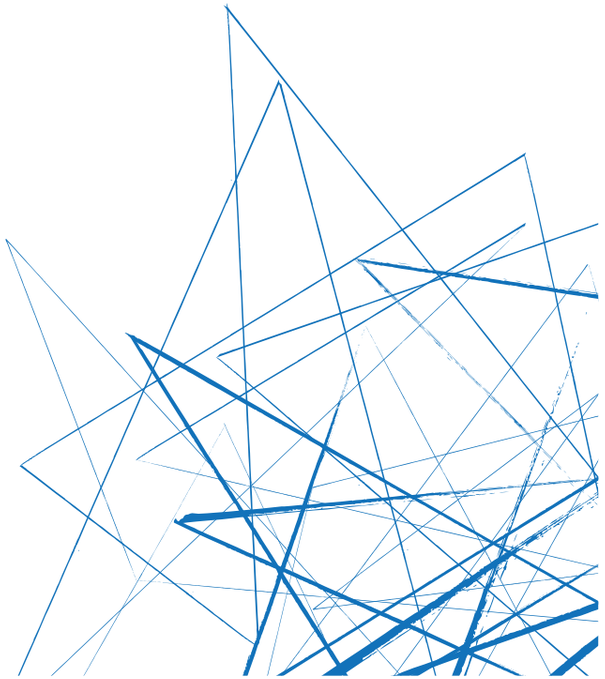
*Citation for published version (APA):*
Günther, A. (2021). *Essays on Firm Strategy and Human Capital*. Copenhagen Business School [Phd]. PhD Series No. 17.2021

**COPENHAGEN BUSINESS SCHOOL**
SOLBJERG PLADS 3
DK-2000 FREDERIKSBERG
DANMARK

**WWW.CBS.DK**

**ISSN 0906-6934**

**Print ISBN: 978-87-7568-010-8**
**Online ISBN: 978-87-7568-011-5**



ESSAYS ON FIRM STRATEGY AND HUMAN CAPITAL

PhD Series 17.2021

Agnes Guenther

# ESSAYS ON FIRM STRATEGY AND HUMAN CAPITAL

CBS PhD School | **PhD Series 17.2021**

CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

# Essays on
# Firm Strategy and Human Capital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Firm Strategy and Human Capital

1st edition 2021
PhD Series 17.2021



ISSN 0906-6934

Print ISBN: 978-87-7568-010-8
Online ISBN: 978-87-7568-011-5

The CBS PhD School is an active and international research environment at Copenhagen Business School for PhD students working on theoretical and empirical research projects, including interdisciplinary ones, related to economics and the organisation and management of private businesses, as well as public and voluntary institutions, at business, industry and country level.

# Abstract

A fundamental source of firms' competitive advantage is human capital—the knowledge, abilities and skills embedded in employees. Human capital is different to many other resources critical to firm performance inasmuch as it is has a limited capacity and cannot be possessed by a firm. These characteristics create several challenges for firms. Human capital needs to be allocated to specific tasks, functions, and locations. Moreover, human capital is mobile and often lost with the departure of employees. Although much is known about human capital, too little is known about the reallocation of human capital within firms, the human capital mobility out of firms, and the value human capital provides to firms. This dissertation addresses these questions by examining how changes in the firm context affect the reconfiguration, mobility, and value of human capital. Thereby, it advances our understanding of the dependence of firm competitive advantage on human capital, and contributes to the broader strategy and entrepreneurship literatures.

The dissertation consists of three self-contained chapters. Chapter 1 provides a comprehensive model of human capital reconfiguration after acquisitions, specifically focusing on managers as a key type of human capital in acquisitions and to reconfiguration decisions in general. Chapter 1 shows increases in managerial reconfiguration activities *between* and *within*

firm units immediately after the acquisition, underlining the importance of both acquirer- and target-specific knowledge. The findings suggest that re-configuration may help mitigate strategic dilemmas faced in acquisitions.

Chapter 2 examines the mobility of R&D workers embedded in teams after acquisitions. The results show that team diversity reduces employee mobility. This effect is reduced for R&D workers with the more general human capital. The findings suggest that who leaves post-acquisition is largely pre-determined prior to the acquisition by the employees' human capital specifically, which depends on their team embeddedness and their individual characteristics.

Chapter 3 studies the well-established relationship between industry experience and new ventures success, and the mechanism underlying it. Although commonly suggested in the literature, the observed patterns question industry-specific *knowledge* as causal mechanism underlying the relationship. Mobility is suggested as a more plausible mechanism. Chapter 3 also suggests that other human capital characteristics, such as firm-specificity, may capture different mechanisms than often believed.

# Resumé

Evner og færdigheder hos virksomhedens ansatte, også kaldet virksomhedens humankapital, er en grundlæggende kilde til virksomhedens konkurrenceevne. Humankapital adskiller sig fra andre af virksomhedens ressourcer, idet den har en begrænset kapacitet og ikke ejes af virksomheden. Dette skaber flere udfordringer for virksomheden sammenlignet med andre vigtige ressourcer. Humankapital skal allokeres til specifikke opgaver, funktioner og områder. Derudover er humankapital mobil og forsvinder med de ansatte der forlader virksomheden. På trods af at humankapital er et velkendt begreb, er der kun begrænset viden om, hvordan human kapital omfordeles i virksomheden, hvordan humankapital bevæger sig ud af virksomheden, og den værdi humankapital tilfører virksomheden. Denne afhandling tager fat på disse spørgsmål ved at undersøge, hvordan ændringer i virksomhedens kontekst påvirker rekonfiguration, mobilitet, og værdien af human kapital. Derved fremmes forståelsen af, i hvilken grad virksomhedens konkurrencemæssige fordel afhænger af humankapital, og afhandlingen bidrager yderligere til litteraturen omkring strategi og iværksætteri.

Afhandlingen består af tre selvstændige kapitler. Kapitel 1 indeholder en omfattende model for rekonfigureringen af humankapital som ofte sker efter at en virksomhed bliver opkøbt, med særligt fokus på ledere som både er en vigtig type af humankapital i forbindelse med opkøb og mere generelt i be-

slutninger omkring rekonfiguration. Kapitel 1 viser en stigende tendens til rekonfiguration af ledere, både virksomheder imellem og internt mellem virksomhedens afdelinger, umiddelbart efter at en virksomhed bliver overtaget, hvilket understreger betydningen af specifik viden både hos opkøberen og den opkøbte virksomhed. Disse resultater tyder på, at rekonfiguration kan bidrage til at afhjælpe de strategiske dilemmaer man står over for i forbindelse med overtagelse af en virksomhed.

I kapitel 2 undersøges mobiliteten af F&U ansatte indlejret i teams efter en overtagelse. Resultaterne viser at mangfoldighed i teamet reducerer den enkelte ansattes mobilitet. Denne effekt er mindre for F&U ansatte med generel humankapital. Dette tyder på at beslutningen om at forlade en virksomhed efter en overtagelse i vid udstrækning er forudbestemt af den ansattes specifikke humankapital, der netop afhænger af deres indlejring i et team og deres individuelle karakteristika.

I kapitel 3 undersøges den veletablerede sammenhæng mellem brancheerfaring og succes for nye virksomheder, samt den mekanisme der ligger til grund for denne sammenhæng. På trods af at tidligere forskning ofte peger på branchespecifik viden som en underliggende mekanisme viser de observerede mønstre at ansattes mobilitet er en mere plausibel mekanisme. Kapitel 3 viser også at andre karakteristika ved humankapital, f.eks. i hvor høj grad den er virksomhedsspecifik, kan afspejle andre mekanismer end hidtil påvist i litteraturen.

# Acknowledgements

This dissertation is the result of a long journey. Like most of my other journeys, it introduced me to many new ideas, environments, challenges, perspectives, and people. Also, like many of my past journeys[1], it did not follow a direct path. Initially, I set out to examine the area of international business and the location choices for foreign direct investment. Most foreign direct investment inflows into countries are in the form of acquisitions—and it is acquisitions that have persisted since my initial proposal. Curiosity and new insights "converted" me to strategy and human capital investigations. Just as the human capital of employees is affected by embeddedness in teams, so was this work affected by the people I met in my PhD journey. I want to thank those who made this journey a unique experience, who supported me, who challenged me, and who believed in me.

First, I want to thank my supervisors H.C. Kongsted and Francesco Di Lorenzo for their advice, their trust in me, and their injunctions that "enough

[1] My initial further education was in industrial design and communication design, then I worked in UX design and as a consultant, and finally did a master's in strategic design. While I was working in Australia the idea of a PhD in Management and Economics finally emerged.

is enough". I am grateful for our many discussions—whether on the specifics of the empirical design (challenges) or on the ideas to explore—and for their supervision more generally. I also thank the members of the assessment committee Russ Coff, Aleksandra Kacperczyk and Wolfgang Sofka.

My deep gratitude goes to my co-author and mentor Myles J. Shaver who has been a valuable source of inspiration and advice on numerous occasions. I am grateful for the opportunity to work together, the many entertaining and enriching conversations we engaged in, his availability, and his thoughtful comments. I thank Myles also for inviting me to visit the University of Minnesota where I stayed during the end of my first year and much of my second year PhD studies. I thank Dan Forbes and Evan Rawley from the University of Minnesota for welcoming me to their classes, and my fellow PhD candidates at Carlson—especially Keith Pennington and Dennie Kim—who made my stay in Minneapolis both intellectually and socially valuable.

I could not be more grateful for all the comments received and the discussions held during this time. I especially thank Wolfgang Sofka and Larissa Rabbiosi from the department of Strategy and Innovation at Copenhagen Business School who commented on previous versions of Chapters 1 and 2 during my time at CBS, and Wolfgang and Vera Rocha for judicious comments during the pre-defense meeting. I thank my colleagues from the department for their collegiality and for sharing their experience and knowledge. I thank my fellow PhD candidates with whom I embarked on this journey—the SMG-ladies—and others that I met later—the PhD cohort from the Strategy and Innovation department. Thank you for the times we had together.

I greatly acknowledge support received from the Strategic Research Foundation of the Strategic Management Society. I thank my SRF-cohort and the CCC-community for the many virtual interactions we had during the covid-19 lockdown. I thank my NORD-IB cohort for the times we had to-

gether across northern Europe—shall the Rotterdam-module never be forgotten.

I want to thank Christian G. Asmussen and Bo B. Nielsen under whose supervision I initially started this journey. I am grateful for the freedom and the opportunities they gave me. I thank Bo, Massimo Garbuio, and Boris Eisenbart for their encouragement, their belief in my ideas, and for convincing me to start my PhD journey.

Last, I thank my family, friends and hockey team who remined me that there are other things than dissertations, more journeys, and other competitions. I especially thank my partner, Lars Alkærsig, for not only tolerating but (seemingly) enjoying my talking about work, data, and measurements. Thank you for listening to me and debating with me; for your support, patience, and ability to make me laugh.

Agnes Guenther
Copenhagen, 2021

# Table of contents

# Introduction

The ultimate goal of strategy scholarship is to understand how firms achieve and sustain competitive advantage. One of the key sources of firms' competitive advantage is human capital (Coff, 1997). Human capital refers to the knowledge, abilities and skills embedded in employees (Becker, 1964). This work examines the acquisition, mobility, and reconfiguration of human capital, and how changes in the firm's context affect the strategic value of specific types of human capital. The strategic value of human capital refers to the value of human capital to a firm beyond the knowledge, skills and abilities that define it. In other words, the unique value it provides to the firm—for instance, by enabling critical firm capabilities (Wright, Coff, & Moliterno, 2014).

Understanding how firms acquire human capital is important because it affects their human capital endowment. The mobility of human capital matters because much of the human capital embedded in employees is lost or is transferred to competitors if they leave the firm—thereby employee mobility threatens the original firm's competitive advantage (e.g. Campbell, Ganco, Franco, & Agarwal, 2012). Also, employee mobility patterns provide information on what makes their human capital valuable to the firm. Finally, the reconfiguration of human capital is critical to firm performance (Karim & Capron, 2016). Since human capital is a non-scale free resource[2] it cannot be shared simultaneously (e.g. by different firm units at the same time) but instead needs to be allocated at a specific point in time to a specific task (Levinthal & Wu, 2010).

[2] An example of a scale-free resource which can be shared or used simultaneously is firm image or reputation i.e. multiple brands of the same firm are associated with the firm's image. The firm's image is independent of the number of brands associated with it.

This work investigates the acquisition and reconfiguration (Chapter 1), the mobility (Chapter 2), and the value (Chapter 3) of human capital to provide a better understanding of the dependence of firm competitive advantage on human capital. These issues have relevance for the broader strategy and entrepreneurship literatures.

## Setting

The three separate chapters that make up this thesis study the acquisition, mobility, and reconfiguration of human capital in two settings where human capital is particularly important: acquisitions and new ventures.

**In acquisitions**, human capital is important because access to the target's human capital is often the main driver of the acquisition (e.g. Ranft & Lord, 2002). In fact, the share of knowledge-seeking acquisitions compared to market- or other resource-seeking acquisitions has increased in recent years (Cantwell & Vertova, 2004). The importance of human capital in acquisitions is furthermore underlined by the findings that the acquirer's response is often longer negotiating periods in order to reduce the information asymmetries about the knowledge of the human capital (Coff, 1999a), and that the risk of losing human capital can increase the bargaining power of the target firm during these negotiations (Coff, 2002). Accessing human capital by acquiring its employer (i.e. target firm) rather than hiring in the external labor market has been described as acqui-hiring (Chatterji & Patro, 2014). Acqui-hiring has several advantages. It allows the firm to access human capital not available in the labor market, and human capital in bundled form (e.g. teams of employees) (Coff, 1999a). Also, acquisitions allow acquirers to observe team- rather than only individual performance. Team performance cannot be considered the cumulative performance of the individual team members, and individuals' contribution to the team are often difficult to assess.

In addition to being a setting where human capital is particularly important, acquisitions are an excellent context to study reconfiguration (Chap-

ter 1) and mobility (Chapter 2) of human capital for two mains reasons. First, acquisitions are known to increase human capital mobility (Ernst & Vitt, 2000; Hussinger, 2007; Walsh, 1988) due to the disruption to the targets' workforce and the uncertainties that accompany acquisitions (Cartwright & Cooper, 1993; Haspeslagh & Jemison, 1991; Hussinger, 2007; Puranam, Singh, & Zollo, 2006; Walsh, 1989). Although acquisitions increase mobility, the reasons why employees leave are more homogeneous than in many other circumstances. Second, since acquisitions increase the pool of resources available to the firm, they create the need to reconfigure these resources (Karim & Capron, 2016) which include human capital (e.g., Capron, Dussauge, & Mitchell, 1998; Karim & Williams, 2012).

By focusing on what happens to human capital *after* an acquisition, this work differs from studies that examine the role of human capital in the decision to engage in an acquisition (e.g., Younge, Tong, & Fleming, 2014), alternatives to acquisition (Villalonga & McGahan, 2005), and how human capital affects firms' financial post-acquisition performance (Cannella & Hambrick, 1993)—last often declines (for a meta-analysis see King, Dalton, Daily, & Covin, 2004).

**In new ventures**, human capital is important because—due to resource constraints—human capital is often the only resource (or one of the few resources) the venture possesses or has access to (Baker & Nelson, 2005). Its limited pool of resources makes each individual resource relatively more important for creating and sustaining a competitive advantage. Moreover, at the time of venture establishment the human capital of the initial employees and the founder(s) is not firm-specific. Firm-specific human capital (FSHC) develops over time and is commonly seen as a source of firm competitive ad-

vantage (Coff, 1997) and limiting for employee mobility (Campbell, Coff, & Kryscynski, 2012)[3]. Focusing on human capital in new ventures allows investigation of the factors that make human capital vital to the firm beyond firm-specificity.

The entrepreneurship literature suggests that the *experience* (e.g. industry and entrepreneurial experience) of employees and founders is crucial for new venture performance and survival (Brüderl, Preisendörfer, & Ziegler, 1992; Dahl & Reichstein, 2007). This is because industry experience provides knowledge about the market, technologies, marketing and other operational expertise which is helpful when setting up and growing the venture (Agarwal & Shah, 2014; Chatterji, 2009; Klepper & Sleeper, 2005). Yet, it remains unclear to what extent new ventures hire employees with such experience and what makes it valuable. Chapter 3 explores employee experience and the value it brings to the new venture.

## Types of human capital

Different types of employees possess different types of human capital. The assumption that all types of human capital are equally important to the firm at any point in time, and that all types of employees respond similarly to different events is oversimplistic. Extant work on human capital mobility—which is relevant to this dissertation—shows great heterogeneity (i.e. variance) even within a narrow set of employee types, such as R&D workers (Di Lorenzo & Almeida, 2017; Hussinger, 2007; Paruchuri, Nerkar, & Hambrick, 2006). To account for these differences, each of the three chapters focuses

[3] Campbell et al. (2012) argue that the benefits of FSHC is often overstated in extant work. Chapter 2 provides more insights into on how establishment tenure—a commonly used measure for FSHC—affects employee mobility.

on a different type of employee. The employee types investigated are: managers (Chapter 1), R&D workers (Chapter 2), and founders and initial employees (Chapter 3). The choice of which type of employee to study is not trivial and was dependent on the research question.

Chapter 1 which examines the reconfiguration of human capital post-acquisition focuses on managers because of their importance to the success of the acquisition (Cannella & Hambrick, 1993; Haspeslagh & Jemison, 1991) and resource reconfiguration decisions more generally (Feldman, 2020), and because subsequent resources reconfiguration decisions depend manager origin i.e. whether the managers were part of the acquired unit or not (Karim & Mitchell, 2000). Chapter 2 explores post-acquisition mobility of R&D workers in line with the argument that firms use acquisitions as a means to access the human capital embedded in the target's employees (Ahuja & Katila, 2001; Paruchuri et al., 2006; Ranft & Lord, 2002). Since this is especially important in knowledge intensive industries, only industries in sectors that meet this criterion are included in the study. Similarly, Chapter 3 focuses on new ventures in knowledge intensive industries but focuses on initial employees (including founders) in knowledge intensive functions since at the earliest stages it can be difficult to distinguish among between different types of venture employees e.g. R&D workers and managers because their functions often overlap.

## Empirical context

All the studies use samples based on data provided by Statistics Denmark, the national statistics office. These data are recognized internationally as being of high quality (see Dahl, 2011; Grimpe, Kaiser, & Sofka, 2019; Kaiser, Kongsted, Laursen, & Ejsing, 2018). They provide information on all employees in the Danish labor market in the years 1980 to 2016. They provide information on firms and the establishments owned by them. All this information can be linked using unique identifiers which track firms, estab-

lishments, and individuals over time. The richness and granularity of the data allows me to go beyond what has been done in other empirical studies—whether this is the creation of control groups, using more direct measures, or access to information which is usually not available (e.g. on smaller, private firms). However, it should be noted that the data come from different datasets; none of the chapters uses only one dataset. I constructed unique datasets to address different research questions by merging different data—often at different levels. Figure 1 provides an overview of the main datasets used in this work. Figures 2 and 3 depict the sample construction for Chapters 1 and 2.

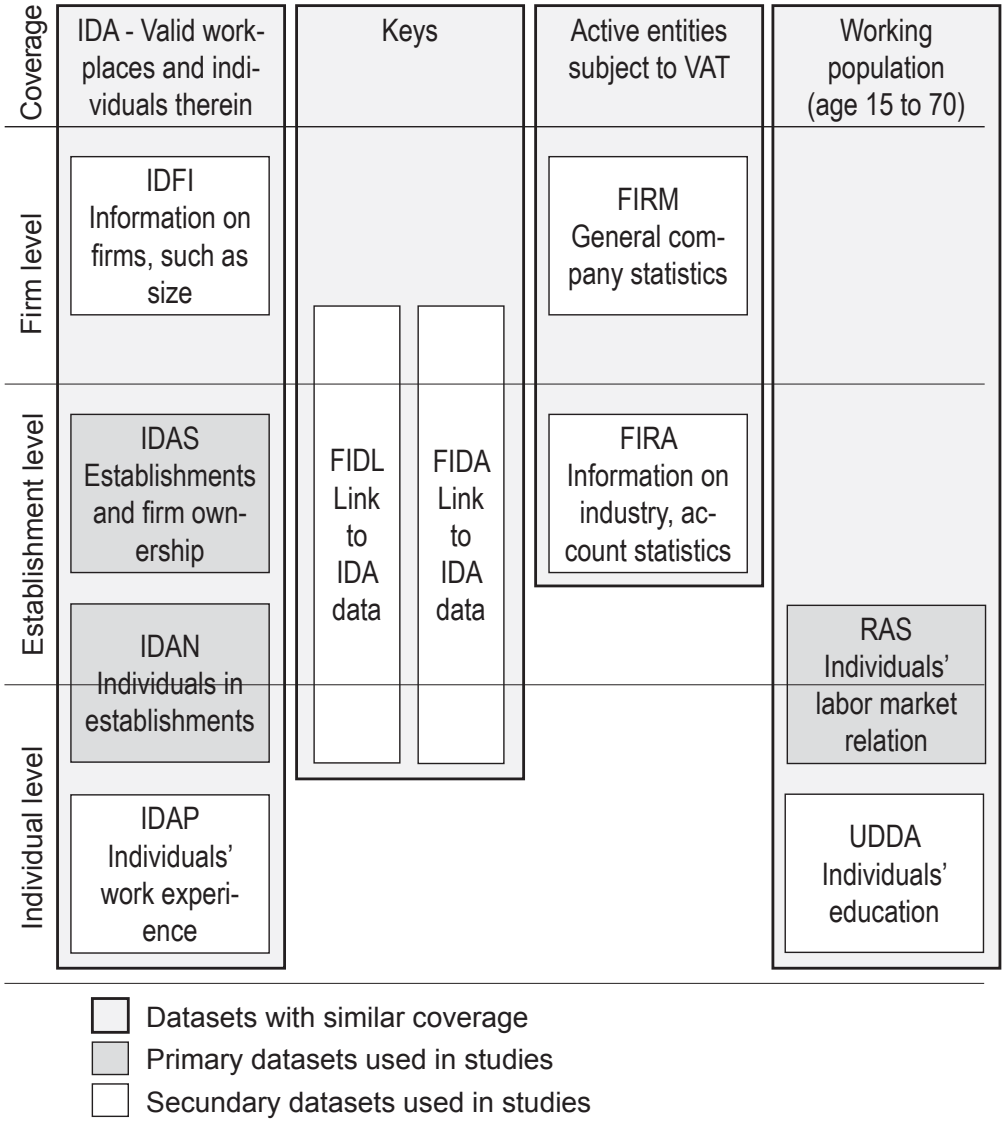


**Figure 1: Datasets used in this work**

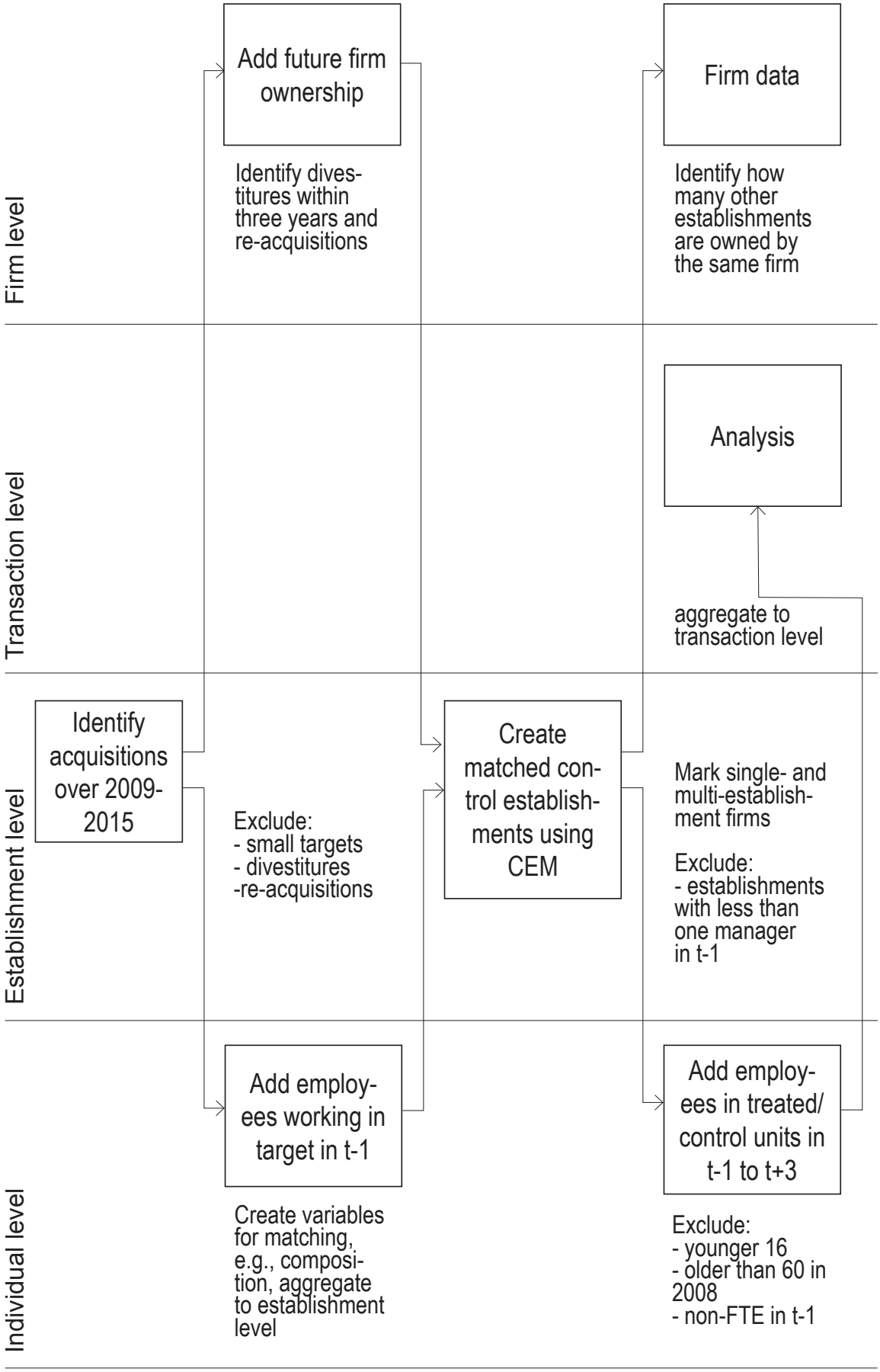


**Figure 2: Construction of sample used in chapter 1**

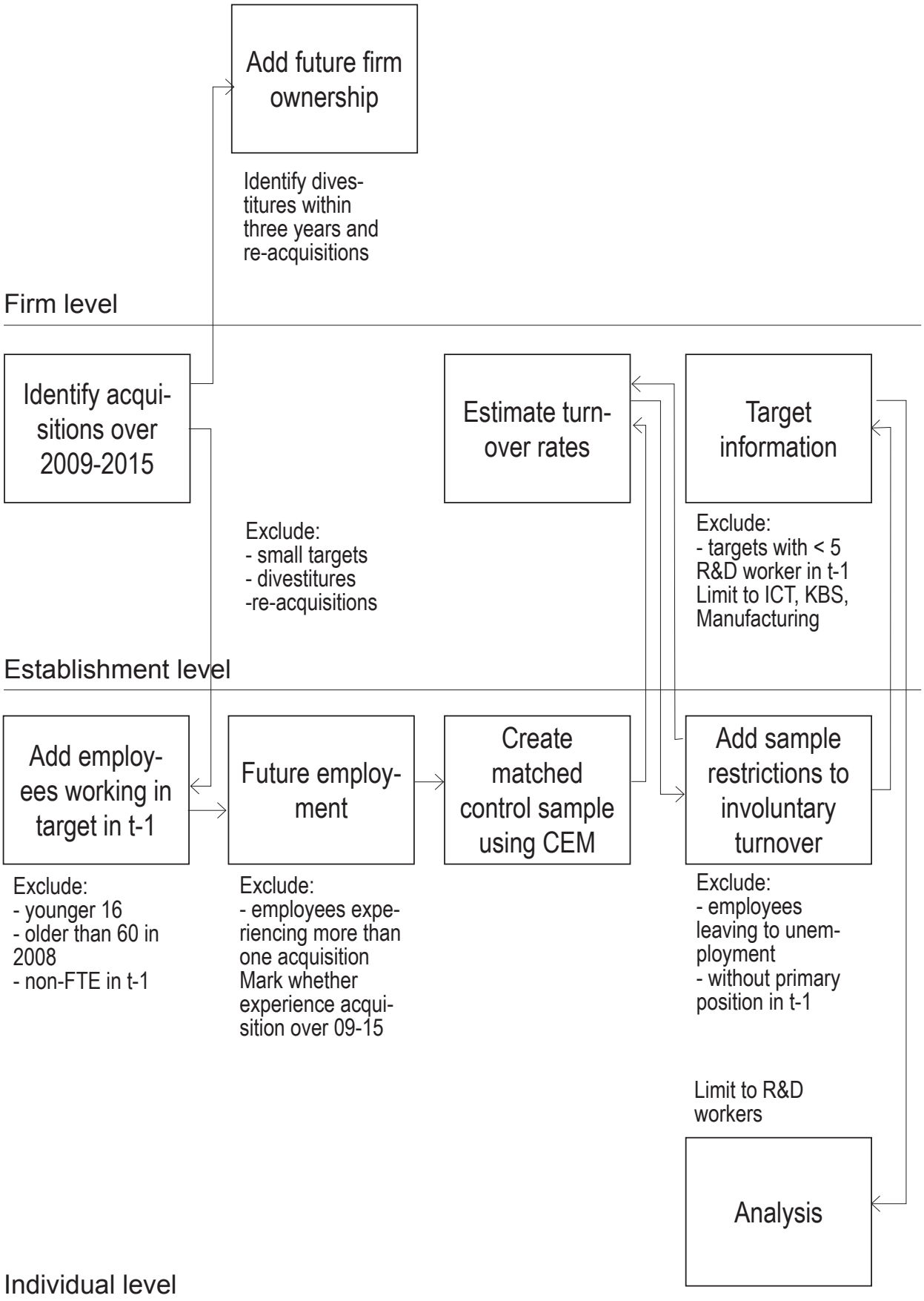


**Figure 3: Construction of sample used in chapter 2**

The empirical advantages provided by the Danish data are also related to the characteristics of the context: (1) vibrant and dense labor market including both small and big firms, (2) relatively homogeneous labor demand and supply, (3) good conditions for starting a venture, and (4) flexible labor contracts which make hiring and firing of employees easier than in most other European countries and allow employees to move between employers (similar to the Anglo-Saxon context). These characteristics are notable inasmuch as they make Denmark an ideal setting to study questions related to human capital and particularly human capital mobility.

The empirical characteristics of this context that make up this conclusion are described below. While Denmark is a relative small country (5.6 million people), it has more than 300,000 establishments, and more than 30,000 new business are registered yearly. Relative to its population, these numbers are higher than in many other countries.[4] Some firms are very large (e.g. the Maersk Group, Danske Bank, Novo Nordisk, Ørsted and Carlsberg, to name a few). The 100 largest firms have 15 establishments and 2,770 full-time employees on average, while the majority of firms (87%) have less than 20 full-time employees. This variance in firm size matters for the examination in Chapter 1. The employment rate varies between 75 percent and 76 percent, and the unemployment rate is low (between 5% and 7% over the years 2009 to 2016). While many businesses are located in the greater Copenhagen area, the rest of Denmark is also economically active. This is important since the number of firms in an area influences whether an employee leaves a firm or is hired in the first place. With an average commuting distance of 21 kilome-

[4] For instance, 2,882,419 firms were registered in France in 2012. In that year, France had a population of 65.66 million people.

ters, and 35 percent of employees commuting less than 5 kilometers to work, concerns regarding geographic differences in labor supply and demand are mitigated in the Danish economy. Moreover, the conditions in Denmark for starting a venture are ranked 34th by the World Bank (2018, 2020) which positions Denmark roughly mid-way between the UK (14th) and the US (49th)—two frequent contexts for studying new ventures. Thus, Denmark is also particularly well-suited to studying human capital in new ventures.

## Overview of the chapters

I next outline each chapter. Table 1 provides a broad overview of the research questions, the context and the empirical approach in the chapters.

| Ch. | Broad question | Research question | Setting | Employee type | Main literatures | Approach |
|---|---|---|---|---|---|---|
| 1 | How is human capital in firms reconfigured? | Under which conditions are specific reconfiguration mechanisms (i.e., transfer, promotion, and hiring) used to reconfigure employees in managerial positions post-acquisition? | Acquisitions | Managers | - Resource reconfiguration<br>- Human capital | Hypotheses-driven |
| 2 | How does human capital affect mobility? | How does the diversity of a target's R&D team and characteristics of R&D workers within their team affects who leaves after an acquisition? | Acquisitions in knowledge-intensive industries | R&D workers (Kaiser et al., 2018) | - Post-acquisition mobility<br>- Strategic human capital | Hypotheses-driven |
| 3 | What makes human capital valuable to firms? | Is industry-specific knowledge important for new venture survival? | New ventures in knowledge-intensive industries | Initial employees including founders | - New venture success<br>- Industry-specific human capital | Explorative, descriptive |

**Table 1: Overview of chapters**

**Chapter 1** starts by examining how firms reconfigure target firm managers after an acquisition and contributes to our understanding of how firms reconfigure their human capital resources (Dickler & Folta, 2020; Karim & Capron, 2016; Karim & Williams, 2012). Resource reconfiguration refers to the addition, deletion and redeployment (or re-allocation) of resources (Capron et al., 1998). How firms reconfigure their resources is critical for firm performance (Karim & Capron, 2016). Investigating resource reconfiguration after an acquisition is interesting for at least two reasons. First, acquisitions are a corporate strategy to reconfigure resources by changing the firm's boundaries (Capron, Mitchell, & Swaminathan, 2001; Karim & Williams, 2012). The new boundaries make more resources available to the firm (Karim, 2006). To make the most efficient use of these resources, many need to be re-allocated. Thus, acquisitions create the need for resource reconfiguration especially resource redeployment (or transfer)—defined as the re-allocation of a resource from one firm unit to another (Capron et al., 1998; Folta, Helfat, & Karim, 2016). Second, a better understanding of the conditions in which resources are being reconfigured could increase the firm's competitive advantage.

Human capital is especially important for reconfiguration decisions because like other tangible assets, it is a non-scale-free resource. While scale-free resources such as reputation, can be shared across multiple firm-units or brands without this decreasing its value, human capital needs to be allocated to a specific task at a specific point in time (Levinthal & Wu, 2010) to create so called inter-temporal economies of scope (Helfat & Eisenhardt, 2004)—as opposed to intra-temporal economies of scope. The ability to redeploy non-scale free resources between firm units is one of the reasons why multi-business-firms have advantages over single-business-firms (Folta et al., 2016). The human capital critical in reconfigurations includes managers. This is especially true in acquisitions since managers can help to navigate the integra-

tion process (Haspeslagh & Jemison, 1991). Extant research shows that managerial resources are the resources most often transferred from acquirer to target after acquisition (Capron et al., 1998).

However, work on the redeployment of resources between acquirers and targets ignores the scalability of resources i.e. it does not differentiate between scale-free managerial resources such as management systems and tools, and non-scale-free managerial resources such as managers (see e.g. Capron et al., 1998). This distinction is important because the implications of scale-free and non-scale-free resources redeployment differ. For instance, if managers are redeployed it suggests that the expected value of the manager is greater for the receiving unit than for the manager's original unit. As scale-free resources can be shared simultaneously, their redeployment provides less information about where they would provide the most value. Differentiating between managers and other managerial resources is also important since the origin of the manager will affect future reconfiguration decisions as shown in work on inter-unit human capital redeployment (Karim & Williams, 2012). Moreover, the high managerial turnover rates that accompany acquisitions (for reviews see Krug & Aguilera, 2004; Krug, Wright, & Kroll, 2014) can create "managerial vacuums" if the leaving managers are not replaced—this vacuum is unlikely to be filled by other managerial resources.

The nature of human capital provides additional alternative resource reconfiguration possibilities. Besides being transferable, human capital can be promoted. That means that in addition to inter-unit redeployment, human capital can be reconfigured *within* firm units. Therefore, besides isolating non-scale-free managerial resources by investigating target managers, this work differentiates among different mechanisms enabling reconfiguration and redeployment of managers after an acquisition, and analyzes their different prevalence. Due to high turnover rates (Krug & Aguilera, 2004) which limit the availability of resources within the firm, resources may have to be ac-

quired externally e.g. via the labor market. Although hiring is a viable alternative to reconfiguration within and between firm units (transfer and promotion) it has received little empirical attention. Drawing on the acquisition literature and the coordination-autonomy dilemma—a fundamental challenge in acquisitions—I suggest the conditions that produce a preference for one mechanism rather than another.

The overarching conclusion in Chapter 1 is that firm reconfiguration through acquisition not only changes how (human) resources are reconfigured *between* firm units but also *within firm units*. This extends work on resource reconfiguration (Capron et al., 1998; Karim, 2006; Karim & Williams, 2012) which focuses predominantly on redeployment *between* firms and firm units. While all reconfiguration mechanisms i.e. hiring, transfer and promotion are used to fill managerial positions after an acquisition only internal reconfiguration mechanisms (transfer and promotion) are used relatively more in an acquisition compared to a non-acquisition context. Therefore, the costs of internal development of managerial resources post-acquisition seem lower than the costs of acquiring these resources externally. This implies also that the firm-specific knowledge embedded in the managers of both acquirer and target firms is a crucial asset in the post-acquisition phase (see calls from Argote, McEvily, & Reagans, 2003). The choice to reconfigure between or within firm units is conditional on the relative sizes of the firms involved and the acquired firm's quality, suggesting that managerial redeployment is a strategic decision which helps to mitigate the coordination-autonomy-dilemma faced in acquisitions. Lastly, recall that the resource reconfiguration literature suggests that acquisitions create a need for managerial reconfiguration because of the increased number of resources available within the firm's boundaries. In line with work showing that resource receiving units are more likely to divest resources afterwards (Capron et al., 2001), this suggests that the high managerial turnover observed after an acquisition might not be as

bad as is often assumed (Bergh, 2001; Cannella & Hambrick, 1993). Rather than an unwanted effect of acquisitions (Krug et al., 2014), managerial turnover might be a response to strategic reconfiguration decisions. Therefore, not all managerial turnover might be equally harmful.

**Chapter 2.** To be relevant to internal reconfiguration (transfer or promotion) employees (and their human capital) must be retained within the firm's boundaries post-acquisition. Chapter 2 examines how the configuration of human capital within firms affects the mobility of R&D workers after acquisitions. R&D workers (or inventors) along with managers are key human resources in acquisitions. The mobility of R&D workers is a major concern especially in knowledge-seeking acquisitions (Paruchuri et al., 2006; Ranft & Lord, 2002). Extant work on R&D workers' post-acquisition mobility focuses mainly on the acquirer's characteristics or the differences between acquirer and target (Ernst & Vitt, 2000; Hussinger, 2007; Paruchuri et al., 2006). It assumes also that the human capital embedded in R&D workers is largely transferable across firms. However, as the human capital literature shows, this is often not the case (Campbell, Coff, et al., 2012; Coff, 1997; Kryscynski, Coff, & Campbell, 2021). Rather, much of the human capital is firm-specific, and therefore is less valuable in the labor market (Coff, 1999b). Since FSHC develops over time (Morris, Alvarez, Barney, & Molloy, 2017), many employee external options should predetermined prior to acquisition. Note that this is consistent with the findings from Chapter 1 which show that the acquired firm's characteristics prior to the acquisition (i.e. target quality) explain some of the variance observed in how firms reconfigure human capital after acquisition. Since the existing literature views the effects on mobility as dependent on the acquirer's or target-acquirer dyad's characteristics, little is known about how target firm characteristics affect them and whether who leaves is predetermined.

The extent to which human capital is firm-specific depends among other things on the configuration of human capital within teams (Huckman & Pisano, 2006; Palomeras & Melero, 2010; Pisano, Bohmer, & Edmondson, 2001). Yet, although embeddedness in teams is acknowledged in the human capital literature, it has received less attention in the human capital mobility literature (Campbell, Ganco, et al., 2012; e.g., Carnahan, Agarwal, & Campbell, 2012; Starr, Ganco, & Campbell, 2018). Chapter 2 provides insights into how the diversity of the target's R&D team expertise affects mobility[5].

Central to my theorizing is the idea that "the embeddedness of [R&D workers'] knowledge within a team and organization structures" affects the value of their knowledge to other firms, and thereby constrains R&D workers' mobility (Palomeras & Melero, 2010, pp. 882–883). Consider target A and target B, both with the same number of high quality R&D workers. Target A has a homogenous R&D team comprised of R&D workers with similar human capital working on similar tasks. Target B has a heterogenous (di-

[5] Similar to Chapter 1, Chapter 2 could have investigated whether high-quality targets have lower R&D worker turnover than lower quality targets. Yet, it is likely that target quality also affects target selection—it is different whether the acquirer is buying a high quality target with valuable R&D workers or a target that lacks these resources. Investigating how the performance of an R&D worker relative to peers affects the mobility decision would help to reduce this concern. High-performers are generally, i.e. outside the acquisition context, less likely to leave compared to their peers. However, if high-performers leave, they are more likely to exit to entrepreneurship (Campbell, Ganco, et al., 2012). Lower mobility of high-performers is also observed after acquisition although the evidence for this is smaller (Hussinger, 2007). The underlying logic is that high-performers are able to extract higher rents from firms (i.e. they are paid a premium), and therefore have higher mobility-costs. While it might be interesting to investigate monetary incentives in acquisitions in more detail, Chapter 2 investigates the effect of target characteristics which are independent of the quality of the human capital.

verse) R&D team with more distinct human capital and members who are more dependent on (or complement) the human capital of other R&D workers in the team. I suggest that team diversity limits mobility. I theorize also that individual R&D worker characteristics can reduce this effect if they reduce the information asymmetries related to the value of the human capital. I propose two characteristics that meet this criterion: position and tenure in the firm. While employees' position provides information on general human capital, tenure provides information on R&D workers' willingness to make firm-specific investments (Campbell, Coff, et al., 2012; Morris et al., 2017).

The findings in Chapter 2 confirm that post-acquisition mobility is largely pre-determined by the characteristics of the target prior to the acquisition. Chapter 2 moves the discussion from post-acquisition mobility as dependent on the characteristics of the transaction, the acquirer, and the difference between acquirer and target, to post-acquisition mobility predetermined by the characteristics of the target firm. Chapter 2 contributes to the broader human capital mobility literature by showing how team embeddedness affects the specificity (and transferability) of human capital. Managers evaluating the risk of losing human capital post-acquisition should pay attention to the configuration of human capital in the firm when selecting the acquisition target. Last, the acquisition context may help to show how firm-specific knowledge emerges by disentangling how knowledge is organized within teams and the human capital created through its interactions.

**Chapter 3.** Chapters 1 and 2 argue that firm-specific human capital is important. To better understand what makes it so crucial one may ask what makes human capital vital to the firm if it does not involve firm-specific knowledge. To examine this, it is useful to investigate human capital in firms that do not possess FSHC—simply because the firm did not exist before: new ventures.

The literature on entrepreneurship and new ventures shows that ventures founded or staffed by human capital with prior industry experience survive longer and grow more than ventures staffed by human capital that lack such experience (Brüderl et al., 1992; Cooper, Gimeno-Gascon, & Woo, 1994; Delmar & Shane, 2006; Gimeno, Folta, Cooper, & Woo, 1997; Klepper & Sleeper, 2005). Therefore, the hiring of human capital with industry experience is believed to be beneficial to new ventures (Honoré & Ganco, 2020). However, not all new ventures hire human capital with prior industry experience. Chapter 3 shows that less than one in five new ventures employs at least one knowledge-intensive worker with prior industry experience. This might be due to resource constraints, lack of social networks, and lack of access to appropriate human capital (Baker & Nelson, 2005). However, the pattern is similar for staffing of new subsidiaries established by existing firms which should be less resource constrained. To understand what is driving the relationship between employee industry experience and venture survival, Chapter 3 explores the mobility patterns of initial employees to and from new ventures.

If industry experience is as important as is often believed, we would expect that (1) employees will build on their accumulated experience and remain in the industry, (2) if industry-specific *knowledge is valuable*, we would expect that more industry experience would be better. Surprisingly, I find a great fluidity in the movement of knowledge-intensive workers across industries when leaving a venture. Also, although having an employee with prior industry experience is positively correlated with new venture survival, more knowledge does not seem to be better. Taken together, the findings in Chapter 3 question the importance of industry specific *knowledge* for new venture survival.

A reason for the high inter-industry mobility observed in Chapter 3 might be that how industries are classified does not reflect how people are

bounded by them. While this would explain high mobility, it does not fully explain why industry experience but not industry-specific knowledge matters for venture performance. The findings show that having experience in a related industry is an imperfect substitute for direct industry experience and that ventures with at least one employee with related industry experience but no direct industry experience are not more likely to survive. Also, other types of experience that might be useful to new ventures such as experience of working in a similar position in previous employment, do not affect venture survival.

The data suggest an alternative mechanism: mobility (or tenure). Future mobility is correlated with both industry experience and venture survival. Employees with prior industry experience are less likely to leave a new venture than employees from a related or unrelated industry. In the case of new ventures in particular, high turnover might be costly and distract the remaining employees from executing their tasks. Indeed, realized mobility is a better predictor of venture survival than industry experience. Besides showing that prior inferences about the importance of industry-specific knowledge are overstated, one of the main contributions of Chapter 3 lies in its descriptive and empirical nature, which puts existing research into context and calibrates findings.

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Chapter 1

# Managerial reconfiguration in acquisitions

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# Abstract

Acquisitions are an important means through which firms can reconfigure and redeploy their resources. Among the resources being reconfigured, human capital and managerial resources take a primary role. To provide a more comprehensive model of human capital reconfigurations post-acquisition, we investigate the mechanisms through which managers are redeployed, reconfigured internally and sourced externally (via transfers, promotion and hiring) and discuss the relative advantages of these means in relation to the 'coordination-autonomy dilemma' typical of acquisitions. The results of our analysis suggest that internal managerial reconfigurations are preferred to external resource acquisition, and that the reconfiguration strategy adopted by the firm is conditional on relative sizes of the merging firms and the quality of the target (acquired) firm. Specifically, acquired managements are more likely to be reconfigured via i) transfers from the acquirer if acquirer and target firms are similar sized, and ii) promotions within the target firm in the case of high-quality target firms.

# Introduction

Resource reconfiguration is a fundamental source of firm competitive advantage and value creation. "If competitive advantage is created by assembling the optimum set of resources under specific conditions, and lost when those conditions change, firms should focus on how to swiftly assemble, re-assemble, and dis-assemble such resources in a meaningful manner" (Karim & Capron, 2016, p. 6). An increasing number of studies investigate several aspects of resource reconfiguration and its antecedents, such as diversification (Helfat & Eisenhardt, 2004), the characteristics of the resources being reconfigured (Levinthal & Wu, 2010; Sakhartov & Folta, 2014), and the implications for performance (Dickler & Folta, 2020; Karim & Mitchell, 2000; Lieberman, Lee, & Folta, 2017). Studies that consider the specific resources being redeployed between units as part of a reconfiguration strategy focus primarily on products (Giarratana & Santaló, 2020; Karim & Mitchell, 2000; Miller & Yang, 2016) and cash (Morandi Stagni, Santaló, & Giarratana, 2020), and employ perceptual measures of redeployment based on survey data (Capron, Dussauge, & Mitchell, 1998; Capron, Mitchell, & Swaminathan, 2001; Capron & Mitchell, 1998).

Although the extant literature has studied reconfiguration along several dimensions, current understanding is limited on two accounts. First, despite the importance of human capital (Karim & Capron, 2016) as the main source of competitive advantage (Coff, 1997, 1999), and criticality for resource redeployment decisions based on its limited capacity (Helfat & Eisenhardt, 2004; Levinthal & Wu, 2010), we know little about how human capital is reconfigured. Second, we have little guidance about how resources are reconfigured *within* firm units and how different means of reconfiguration are used simultaneously; in fact, most work focuses on redeployment between firm units (Capron et al., 1998; Folta et al., 2016) which is "only one available alternative" to reconfigure resources (Folta, Helfat, & Karim, 2016, p. 4). Consideration of

the firm's options related to reconfiguring human capital throw light on alternatives to redeployment (henceforth referred to as "transfer"). For instance, in addition to the transfers of human capital between firm units and external recruitment (or hiring), human capital can be reconfigured within the same firm unit through employee promotions. However, we have less understanding about the influence of within-unit human capital reconfigurations, and the tradeoffs related to reconfiguration of strategic assets across and within firm units.

In the present paper we address these issues and propose a comprehensive resource reconfiguration model. Our work responds to calls for "more work […] on how human capital is strategically redeployed within firms" (Karim & Capron, 2016, p. 7) and the need of "more direct measures of resource redeployment" (Dickler & Folta, 2020, pp. 2364–2365). We investigate managerial reconfiguration in the context of acquisitions. Acquisitions are an ideal setting since they create the conditions that allow attainment and subsequent reconfiguration of resources (Capron et al., 1998; Karim, 2006; Karim & Mitchell, 2000). Our focus on managers as a specific type of human capital is due to their particular importance in acquisitions (Cannella & Hambrick, 1993; Graebner, 2004; Haspeslagh & Jemison, 1991) and reconfiguration decisions more generally (Feldman, 2020). The literature on acquisitions acknowledges the importance of managers as firm resources and focuses on their departure from acquired (target) firms (Cannella & Hambrick, 1993; Krug, Wright, & Kroll, 2014; Walsh, 1989). To the best of our knowledge, how managers are reconfigured in response to the managerial vacuum created by the departure of managers is poorly understood.

To examine how firms decide about reconfiguration of the acquired firm's managers post-acquisition (via transfers or promotions), we build on the coordination-autonomy dilemma faced by firms in acquisition activities (Haspeslagh & Jemison, 1991; Puranam, Singh, & Zollo, 2006) and we look at two conditions related to critical aspects for the success of acquisitions

(Haspeslagh & Jemison, 1991): quality of the acquisition target and relative size of the firms involved (Villalonga & McGahan, 2005). We suggest that higher target quality amplifies the need to preserve target-firm specific knowledge, and hypothesize that in that case promotion will be the dominant reconfiguration mechanism. If the acquirer and target firms are similar in size this raises agency issues (Villalonga & McGahan, 2005), and we expect transfers to be the main reconfiguration means. Transfers from the acquiring to the acquired firm reduces agency issues and improves coordination through the transfer of acquirer-specific knowledge.

To test our theory, we use a novel dataset based on employer-employee linked register data for Denmark. These data provide annual information (including salary, position in the firm, etc.) on entire individual career histories for employees in Denmark. Our sample includes 339 firms acquired between 2009 and 2015, and all employees who worked in the target firms in the year before the acquisition and all employees who joined the acquired firm in the three years following the acquisition. Our theoretical predictions are supported: transfer and promotion rates increase in acquisitions while hiring rates do not change. In terms of the conditions favoring reconfiguration within or across firm units, we find that transfers are nearly four times more frequent in acquisitions involving similar sized firms compared to very different sized acquirer and target firms. When considering high-quality versus low quality targets, promotion occurs more than twice as often in the former case.

Our study makes two main contributions to the growing stream of literature on resource reconfiguration (Capron et al., 1998; Karim, 2006; Karim & Williams, 2012). First, we study within-unit reconfiguration (promotion) as an alternative to between-unit redeployment which offers a more comprehensive picture of resource reconfiguration. Second, we provide insights into how human capital is reconfigured in acquisitions, by showing when firms redeploy human capital between firm units and when they engage in reconfiguring re-

sources within firm units. Our findings contribute also to the literature on acquisitions. First, they contribute to work on the coordination-autonomy dilemma (Haspeslagh & Jemison, 1991; Puranam et al., 2006) by suggesting that managerial reconfiguration is a strategic decision used in part to overcome this dilemma during acquisitions. Second, we move the focus from managerial turnover (Cannella & Hambrick, 1993; Krug et al., 2014; Walsh, 1989) to managerial reconfiguration after the acquisition which provides preliminary information on who manages the target following the acquisition.

# Literature

## Resource reconfiguration and redeployment

Resource reconfiguration is defined as the retention, redeployment, deletion, and addition of resources (Capron et al., 1998). The antecedents to reconfiguration include among others, divestiture (Helfat & Eisenhardt, 2004), resource inducements (Sakhartov & Folta, 2015), and market decline (Levinthal & Wu, 2010; Lieberman et al., 2017). The ability to reconfigure resources has important implications for firm performance (Dickler & Folta, 2020; Karim & Mitchell, 2000; Lieberman et al., 2017). For instance, firms can withdraw resources from declining markets and redeploy them in growing markets. Especially in the case of resources with high transferability (Sakhartov & Folta, 2014), this mitigates losses and increases benefits (Helfat & Eisenhardt, 2004). Among the ways available to the firm to reconfigure its resources, much attention has been focused on resource redeployment (Folta et al., 2016), i.e., the reallocation of resources from one business unit to another (Capron et al., 1998). Of particular importance in the redeployment decision are resources with limited capacity such as human capital or machinery, which need to be allocated to a specific use or task over time to create the so-called inter-temporal economies of scope (Helfat & Eisenhardt, 2004; Levinthal &

Wu, 2010). As such, several empirical works have examined how firms reconfigure their product lines and product niches (Giarratana & Santaló, 2020; Karim & Mitchell, 2000) between firm units, and how the ability to do so affects firm exits and performance (Lieberman et al., 2017; Miller & Yang, 2016).

## Resource reconfiguration, redeployment post-acquisition and human capital

Resource redeployment has been studied particularly in the context of acquisitions (Capron et al., 1998; Capron & Mitchell, 1998; Karim & Williams, 2012). Acquisitions are themselves a means to reconfigure resources through the addition (Karim & Williams, 2012) or divestiture (Capron et al., 2001) of resources after the acquisition. As Karim (2006, p. 800) puts it: "Acquisitions are malleable components that provide key resources to internal units, and provide organizations with opportunities to experiment with structure as they strive to create value by reconfiguring targets together." In fact, acquired units are more likely than internally developed units to be reconfigured (Karim, 2006); also, units receiving additional resources are more likely to be subject to other resource reconfiguration actions such as divestitures (see Capron et al., 1998, 2001)[1].

The resources transferred the most frequently from acquirer to acquired firm are managerial resources i.e., "managerial capabilities such as reporting systems, planning tools, and financial expertise, which may be embodied in codified systems or reside within tacit routines" (Capron et al., 1998, p. 636).[2]

[1] In resource divestitures as a type of resource reconfiguration following an acquisition, the resource receiving units divest between two and five times more resources than the resource supplying units (Capron et al., 2001). This difference is asymmetric and independent of the acquirer (Capron et al., 2001).

[2] Specifically, 90% of acquirers transfer some managerial resources to the target. Financial and manufacturing resources are less often transferred (88% and 80%, respectively). Our argument that managerial resources are important during acquisitions is supported by the fact that 74% of acquirers transfer managerial resources often to a large extent. The redeployment

Although the literature suggests that human capital is important for reconfiguration decisions, particularly in the context of acquisitions, measures of redeployment are often perceptual and based on survey data (Capron et al., 1998, 2001; Capron & Mitchell, 1998), and do not differentiate between human capital and other types of resources (see also Dickler & Folta, 2020; Folta et al., 2016). Only a few studies measure redeployment of human capital specifically. This small strand of work shows that human capital is more likely to be redeployed in countries with stronger labor protection laws which make employee lay-offs costly (Belenzon & Tsolmon, 2016), and that managers are often redeployed in the case of units with a similar structural evolution, e.g., between internally developed units or between acquired units (Karim & Williams, 2012).[3]

We focus on managers as a specific managerial resource for several reasons. First, based on the idea that knowledge is embedded in individuals and combined in groups (Grant, 1996; Kogut & Zander, 1992), managers are a type of human capital that is fundamental to firm competitive advantage (Coff, 1997, 1999). Also, managers are particularly important in an acquisition context (Cannella & Hambrick, 1993; Graebner, 2004) as they help the firm navigate the integration process (Haspeslagh & Jemison, 1991). Second, as managers are ultimately those who decide about the resources to be reconfigured and how this can be achieved (Feldman, 2020), and because their experience affects subsequent resource reconfiguration decisions (Karim & Williams, 2012), the managerial reconfiguration in the post-acquisition phase has strategic implica-

of managerial resources from target to acquirer is less important (19% of transfers compared to 90% of transfers from acquirer to target firm).

[3] The authors differentiate also between combinations of internally developed units, combinations of acquired units, and "a combination of an acquired unit with an internally developed unit" (Karim & Williams, 2012, p. 689).

tions beyond the acquisition. Third, focusing on a specific type of human capital allows us to isolate different reconfiguration mechanisms within the firm; specifically, we distinguish between redeployment between firm units (transfer) and reconfiguration within a firm unit (promotion) and account also for the possibility of acquiring the same resources externally (hiring).

## Reasons for managerial reconfiguration post-acquisition

We define managerial reconfiguration as the transfer (i.e., redeployment from acquirer to target), promotion to, or hiring of human capital for managerial positions. There are two primary reasons for managerial reconfiguration after an acquisition. First, as suggested by the resource reconfiguration literature, firms redeploy and refigure resources to maximize value (e.g., Karim & Capron, 2016). Since an acquisition increases the set of available (managerial) resources, the firm needs to evaluate which resources are required and where they should be allocated. Resources that are no longer needed are divested (Capron et al., 2001). Therefore, we would expect employees to be transferred from the acquirer to the target firm if it is believed that their contribution to the target firm will be greater than their contribution or value to the acquirer (cf. Capron et al., 1998). Similarly, we would expect target firm employees to be promoted to managers if it is believed that a managerial role will provide greater value than continuing in their current position, and if the benefits of such promotions exceed the benefit that would be obtained from a managerial transfer from the acquiring firm. Second, as suggested by the literature on post-acquisition managerial turnover, the high turnover after an acquisition (around 25% in the year following the acquisition see Krug & Aguilera, 2004 for a review) could create a "managerial vacuum" if the positions are not re-staffed. The importance of managers in acquisition activities (Cannella & Hambrick, 1993; Graebner, 2004; Jemison & Sitkin, 1986) make it unlikely that managerial positions in the target will be left unfilled.

To summarize, the resource redeployment literature suggests that acquisitions create a need for managerial reconfiguration which could lead to subsequent managerial turnover in the target, while the acquisition literature suggests that acquisitions create the need for reconfiguration due to high levels of managerial turnover. Both perspectives create the need for managerial reconfiguration post acquisition, yet disentangling the reasons involved is beyond the scope of this study. The heterogeneity in acquisitions (e.g., target characteristics) make them an ideal setting to examine different reconfiguration mechanisms.

## Alternative modes of human capital redeployment and reconfiguration

Most of the literature on firms' reconfiguration of human capital related resources focuses on redeployment between firm units (Capron et al., 1998; Karim & Williams, 2012). However, reconfiguration of human capital can involve single units, taking the form for instance of employee promotions.[4] In our context, this refers to an employee in a non-managerial position being promoted to manager level. To the best of our knowledge, promotion as an alternative to redeployment between units (transfer) has been overlooked in the resource reconfiguration literature. Most of the work on the benefits of promotion relative to other ways of filling a position compares promotion to hiring but not to transfer (e.g., Bidwell, 2012).[5] In the literature on internal

[4] Another within firm unit human capital reconfiguration option is a change of responsibilities/tasks related to the current role or job function.

[5] An exception is the study by Bidwell and Keller (2014) which also considers lateral transfers of employees at the same hierarchical level. However, they focus on whether a position is filled internally or externally depending on the grade ratio and performance variability within the firm which will affect co-workers' motivations and the firm's ability to find a best suited candidate, respectively. Transfer is often seen as a substitute for promotion. Bidwell and Keller show that as internal pressure for promotions increases, the probability of transfers decreases. This internal pressure is less relevant during acquisitions since both firms are going

versus external labor markets, promotions are usually seen as a career-step. The decision to promote depends mostly on internal pressure to offer incentives to employees, and less on the firm's need for senior employees (Bidwell & Keller, 2014). In the case of acquisitions the reverse should apply. Since acquisitions can create managerial vacuums, the decision to promote should depend less on internal pressures and more on the need for senior employees (i.e., managers), and specifically the knowledge and capabilities needed following the acquisition. As described in more detail in the next section, the choice of reconfiguration mechanism depends on the level of the manager's target-specific or acquirer-specific and managerial knowledge. The transfer or promotion of employees affect the knowledge of the reconfigured managers.

Moreover, as acquisition may reduce the pool of available resources as a result of post-acquisition turnover (for reviews see Krug & Aguilera, 2004; Krug et al., 2014), we need also to consider external resource acquisition (i.e. hiring[6]). Most existing studies do not consider reconfiguration options external to the firm mainly because it is difficult to distinguish among the types of resources being reconfigured (see Dickler & Folta, 2020). Considering hiring as an alternative allows us also to move beyond the assumption that the internal reconfiguration of resources is more efficient than external acquisition of the same resources (see e.g., Folta et al., 2016). We study how managers are reconfigured during acquisitions by considering reconfiguration mechanisms both internal and external to the firm (i.e., hiring, promotion, and transfer) and investigating the boundary conditions to the use of specific reconfiguration strategies.

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concerns. Moreover, in their study, transfers involve similar capabilities in promoted employees. In our study, promotion is associated with target-specific knowledge while transfers are associated with acquirer-specific knowledge.

[6] Contracting of human capital (freelancing) is an alternative to hiring in the external labor market. This is an alternative to the classical "ownership" of resources and its associated challenges, and is beyond the scope of this manuscript.

# Theory and hypotheses

Acquisitions are characterized not only by the possibilities they provide for resource reconfiguration but also by the complexity of the integration process (Jemison & Sitkin, 1986). Issues related to the transfer of knowledge between acquirer and acquired firm are important and warrant significant managerial attention (Haspeslagh & Jemison, 1991). Firm's knowledge transfer relies on coordination mechanisms in the form of formal hierarchical structures (e.g., centralization and specialization) or informal lateral relations (e.g., cross-unit social interactions; Ghoshal, Korine, & Szulanski, 1994; Tsai, 2002). In acquisitions, these coordination mechanisms need to be either newly designed and implemented or adopted by the target firm (or vice versa) (Puranam et al., 2006). In many cases, adoption of the coordination mechanisms of one of the firms involved is more efficient than the development of new coordination mechanisms which would have to be adopted by both the target and acquirer firms.

## Coordination-autonomy dilemma

The adoption of shared coordination mechanisms requires some level of integration between the target and acquirer—"the degree of interaction and coordination between the two firms involved" (Larsson & Finkelstein, 1999, p. 6). The coordination-autonomy dilemma addresses the trade-off between full integration of the target to ensure a high level of coordination and granting the target more autonomy in order to avoid disrupting its routines and capabilities (and therefore focusing on preserving the target firm's knowledge) (e.g., Haspeslagh & Jemison, 1991; Puranam et al., 2006; Ranft & Lord, 2002). A higher level of integration which enables better coordination allows greater access to the target's knowledge. However, integration results in some loss of organizational autonomy for the target firm (Haspeslagh & Jemison, 1991), and disruption to its work routines and organizational dynamics. This can undermine its knowledge capabilities (Ranft & Lord, 2002) (Puranam, Singh, &

Chaudhuri, 2009; Puranam et al., 2006). The acquired firm's employees may experience loss of control and resist the change (Cartwright & Cooper, 1993), resulting in exit from the firm (e.g., Krug & Hegarty, 2001; Paruchuri & Eisenman, 2012) or reduced efforts (Larsson & Finkelstein, 1999). Given that much firm knowledge is intangible and embedded in individuals (Grant, 1996; Kogut & Zander, 1992) and mostly lost with employees' departure, reducing the target firm's autonomy can reduce the ability to preserve the target's knowledge. Haspeslagh and Jemison (1991, p. 142) suggest that "one of the paradoxes in acquisitions is that the pursuit of capability transfer itself may lead to the destruction of capability being transferred. Whereas capability transfer requires different degrees of boundary disruption or dissolution, the preservation of capabilities requires boundary protection and, hence, organizational autonomy". Similar to work on the coordination-autonomy dilemma, the reconfiguration literature recognizes that the "benefits [of integration] may be offset by the disruption caused by changes in structure" (Karim & Kaul, 2015, p. 440). Thus, to optimize the reconfiguration process acquirers might benefit from allowing the acquired firm more autonomy at the cost of a lower level of coordination and control.

## Benefits of reconfiguration mechanisms

Each of the reconfiguration mechanisms we propose (transfer, promotion, hiring) has advantages and disadvantages in terms of coordination benefits and knowledge preservation (see Table 1). In our theory development, we focus primarily on reconfiguration mechanisms internal to the firm (transfer and promotion) since within-firm reconfigurations are commonly seen as providing more benefit than external acquisition of the same resource (e.g., Folta et al., 2016; Helfat & Eisenhardt, 2004). Specifically, we argue that the choice of reconfiguration mechanism (transfer or promotion) allows decisions about appointing managers with more acquirer-specific and managerial

knowledge versus more target-specific and non-managerial knowledge, and whether this achieves higher coordination or higher target autonomy.

| | Reconfigured managers | | | |
|---|---|---|---|---|
| **Reconfiguration mechanism** | Type of knowledge possessed | Target knowledge preservation potential | Acquirer-target coordination potential | Target autonomy potential |
| Transfer | *Acquirer-specific managerial* | *Medium* | *High* | *Low* |
| Promotion | *Target-specific non-managerial* | *High* | *Low* | *High* |
| Hiring | *Neither acquirer- nor target-specific managerial* | *Low* | *Medium* | *Medium* |

*Note: For completeness, hiring is included in the comparison.*

**Table 1: Benefits and drawbacks of managerial reconfiguration mechanisms in acquisitions**

Managerial transfers from the acquiring to the acquired firm promote knowledge exchange and the transfer of organizational routines between acquirer and acquired firms (coordination) (Argote, McEvily, & Reagans, 2003; Kogut & Zander, 1992). Acquirer-specific managerial knowledge promotes integration (or adaptation) of firm processes. However, managerial transfers from the acquiring firm reduce the target organization's autonomy whereas promotions provide the target with more autonomy while preserving its firm-specific knowledge and human capital by providing its employees with an incentive to stay. Although a promoted manager may lack managerial skills, her target-specific knowledge may be valuable. However, promotion can also reduce the ease and speed of integration because it reduces the acquirer's coordination and control. In the case of hiring to fill a managerial position, the hired manager might be less reluctant to implement changes and may adopt a more neutral position. However, hired managers inevitably lack both acquiring

and acquired firm specific knowledge which might reduce their effectiveness in managing the integration process.

## Contingencies

We exploit the coordination-autonomy dilemma logic to identify the contingencies where we expect reconfiguration mechanisms that provide coordination (or knowledge preservation) advantages to be more frequent. Specifically, we do focus on neither the ultimate choice of integration (i.e., whether the acquired firm is integrated and the level of its integration), nor the post-merger integration process. Instead, we examine the conditions that may affect the choice of integration (i.e., the conditions prevailing *before* integration that might make integration more difficult), and conditions that suggest a greater need for autonomy in the acquired firm. These two dimensions will affect the subsequent integration decisions (see Haspeslagh & Jemison, 1991, Ch. 8).[7] Although we expect target firms to engage in each of these strategies, we theorize that (1) the quality of the target and (2) the relative size of the acquirer and target firms will affect the reconfiguration strategy employed. The quality of the target firm reflects the need to preserve its knowledge and skills, and the relative size of the target and acquirer firms reflects the acquirer's coordination and control needs.

We conceptualize a high-quality firm as a firm that pays a premium for the knowledge and skills possessed by its employees. This premium reflects the knowledge that cannot be codified and the skills that cannot be permanently captured by the firm. Firms that embody such assets and are able and willing to pay such premiums are considered high-quality targets (see Wright,

[7] Furthermore, as we are investigating firm's immediate response to acquisitions, most firms will likely be at a similar stage of integration—independent of the ultimate, desired level of integration. As explained later in the method section, we exclude extreme cases, i.e., acquisition targets that are not at all integrated (referred to as holding) and acquisition targets that are immediately and completely absorbed with the acquisition. Thus, we are investigating targets that will be at least to some extent integrated.

McMahan, & McWilliams, 1994). In the case of acquisition of a high-quality target, the need to preserve the acquired firm's knowledge is amplified. Retention of the firm's human capital affects not only the price of the acquisition (Coff, 2002) but also its likelihood (Younge, Tong, & Fleming, 2014). We theorize that while "[re]deploying managerial capabilities to a target business allows a corporation […] to profit from any improvements they [the transferred managers] are able to achieve at the target (Penrose, 1959)" (Capron et al., 1998, p. 636), these benefits will be outweighed by loss of target-specific knowledge.

Promotion of target firm employees to managerial positions provides an incentive for acquired firm employees to stay. Moreover, the target-specific knowledge of an employee promoted to a managerial position enables identification of valuable (human) resources and brings knowledge about processes, thereby preserving organizational capabilities. Although a transferred manager may have greater managerial, and acquirer-specific knowledge, transfers from acquirers can result in perceived loss of autonomy by acquired firm employees. This increases the risk of employee departures (Cartwright & Cooper, 1993; Lubatkin, Schweiger, & Weber, 1999), and in turn, loss of target-specific knowledge.

Therefore, in the case of a high-quality target firm, we expect promotion to be more used:

> *Hypothesis 1 (H1): The promotion of a target's employee to manager level is more likely if the acquisition target is a high-quality firm compared to if it is a low-quality firm.*

Different challenges occur if acquirer and target firms are similar in size as this gives rise to multiple agency problems. Indeed, a similar size may reduce the chance of an acquisition and favor other boundary-spanning modes (Villalonga & McGahan, 2005). Alternatively, "acquisitions that are small compared to its acquirer in terms of size might be less affected and 'remain virtually

unintegrated"' (Pablo, 1994, p. 824). While preservation of knowledge remains important, accessibility is also critical. Firms need coordination routines which enable knowledge sharing. The transfer of a manager from the acquirer to the acquired firm increases the acquirer's control which enables greater coordination. Both acquirer-specific and managerial knowledge help facilitate coordination between target and acquirer. Extant work suggests that the redeployment of managers between firm units (Karim & Williams, 2012) enables knowledge transfer and knowledge recombination (Kogut & Zander, 1992). Also, if acquirer and target are similarly sized, the target's loss of autonomy may resolve some of the agency problems by making the division of power clearer. In contrast, in addition to lack of managerial and acquirer-specific knowledge, promotion may reinforce agency problems and hinder integration. Therefore, we hypothesize that:

> *Hypothesis 2 (H2): The transfer of managers from acquirer to acquired firms will be more likely if acquirer and target firms have similar rather than different size.*

# Data and sample

## Data

To test our hypotheses and derive empirical insights into the acquirer's choice of managerial reconfiguration mechanisms, we construct a comprehensive dataset based on individual-level matched employee-employer data from the Danish labor register (IDA). IDA is updated annually by Statistics Denmark in the last week of November. The register data start in 1980, and provide information on all current employees. The quality of the Danish data has been internationally acknowledged (cf. Dahl, 2011; Sørensen, 2007) and IDA data have been used for studies of scientists' mobility (Kaiser, Kongsted, Laursen, & Ejsing, 2018) and individual pay (Grimpe, Kaiser, & Sofka, 2019).

IDA contains information on the identity of each firm, its establishments (subsidiaries), and each of its establishment's employees. Firms, establishments, and individuals have unique identifiers which are consistent over time. To construct our dataset, we first identify all acquisitions occurring in Denmark in the period 2009 to 2015[8] based on a change of establishment ownership (existing firm identifier) compared to the previous year. Our sample includes all establishments with more than five employees. The cut-off of five employees per establishment has been used in other studies using Danish data (Dahl, 2011).We exclude establishments divested within the three years post-acquisition in order to reduce the probability that a mobility event is unrelated to the acquisition (e.g. leaving a firm because of firm closure). We also exclude establishments that were acquired more than once during the sample period to ensure that the observed effect is attributable to a specific acquisition.

## Accounting for endogeneity

The multiple stages of the acquisition process suffer from well-known endogeneity issues. The primary concern is the fact that firms are not acquired at random and acquired and non-acquired firms may be inherently different. There are also endogeneity concerns related to later stages of the acquisition process; for instance, acquired targets with managerial turnover may differ from those without managerial turnover. There may also be differences between targets that reconfigure managerial positions if managers leave (via transfer, promotion or hiring) and those that do not. These examples illustrate three of the potential endogeneity concerns: acquired versus non-acquired; conditional on acquisition, turnover versus no turnover; and conditional on

[8] We chose this period because a municipality reform in 2007 led to the (fictive) creation and closure of many establishments in Denmark. Therefore, including 2007 would have led to overestimation of discontinued establishments. Consequently, we exclude all establishments acquired in 2007.

turnover, reconfiguration versus no reconfiguration are three. While the selection of acquisition targets and the determinants of managerial turnover in acquisitions have been studied extensively (e.g. Krug et al., 2014; Walsh, 1988; Younge et al., 2014), our analysis focuses on the last step, the phenomenon of managerial reconfiguration which has been less well investigated. In fact, we know little about how managers are reconfigured within and between establishments during acquisitions. To investigate and provide evidence of this phenomenon, we need a comparison group that allows us to explore differences between acquired and non-acquired firms. Moreover, turnover may be a consequence (not just an antecedent) of reconfiguration. Therefore, we focus on "first-stage" endogeneity—acquired versus non-acquired. We try to account for other differences (e.g., turnover versus no turnover affecting managerial vacuum post-acquisition) by including controls in the analysis.

**Coarsened exact matching.** To increase comparability between acquired and non-acquired businesses, we used coarsened exact matching (CEM) to match establishments that were acquired in *t* to similar, non-acquired establishments based on their characteristics in the previous year (*t-1*). CEM has the advantage that establishments in the treatment and control groups can be exactly matched on specific conditioning variables, some of which are coarsened (Iacus, King, & Porro, 2012). Thereby, it overcomes the limitations of other matching methods such as propensity score matching (King & Nielsen, 2019). We use a one-to-one matching specification and conduct matching for each year prior to an acquisition, starting with 2008, and exclude matched "non-acquired" establishments in the focal year (or any prior year) from the pool of potential matches in the following year. We constructed the panel including all years since 1980. Our matching approach does not rely on weights which are normally assigned to the control observations depending on matching quality. This enables us to aggregate the establishments at the transaction level (see more detail below). While the one-to-one matching specification increases the risk of loss of observations that cannot be matched well (normally less well-

matched observations are assigned a lower weight), we have the entire population of businesses in Denmark as potential controls which reduces concern of this issue in our case.

**Matching criteria.** We match establishments on the following variables. Whether the match is exact or coarsened is indicated in parentheses. At firm level, we match on firm age (coarsened). At establishment level, we match on industry sector (exact), location characteristics (exact, 4 groups), number of employees in the establishment (quartiles, coarsened), and labor composition (several variables, see below). Industry sector is based on the six-digit Danish Industry Code 2007 (DB07) which uses the four-digit NACE rev. 2[9] which has been applied to all EU member states since 2008. The Danish Industry Code groups firms into 19 different industry sectors similar to the NACE classification. The location classification groups all 98 municipalities in Denmark into four groups: global cities, metropolitan areas, population centers, and rural areas (Asmussen, Nielsen, Goerzen, & Tegtmeier, 2018). We match on geographical characteristics because economic density can influence the external options for employees, and thus, decision to leave a firm and availability of labor. As such, it can also affect decisions about hiring , promotion, or transfer of managers.

In the same way as firms are not randomly selected as targets for acquisition deals, Kapoor and Lim (2007) suggest that the human resources employed at the time of the acquisition are also not random. The granularity of the data allows us to identify these compositional differences using information on gender and age and the Danish version of the International Standard Classification of Occupations, prepared by the International Labor Organization (ILO). This classification provides information on the different skill levels and employee positions including employees in managerial positions, professional positions

[9] NACE rev. 2. is based on the UN industry nomenclature ISIC rev. 4.

requiring high levels of knowledge (e.g., engineers, software developers, lawyers), positions requiring an intermediate-level of knowledge (technicians and associate professionals), positions requiring basic knowledge (ordinary office and customer-service work), manual labor, labor without further specifications (other wage-earners), and non-primary appointments (e.g., secondary employment).

We counted how many employees worked in managerial, high-knowledge, and intermediate-knowledge positions. The remaining positions are included in the establishment's total employee count. In the matching, we include the ratio of high-knowledge workers in an establishment relative to the total number of its employees (coarsened); the ratio of intermediate-knowledge workers (coarsened); and whether the establishment has no managers, one to five managers, or more than five managers (exact). We also included the ratio of female employees (coarsened) and the average age of employees (coarsened), since younger or female employees may fill different positions and work in different firms. Finally, we matched on average employee income in the establishment (coarsened) to ensure that we compare establishments with similar wage levels. By matching on compositional differences in terms of positions filled and average salary, we implicitly match establishments of similar quality where "quality" refers to differences in salary not attributable to compositional difference (e.g., an establishment with a high ratio of high-knowledge workers is likely to have a higher average salary than an establishment employing more people in lower positions).

**Aggregation to the transaction level.** A match was found for approximately 80 percent of the target establishments, resulting in a sample of 1227 acquired and 1227 comparable, non-acquired establishments. Some of the matched target establishments are part of multi-establishment firms. If a multi-establishment firm is acquired, transfers from acquirer to one of the target establishments affects the probability of transfers from the same acquirer to other target establishments. This is because the pool of human resources that

could be transferred is limited (i.e., one source of transfer for multiple potential receiving units). Therefore, we aggregate establishments at transaction level (i.e., all acquired establishments belonging to firm b acquired by firm a). See Appendix 1 for more details. Matching establishments rather than firms has important advantages. First, in cases of partial acquisitions, we analyze only the acquired part of the firm. Second, it allows us to construct a counterfactual for transfers in the comparison group (i.e., inter-establishment–intra-firm mobility, see further below). Our sample includes 960 acquisition transactions between 2009 and 2015.

## Employee information

After matching establishments, we identified employees working in the acquired or non-acquired establishments in the year before the acquisition. We exclude employees aged less than 16 years and more than 60 years in 2008. The latter restriction helps to mitigate the risk that employees left the labor market because of (early) retirement. In order to exclude contractors and short-term employees we also restricted our sample to employees with full-time jobs in the year *t0*[10]. The remaining employees form the pool of potential "leavers" or employees who could be promoted. We also identify employees who joined the acquisition target (or control) in year *t0* or any of the following three years (*t+1* to *t+3*).

Danish register data allow differentiation between intra- and inter-firm mobility which we use to identify the different reconfiguration modes. We identify employees who were transferred from the acquiring firm to the target organization in year *t0* or in the succeeding three years. Non-acquired firms

[10] Year *t0* is the year of acquisition (for acquired establishments). In other words, it is the year after the matching (for both non-acquired control establishments and acquired establishments). Although control firms do not have a "year of acquisition," for simplicity we use the term *t0* and "year of acquisition" interchangeably.

have no *transferees* because they are not associated to an acquiring firm. To ensure a meaningful comparison, we identify employees joining matched, non-acquired establishments from another establishment in a multi-establishment firm (intra-firm, inter-establishment mobility). For simplicity, we refer to both types of inter-firm movement (between establishments in control firms and from acquirer to target) as "transferees." We also identify all employees *promoted* to managerial level within a target (or control unit) in a given year. Last, we identify employees who joined an acquired or non-acquired firm from the external labor market. For acquired firms, this means that a "hired employee" did not work at the acquiring firm or the acquired firm in the year prior to the acquisition (*t-1*). "Hired employees" in non-acquired firms did not work at the non-acquired firm in *t-1*. We again include the entire work history since 1980. Therefore, our sample includes all employees present in *t-1* and those joining in *t0* or any of the three years following the acquisition.

In the analysis, we restrict the sample to targets with at least one manager in *t-1*. We exclude acquisitions where the acquirer had less than two employees in the year prior to the acquisition and those that were younger than two years in the year of the acquisition. The former restriction is applied because firms without a manager prior to the acquisition are unlikely to have a manager after the acquisition. The latter restriction is aimed at excluding purely financial transactions. The resulting sample includes 339 acquired targets and 626 units in non-acquired firms (controls) with similar characteristics.

# Descriptive statistics on managerial reconfiguration

## Target and control firm characteristics

Tables 2 and 3 present the descriptive statistics of the target and control firms. In the year prior to the acquisition, targets had, on average, four managers and 62 employees, and 66 employees in the year of the acquisition. Around a third (34.9%) of employees worked in managerial, high-knowledge, and intermediate-knowledge positions. Employees in the targets earned on average of DKK 268,305 (USD 38,850) per year. Acquiring and target firms are on average 26 and 21 years old respectively, and most acquisitions (75%) are within the same three-digit industry code.

Since the matching included many of the variables, we expect non-acquired firms to be very similar to acquired firms. As expected, the control firms are generally similar to the acquired firms in terms of their composition although the control firms are slightly older (25 versus 21 years) and smaller (compare Tables 2 and 3). These small differences are due to the aggregation which causes an unequal number of target firms and controls (see Appendix 1). Similar to acquired firms, around a third (35.3%) of employees in the control firms worked in managerial, high-knowledge, or intermediate-knowledge positions. The average salary is similar (DKK 269,096 or USD 38,965) in the control and acquired firms. The overall similarities between the acquired and control firms (compare Tables 2 and 3) provide support for our matching approach.

| Variable | N | mean | sd | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|---|---|---|
| (1) No. employees in t-1 | 339 | 61.634 | 117.913 | 1 | | | | | | |
| (2) No. employees in t0 | 339 | 66.156 | 126.290 | 0.952 | 1 | | | | | |
| (3) Average establish-ment salary | 339 | 268305 | 77576 | 0.068 | 0.063 | 1 | | | | |
| (4) Target age in t0 | 309 | 20.757 | 14.270 | -0.011 | 0.030 | 0.032 | 1 | | | |
| (5) Acquirer age in t0 | 339 | 26.236 | 26.209 | 0.035 | 0.053 | 0.075 | 0.013 | 1 | | |
| (6) Same L3-industry | 339 | 0.752 | 0.432 | 0.029 | 0.031 | -0.243 | -0.016 | -0.030 | 1 | |
| (7) Manager in Target | 339 | 3.714 | 6.399 | 0.628 | 0.673 | 0.067 | 0.129 | 0.065 | -0.041 | 1 |
| (8) Prop. managers | 339 | 0.097 | 0.089 | -0.236 | -0.230 | 0.029 | -0.035 | -0.090 | -0.039 | 0.111 |
| (9) Prop. high-knowledge workers | 339 | 0.118 | 0.213 | 0.041 | 0.063 | 0.321 | -0.050 | 0.093 | 0.052 | -0.060 |
| (10) Prop. intermediate-knowledge workers | 339 | 0.133 | 0.174 | 0.009 | 0.014 | 0.337 | 0.074 | 0.005 | -0.171 | 0.025 |
| (11) No. transferred managers | 339 | 0.292 | 1.060 | 0.212 | 0.282 | 0.179 | -0.034 | -0.022 | -0.087 | 0.246 |
| (12) No. hired managers | 339 | 0.434 | 1.392 | 0.421 | 0.517 | 0.019 | 0.105 | 0.110 | -0.027 | 0.576 |
| (13) No. promoted managers | 339 | 0.743 | 5.704 | 0.255 | 0.243 | 0.163 | -0.033 | 0.015 | -0.111 | 0.494 |
| (14) Any transferred | 339 | 0.150 | 0.358 | 0.015 | 0.061 | 0.104 | -0.048 | -0.082 | -0.064 | 0.047 |
| (15) Any hired | 339 | 0.209 | 0.408 | 0.279 | 0.300 | 0.069 | 0.068 | 0.013 | -0.141 | 0.264 |
| (16) Any promoted | 339 | 0.209 | 0.408 | 0.269 | 0.263 | 0.124 | -0.038 | 0.029 | -0.091 | 0.267 |

**TABLE 2 continued**

| Variable | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
|---|---|---|---|---|---|---|---|---|---|
| (8) Prop. managers | 1 | | | | | | | | |
| (9) Prop. high-knowledge workers | -0.172 | 1 | | | | | | | |
| (10) Prop. intermediate-knowledge workers | -0.091 | 0.002 | 1 | | | | | | |
| (11) No. transferred managers | -0.052 | 0.163 | 0.059 | 1 | | | | | |
| (12) No. hired managers | -0.063 | -0.056 | -0.024 | 0.205 | 1 | | | | |
| (13) No. promoted managers | -0.012 | 0.029 | 0.127 | 0.489 | 0.175 | 1 | | | |
| (14) Any transferred | -0.014 | 0.112 | -0.001 | 0.655 | 0.059 | 0.135 | 1 | | |
| (15) Any hired | -0.092 | -0.030 | 0.027 | 0.166 | 0.606 | 0.150 | 0.006 | 1 | |
| (16) Any promoted | -0.085 | 0.009 | 0.035 | 0.098 | 0.293 | 0.254 | 0.088 | 0.252 | 1 |

**Table 2: Descriptive statistics of targets with at least one manager**

| Variable | N | mean | sd | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|---|---|
| (1) No. employees in t-1 | 622 | 53.883 | 125.259 | 1 | | | | | |
| (2) No. employees | 626 | 57.518 | 131.423 | 0.990 | 1 | | | | |
| (3) Average establish-ment salary | 626 | 269096.7 | 67553.7 | 0.134 | 0.133 | 1 | | | |
| (4) Target age in t0 | 626 | 24.623 | 19.262 | 0.068 | 0.069 | 0.078 | 1 | | |
| (5) Manager in establish-ment | 626 | 3.759 | 8.439 | 0.696 | 0.700 | 0.182 | 0.068 | 1 | |
| (6) Prop. managers | 622 | 0.100 | 0.081 | -0.193 | -0.194 | 0.126 | -0.101 | 0.068 | 1 |
| (7) Prop. high-knowledge workers | 622 | 0.112 | 0.202 | 0.124 | 0.128 | 0.342 | 0.035 | 0.071 | -0.079 |
| (8) Prop. intermediate-knowledge workers | 622 | 0.142 | 0.177 | 0.053 | 0.055 | 0.382 | 0.104 | 0.071 | -0.028 |
| (9) No. transferred managers | 626 | 0.045 | 0.346 | 0.230 | 0.220 | 0.019 | 0.083 | 0.400 | -0.018 |
| (10) No. hired managers | 626 | 0.315 | 1.084 | 0.639 | 0.618 | 0.140 | 0.025 | 0.601 | 0.043 |
| (11) No. promoted managers | 626 | 0.278 | 1.165 | 0.412 | 0.443 | 0.073 | 0.079 | 0.582 | -0.035 |
| (12) Any transferred | 626 | 0.026 | 0.158 | 0.124 | 0.120 | -0.024 | 0.106 | 0.206 | -0.025 |
| (13) Any hired | 626 | 0.181 | 0.385 | 0.269 | 0.256 | 0.174 | 0.059 | 0.289 | 0.052 |
| (14) Any promoted | 626 | 0.115 | 0.319 | 0.276 | 0.306 | 0.054 | 0.055 | 0.318 | -0.075 |

**Table 3 continued**

| Variable | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
|---|---|---|---|---|---|---|---|---|
| (8) Prop. managers | | | | | | | | |
| (9) Prop. high-knowledge workers | 1 | | | | | | | |
| (10) Prop. intermediate-knowledge workers | -0.019 | 1 | | | | | | |
| (11) No. transferred managers | -0.006 | 0.006 | 1 | | | | | |
| (12) No. hired managers | 0.060 | 0.042 | 0.351 | 1 | | | | |
| (13) No. promoted managers | 0.023 | 0.079 | 0.164 | 0.401 | 1 | | | |
| (14) Any transferred | -0.047 | 0.018 | 0.799 | 0.168 | 0.074 | 1 | | |
| (15) Any hired | 0.066 | 0.091 | 0.132 | 0.619 | 0.188 | 0.082 | 1 | |
| (16) Any promoted | 0.019 | 0.041 | 0.171 | 0.256 | 0.663 | 0.100 | 0.130 | 1 |

**Table 3: Descriptive statistics of control firms with at least one manager in the year prior**

## Managerial reconfiguration in acquired and non-acquired firms

The literature provides a poor understanding of how managerial positions are reconfigured after acquisitions. We therefore first investigate the prevalence of different managerial reconfiguration mechanisms i.e., transfer, promotion, and hiring. Since "internal resource redeployment only creates value if it is more efficient than external resource acquisition for the same purpose" (Folta et al., 2016, p. 2), we include hiring to account for the costs of developing firm-specific knowledge. Firm-specific knowledge is likely to be particularly helpful in the context of acquisitions, and the costs of promoting someone with target-specific knowledge or of transferring a manager with acquirer-specific knowledge should likely be lower (Becker, 2009). Table 4 column 2 presents annual rates of hiring, promoting, and transferring of managers in acquisition targets over a four-year period starting from *t0*. Among acquired firms, 21 percent hired at least one manager in the year of the acquisition, and 18 percent hired at least one manager in the year after acquisition completion ($t = 0.96$, $p < .339$). In terms of promotion, the share of acquired firms that promote at least one manager is 21 percent (21%) in the year of the acquisition, but it falls to only ten percent in the year following the acquisition ($t = 3.87$, $p < .001$). The last row in Table 4 shows that transfers are less likely; 15 percent of targets use transfers in the year of the acquisition and eight percent use this means in the year after the acquisition ($t = 2.82$, $p = .005$).

To provide a counterfactual, we report the annual rates of non-acquired firms for hiring, promotion, and transfer (Table 4 column 3). Columns 4 to 6 present the results of the t-tests for acquired and non-acquired firms. Although the proportion of non-acquired firms that hire at least one manager in the year of the acquisition is qualitatively three percent lower than the proportion of acquired firms, this difference is not significant (18% versus 21%, $t = -1.09$, $p = .28$). The percentage of firms that use hiring to fill managerial positions does not differ significantly in the succeeding years either. Only 12 percent of non-

acquired firms promote at least one manager in the year of acquisition (*t0*), compared to 21 percent of target firms ($t$ =-3.97, $p < .001$). Significant differences are also observed for transfers in the year of the acquisition. Since employees can only move between establishments within the same firm in firms with multiple establishments, we exclude from the sample non-acquired, single-establishment firms. Therefore, the sample for transfers includes 339 acquired and 297 non-acquired firms (controls) with similar characteristics. Non-

**Hiring: Percent of acquired and non-acquired firms with at least one hired manager**

| Year | Acquired | Non-acquired | b | t | p | N |
|---|---|---|---|---|---|---|
| t0 | 20.94 | 18.05 | -2.89 | -1.09 | 0.28 | 965 |
| t+1 | 18.02 | 18.04 | 0.02 | 0.01 | 0.99 | 954 |
| t+2 | 17.58 | 17.92 | 0.35 | 0.12 | 0.91 | 786 |
| t+3 | 15.81 | 15.44 | -0.38 | -0.13 | 0.90 | 662 |

*Baseline: Non-acquired-firms, two-sided t-test. Only firms with at least one manager in t-1, n=965 in t0.*

**Promotion: Percent of acquired and non-acquired firms with at least one promoted manager**

| Year | Acquired | Non-acquired | b | t | p | N |
|---|---|---|---|---|---|---|
| t0 | 20.94 | 11.50 | -9.44 | -3.97 | 0.00 | 965 |
| t+1 | 10.21 | 8.53 | -1.68 | -0.86 | 0.39 | 954 |
| t+2 | 7.81 | 8.87 | 1.06 | 0.50 | 0.62 | 786 |
| t+3 | 6.05 | 6.49 | 0.44 | 0.22 | 0.83 | 662 |

*Baseline: Non-acquired-firms, two-sided t-test. Only firms with at least one manager in t-1, n=965 in t0.*

**Transfer: Percent of acquired and non-acquired firms with at least one manager transferred**

| Year | Acquired | Non-acquired | b | t | p | N |
|---|---|---|---|---|---|---|
| t0 | 15.04 | 5.39 | -9.66 | -4.00 | 0.00 | 636 |
| t+1 | 8.11 | 6.16 | -1.94 | -0.94 | 0.35 | 625 |
| t+2 | 6.64 | 7.03 | 0.39 | 0.17 | 0.86 | 512 |
| t+3 | 4.19 | 6.07 | 1.89 | 0.89 | 0.38 | 429 |

*Baseline: Non-acquired-multi-establishment firms, two-sided t-test. Only firms with at least one manager in t-1, n=636 in t0. Single-establishment control firms are excluded because of the lack of counterfactual.*

**Table 4: Descriptive Statistics and t-tests comparing acquired and non-acquired firms**

acquired multi-establishment firms fill fewer positions using the mechanism of within-firm transfers (5%) than do acquired firms (15%) ($t = -4.00$, $p < .001$). The percentages of firms using transfers is not significantly different in the years after the acquisition ($p > .1$). Although rates of transfer, promotion, and hiring show some qualitative differences across years in the control firms, they do not differ significantly from one year to the next.

To summarize, Table 4 shows that internal resource reconfiguration mechanisms are used relatively more in acquisitions than in other contexts. Transfers from acquirer to target to fill a managerial position are three times more likely than transfers between different establishments in similar non-acquired firms. These findings support the premise that internal resource reconfiguration is often more efficient than acquisition of external resources (e.g. Folta et al., 2016). Also, managerial reconfigurations in acquisition targets tend to occur in the year of the acquisition; in subsequent years, all reconfiguration mechanisms reach same levels reported for non-acquired firms. Figure 1 depicts rates of hiring, promotion, and transfer in acquired and non-acquired firms over the four-year period starting with the acquisition year (*t0*).

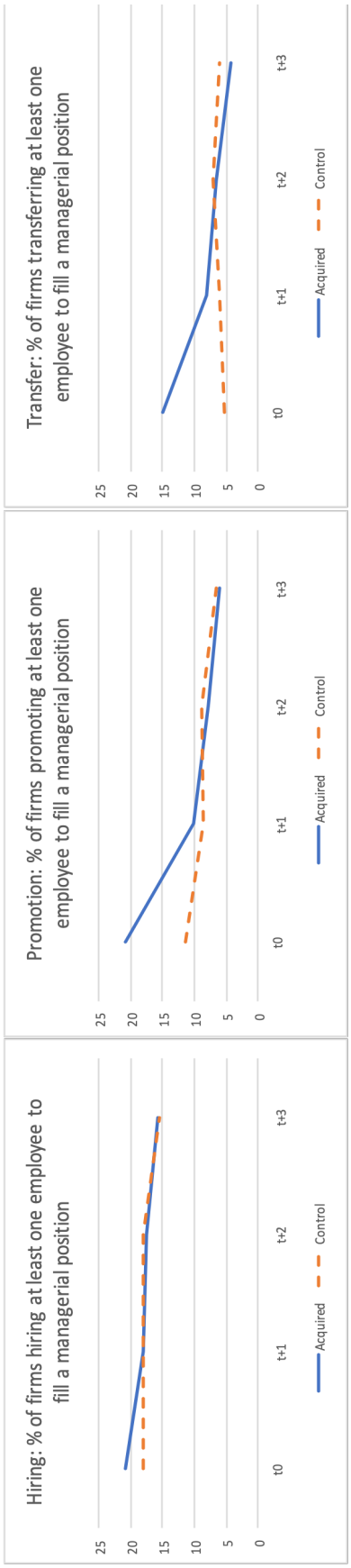


**Figure 1: Rates of hiring/promotion/transfer in acquired and non-acquired firms**

The differences in means (Table 4) may stem from differences between the acquired and non-acquired firms not entirely accounted for by our matching procedure. Table 5 shows how the propensity for hiring, transfer, and promotion is related to acquisition status (i.e., whether the firm was acquired or not) when accounting for compositional differences and inflow and outflow of employees and managers. Managers' outflow controls for the managerial vacuum following an acquisition which likely affects the need for a resource reconfiguration. Similar to the raw means comparisons, these models are descriptive. In order to have the same sample for all three models, we exclude from the sample single-establishment control firms (similar to Table 4 for transfer rates).

| . | Model 1: **Hiring** | | | Model 2: **Promotion** | | | Model 3: **Transfer** | | |
|---|---|---|---|---|---|---|---|---|---|
| . | Coeff. | se | p | Coeff. | se | p | Coeff. | se | p |
| Acquired | 0.188 | [0.132] | [0.153] | 0.378** | [0.139] | [0.007] | 0.582*** | [0.164] | [0.000] |
| log no. employees (t-1) | 0.553* | [0.281] | [0.049] | 0.149 | [0.300] | [0.620] | 0.871** | [0.313] | [0.005] |
| log no. employees (t) | -0.382 | [0.270] | [0.157] | -0.0867 | [0.294] | [0.768] | -0.801** | [0.298] | [0.007] |
| no. manager in t-1 | -0.0212 | [0.012] | [0.076] | -0.0154 | [0.012] | [0.205] | -0.128*** | [0.031] | [0.000] |
| no. manager in t | 0.126*** | [0.023] | [0.000] | 0.144*** | [0.024] | [0.000] | 0.135*** | [0.029] | [0.000] |
| Prop. of high-knowledge worker in t-1 | -0.404 | [0.339] | [0.233] | -0.0862 | [0.331] | [0.794] | 0.569 | [0.358] | [0.112] |
| Prop. of interm.-knowl. worker in t-1 | 0.282 | [0.384] | [0.463] | 0.124 | [0.400] | [0.757] | -0.0355 | [0.450] | [0.937] |
| Prop. of managers in t-1 | -0.415 | [0.941] | [0.659] | -1.503 | [0.940] | [0.110] | 2.213* | [0.874] | [0.011] |
| Year controls | YES | . | . | YES | . | . | YES | . | . |
| _cons | -2.446*** | [0.423] | [0.000] | -2.088*** | [0.420] | [0.000] | -2.462*** | [0.462] | [0.000] |
| *N* | 632 | . | . | 632 | . | . | 632 | . | . |

*Models include 339 acquired establishments and 293 non-acquired-multi-establishment firms in the year of acquisition.*
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table 5: Probit models testing whether acquired targets hire/promote/transfer more than non-acquired firms in the year *t0***

The coefficients of acquisition are positive in Model 3 (respectively $b = 0.582, p < .001$), providing further support for our observation that acquisition increases transfers. We find also that acquired firms are more likely to use promotions (Model 2, $b = 0.378, p = .007$). Therefore, acquisition increases internal resource reconfigurations (promotions and transfers) but not external resource acquisitions (hiring) (Model 1). Furthermore, we find no significant differences in the years after the year of the acquisition (results not reported). Therefore, the next analysis focuses on the year of the acquisition and the sample of 339 acquired and 297 multi-establishment control firms. We consider the comparison between non-acquired multi-establishment firms and acquired firms to be more accurate since by default, any acquired organization will become part of (or remain) a multi-establishment firm as a result of the acquisition. For completeness, in Appendix 2 we report the descriptive statistics of the 297 multi-establishment control firms.

# Statistical method

Since our three dichotomous outcome variables might be correlated, we test our hypotheses using multivariate probit models. Multivariate probit models are similar to seemingly unrelated linear regressions and are estimated using simulated maximum likelihood. Each of the three reconfiguration mechanisms represents a dichotomous outcome modelled against a baseline firm not utilizing the focal mechanism. In the models, the outcomes are allowed to be correlated and the option of no reconfiguration omitted.

**Dependent variables.** *Transfer* is a dichotomous variable which takes the value one if in year *t* the target firm employs at least one manager[11] who previously worked in the acquiring firm in the year prior to the acquisition (*t-1*), and zero otherwise. In the control group, transfer takes the value one if in year

[11] The definition of a manager is based on the Danish version of the International Standard Classification of Occupations (ISCO).

*t* a non-acquired matched establishment employs at least one manager who worked at a different establishment in the same firm in year *t-1*, and zero otherwise. In other words, the counterfactual for transfer in non-acquired firms is an intra-firm–inter-establishment mobility event (see section on employee information for more details about the counterfactual). *Promotion* takes the value one if the target (or control) firm employs at least one manager in year *t* who worked at the target firm (or control firm) in a non-managerial position in *t-1*, and zero otherwise. *Hiring* takes the value one if in year *t* the target employs at least one manager who did not work at either the target or the acquiring firm in the year prior to the acquisition, and zero otherwise. In the sample of non-acquired firms, hiring takes the value one if in year *t* the firm employs at least one manager who did not work at the firm prior to *t0,* and zero otherwise.

**Explanatory variables.** We adapt Villalonga and McGahan's (2005) definition of size balance to measure the *relative sizes of acquirer and target* i.e., the ratio of the target firm's headcount to the acquirer's headcount.[12] A higher value (closer to or above 1) denotes a higher level of size similarity. We use a dichotomous variable *high size similarity* to indicate whether the relative sizes of acquirer and target are above the median. Our operationalization of *target quality* builds on Puranam et al. (2009, p. 320, 2006), who propose the measure "amount paid per employee in the acquisition in millions of dollars (Dollars per Employee)." We extend this work by looking at employee salaries in target firms. Our approach reduces the risk of factoring in aspects of the acquisition that might increase the deal price (i.e., hostile bidding) but not necessarily the intrinsic value of the target at time of the acquisition (we focus specifically on human capital resources and assets). We consider firms that pay a premium

[12] Villalonga and McGahan (2005) calculate the ratio of smaller to larger firms regardless of which is the acquirer and which is the target. However, they include other boundary-spanning and contracting modes such as alliances and divestures. Since we focus only on acquisition, our measure takes account of whether the acquirer or the target is the larger entity.

for employees with high levels of knowledge and skills to be of higher quality. We measure target quality as the average salary in the target firm in the year prior to the acquisition. *High target quality* is a dichotomous variable which takes the value one if target quality is above the median for firms in the same industry sector[13], and zero otherwise.

**Control variables.** Acquisition affects target firms to different extents depending on their size (Pablo, 1994). We include a continuous measure to account for differences among targets using target firm's number of employees in the year prior to the acquisition (log transformed). We also include the number of employees in the target firm in year *t* to control for general growth or a reduction in the target's size (log transformed). The number of managers that decide to leave the target likely affects the need to reconfigure managers to compensate for the managerial vacuum. To account for outflows of managers, we include two variables: the number of managers in the year prior to acquisition (number of managers in target in *t-1*) and the number of managers who remained in the year of the acquisition (number of managers in target in *t*). These control variables should also reduce some of the endogeneity in later stages of the acquisition process. We control for compositional differences among target firms by including three variables: the proportion of high-knowledge workers in *t-1* relative to the total number of employees, the proportion of intermediate-knowledge workers in *t-1*, and the proportion of managers in *t-1*. The inclusion of these variables reduces the variance in salaries stemming from compositional differences among firms. Therefore, any remaining variance in average salaries is likely to stem from the premium paid by the firm for knowledge and skills (target quality). Last, we include year dummies to control for time trends.

[13] Industry sector is defined based on the DB07 code, specifically the 19-sector grouping.

# Findings

We test our hypotheses about reconfiguration modes in acquired firms. Table 8 presents the results of the multivariate probit model (mvprobit) where the three reconfiguration strategies (transfer, promotion, and hiring) are possible outcomes; the option of doing none of these strategies is omitted. Our explanatory variables—acquisition quality and size similarity—enter the probit specification along with controls for compositional differences, inflows and outflows of employees and managers, and time trends.

Table 6 Model 1 presents the direct effects of high size similarity and high target quality on the three outcome variables. High size similarity is predictor of use of transfers by acquired targets ($b = 0.751$, $p < .001$), and has no significant effect on either promotion or hiring. Thus, we reject the null hypothesis in support of Hypothesis 2—size similarity increases use of transfers. Figure 2 shows the marginal effects of size similarity with the remaining covariates at their means. In acquisitions involving low size similarity, the predicted probability of transferring at least one manager is five percent, while in high size similarity firms this probability is 18 percent. This means that in acquisitions where acquirer and target are of similar sizes, transfers are four times as likely as in acquisitions that involve firms of different sizes. High target quality significantly predicts promotion ($b = 0.585$, $p = .006$) which supports Hypothesis 1. In low-quality targets, the predicted probability of promoting at least one manager is 11 percent, while it is 27 percent in high-quality targets (see Figure 3). This means that promotions are used twice as often in high-quality targets compared to low-quality targets. Neither of the other outcomes is significant, and the explanatory variables do not significantly predict hiring.

| . | Model 1 | . | . | . | Model 2 | . | . | . |
|---|---|---|---|---|---|---|---|---|
| **Transfer** | Coeff. | z | se | p | Coeff. | z | se | p |
| High target quality | 0.182 | [0.82] | [0.222] | [0.412] | 0.142 | [0.44] | [0.321] | [0.659] |
| High size similarity | 0.751*** | [3.62] | [0.208] | [0.000] | 0.711* | [2.32] | [0.306] | [0.020] |
| High target quality * high size similarity | . | . | . | . | 0.075 | [0.18] | [0.410] | [0.855] |
| log no. employees in t-1 | 0.732 | [1.56] | [0.468] | [0.118] | 0.727 | [1.55] | [0.469] | [0.121] |
| log no. employees in t | -0.722 | [-1.60] | [0.450] | [0.109] | -0.715 | [-1.58] | [0.452] | [0.114] |
| no. manager in t-1 | -0.302*** | [-4.64] | [0.065] | [0.000] | -0.302*** | [-4.64] | [0.065] | [0.000] |
| no. manager in t | 0.246*** | [5.18] | [0.048] | [0.000] | 0.246*** | [5.18] | [0.048] | [0.000] |
| Prop. of high-knowledge worker (t-1) | 0.843 | [1.84] | [0.458] | [0.066] | 0.844 | [1.84] | [0.459] | [0.066] |
| Prop. of intermediate-knowledge worker (t-1) | -0.291 | [-0.47] | [0.619] | [0.638] | -0.298 | [-0.48] | [0.622] | [0.632] |
| Prop. of managers (t-1) | 3.380* | [2.41] | [1.405] | [0.016] | 3.386* | [2.40] | [1.409] | [0.016] |
| Year controls | YES | . | . | . | YES | . | . | . |
| _cons | -2.298*** | [-3.70] | [0.621] | [0.000] | -2.284*** | [-3.64] | [0.627] | [0.000] |
| **Promotion** | . | . | . | . | . | . | . | . |
| High target quality | 0.585** | [2.75] | [0.212] | [0.006] | 0.717** | [2.61] | [0.275] | [0.009] |
| High size similarity | -0.0636 | [-0.34] | [0.186] | [0.733] | 0.136 | [0.43] | [0.319] | [0.669] |
| High target quality * high size similarity | . | . | . | . | -0.302 | [-0.77] | [0.392] | [0.442] |
| log no. employees in t-1 | 0.731 | [1.75] | [0.419] | [0.081] | 0.756 | [1.79] | [0.422] | [0.073] |
| log no. employees t | -0.619 | [-1.52] | [0.407] | [0.128] | -0.648 | [-1.58] | [0.410] | [0.114] |
| no. manager in t-1 | -0.0882* | [-1.99] | [0.044] | [0.047] | -0.0892* | [-2.02] | [0.044] | [0.044] |
| no. manager in t | 0.214*** | [5.19] | [0.041] | [0.000] | 0.217*** | [5.25] | [0.041] | [0.000] |
| Prop. of high-knowledge worker (t-1) | -0.276 | [-0.62] | [0.447] | [0.537] | -0.246 | [-0.55] | [0.448] | [0.582] |
| Prop. of intermediate-knowledge worker (t-1) | -0.0645 | [-0.12] | [0.550] | [0.907] | -0.0563 | [-0.10] | [0.551] | [0.919] |
| Prop. of managers (t-1) | -0.631 | [-0.50] | [1.258] | [0.616] | -0.729 | [-0.57] | [1.272] | [0.567] |
| Year controls | YES | . | . | . | YES | . | . | . |
| _cons | -1.859** | [-3.29] | [0.566] | [0.001] | -1.935*** | [-3.35] | [0.577] | [0.001] |
| **Hiring** | . | . | . | . | . | . | . | . |
| High target quality | 0.273 | [1.32] | [0.207] | [0.188] | 0.234 | [0.89] | [0.262] | [0.372] |
| High size similarity | 0.0505 | [0.27] | [0.188] | [0.788] | -0.00864 | [-0.03] | [0.306] | [0.978] |
| High target quality * high size similarity | . | . | . | . | 0.0937 | [0.24] | [0.384] | [0.807] |
| log no. employees in t-1 | 1.398*** | [3.40] | [0.411] | [0.001] | 1.389*** | [3.37] | [0.412] | [0.001] |
| log no. employees in t | -1.230** | [-3.09] | [0.398] | [0.002] | -1.221** | [-3.06] | [0.399] | [0.002] |
| no. manager in t-1 | -0.148** | [-2.82] | [0.052] | [0.005] | -0.148** | [-2.81] | [0.052] | [0.005] |
| no. manager in t | 0.257*** | [6.06] | [0.042] | [0.000] | 0.256*** | [6.04] | [0.042] | [0.000] |
| Prop. of high-knowledge worker (t-1) | -0.392 | [-0.86] | [0.459] | [0.392] | -0.4 | [-0.87] | [0.460] | [0.385] |
| Prop. of intermediate-knowledge worker (t-1) | -0.0253 | [-0.05] | [0.551] | [0.963] | -0.0356 | [-0.06] | [0.552] | [0.949] |
| Prop. of managers (t-1) | 0.24 | [0.17] | [1.377] | [0.862] | 0.247 | [0.18] | [1.377] | [0.858] |
| Year controls | YES | . | . | . | YES | . | . | . |
| _cons | -2.235*** | [-3.82] | [0.586] | [0.000] | -2.210*** | [-3.73] | [0.593] | [0.000] |
| atrho31 Constant | -0.405** | [-2.71] | [0.150] | [0.007] | -0.406** | [-2.71] | [0.150] | [0.007] |
| atrho21 Constant | -0.271 | [-1.61] | [0.168] | [0.107] | -0.277 | [-1.62] | [0.171] | [0.105] |
| atrho32 Constant | -0.0376 | [-0.28] | [0.133] | [0.778] | -0.0351 | [-0.26] | [0.133] | [0.792] |
| *N* | 339 | . | . | . | 339 | . | . | . |

*Number of draws set to 50, seed-value is kept at default, i.e., 123456789. Models include acquired units in the year of acquisition.* $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

## TABLE 6: Multivariate probit models – Choice of reconfiguration modes in acquired firms

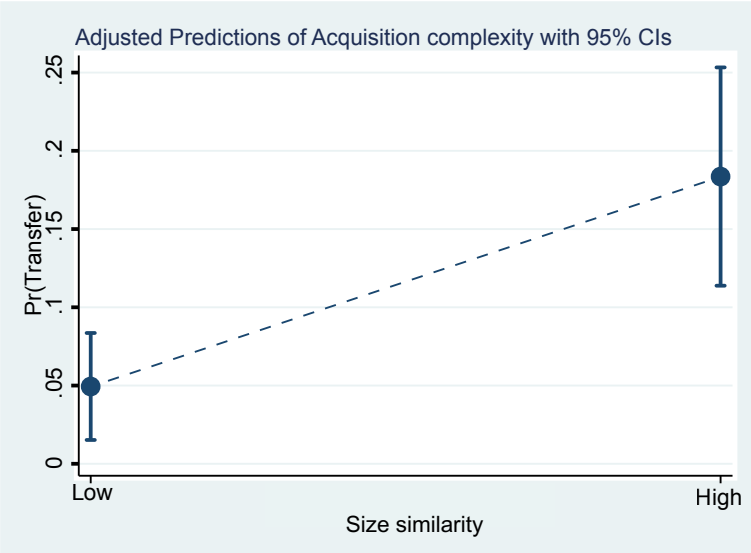


**Figure 2: Marginal effects of size similarity**

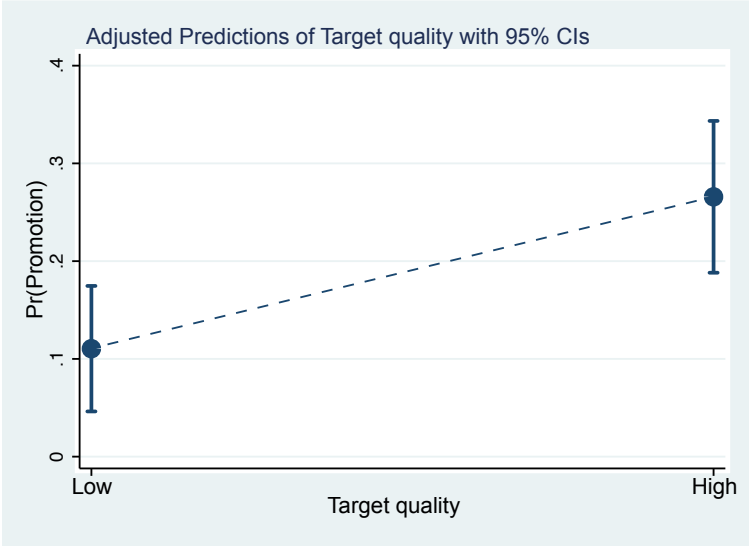


**Figure 3: Marginal effects of target quality**

In an additional analysis, we tested for an interaction effect between high size similarity and high target quality on the acquired firm's chosen mode of managerial redeployment (see Table 6 Model 2). We found no significant interaction effect. The direct effects remain significant and positive in line with Model 1, which lends further support for Hypotheses 1 and 2. We re-ran the analysis including the continuous explanatory variables (target quality, relative size—both log transformed) and controlling for relatedness of acquirer and target and location of target. The results are presented in Appendix 3. The findings do not change.

# Discussion and conclusion

In this study, we examined the phenomenon of managerial reconfiguration during acquisitions. We investigated two internal reconfiguration mechanisms: between-unit redeployment from acquirer to target (i.e., transfer) and within-unit reconfiguration in the target (i.e., promotion). For a more comprehensive approach—allowing to further test the assumption that internal markets are more effective than external acquisition of the same resource (e.g., Folta et al., 2016)—we included external resource acquisition (i.e. hiring) as an alternative reconfiguration strategy. We found that managerial reconfiguration tends to happen in the year of the acquisition. As expected, internal reconfiguration (transfer or promotion) is more frequent than external resource acquisition (hiring). The number of acquired firms using transfers is about three times higher than the number of comparable non-acquired firms using this mechanism. Acquired firms use promotion about 30 percent more frequently than comparable non-acquired firms. With regard to factors that we expect to affect coordination (i.e., relative size of acquirer and target) and importance of preserving knowledge (i.e., target quality), we found that transfers from acquirer to target are more frequent in similar sized acquirers and targets. In higher quality targets (e.g., firms with valuable human capital) compared to low quality targets, a higher proportion of managerial positions are reconfigured using promotion.

To the best of our knowledge, this study is the first to investigate reconfiguration of managers both between and within firm units in acquisitions. It contributes by providing evidence of the phenomenon of managerial reconfiguration in acquisitions and the extent to which different reconfiguration mechanisms are used. This responds to the call in Folta et al. (2016, p. 12) for more "descriptive analysis of redeployment." To investigate this phenomenon, we compared how managers are reconfigured in acquired firms and in comparable, non-acquired firms. We used the group of comparable non-acquired

firms as the baseline (i.e., the level of each reconfiguration mechanism expected outside the acquisition context). Our empirical approach allowed us to establish the phenomenon and explore some of the contingencies. However, it has several limitations. While we account for endogeneity of the acquisition (matching of acquired and non-acquired establishments), we only include control variables in our analysis to reduce potential endogeneity issues occurring at later stages in the acquisition process (e.g., turnover versus no turnover). Further research could investigate managerial reconfiguration *within* acquisitions and account more directly for these endogeneity issues. It would be interesting to examine the differences between acquisition targets that replace managers (i.e., reconfigure in response to the managerial vacuum created through turnover) and those that do not.

Our study extends the stream of literature on resource reconfiguration in acquisitions in several important ways (Capron & Mitchell, 1998; Karim, 2006; Karim & Williams, 2012). First, it is one of the first papers to provide insights into the reconfiguration of human capital, specifically employees in managerial positions. Despite being fundamental to reconfiguration decisions (Helfat & Eisenhardt, 2004; Levinthal & Wu, 2010) and firm competitive advantage (Coff, 1997, 1999), little is known about the extent and conditions under which human capital is reconfigured (Belenzon & Tsolmon, 2016). Second, by including alternative reconfiguration mechanisms (i.e., promotions and hiring), we explore additional forms of reconfiguration—reconfiguration of human capital *within* an establishment and external to the firm. This not only extends research on resource redeployment in general, but also recent working papers of human capital that were "unable to observe redeployment within establishments" (Chauvin & Poliquin, 2020, p. 29). We extend studies showing how transfers of managers change firm boundaries and the configuration of units and knowledge within the firm (Karim, 2006; Karim & Kaul, 2015) by suggesting that firm reconfiguration due to an acquisition not only changes the recon-

figuration of managers *between* firm units but also *within* firm units. While promotion is examined mostly as a career step, we suggest promotion as an important alternative to redeployment *between* firm units.

Third, building on Capron et al.'s (1998) finding that managerial resources are more likely to be transferred from acquirer to target than from target to acquirer, we investigated the contingencies (similar sized firms and high quality firms) making the transfer of managers more likely from acquirer to target in the former case and reconfiguration within the target are likely in the latter case. Future studies could analyze whether the relative size of the firms involved is related also to mobility of managers from target to acquirer.

By including hiring as an alternative strategy, we are able to account for the opportunity costs associated with external resource acquisition. Studies investigating the allocation of non-scale free resources such as managers, suggest that the costs of reallocating such resources must be lower than the costs of developing these resources (Levinthal & Wu, 2010). Folta, Helfat and Karim (2016, p. 2) suggest that "internal resource redeployment only creates value if it is more efficient than external resource acquisition for the same purpose". Our finding that internal resource reconfiguration is more likely in acquired firms than in comparable non-acquired firms implies that in acquisitions, hiring and developing firm-specific knowledge at the managerial level is costlier than developing it internally—either by developing target-specific knowledge in the case of transfers or by developing managerial skills in the case of promotions. This raises the question of whether the costs of internal versus external development are heterogeneous across different types of human capital. Scholars could investigate whether the same contingencies (i.e., target quality and size similarity) equally affect the reconfiguration of employees at other hierarchical levels (e.g., knowledge workers, such as inventors) and employees in positions requiring lower levels of knowledge.

In the context of the literature on coordination-autonomy challenges in acquisitions (Haspeslagh & Jemison, 1991; Puranam et al., 2006), our findings

suggest that managerial reconfiguration is a strategic decision made by the acquiring firm to mitigate the coordination-autonomy dilemma associated with acquisition. By helping to overcome this dilemma, reconfiguration may enhance the firm's ability to preserve knowledge. Firm-specific knowledge (both acquirers' and target firms') embedded in strategic human capital (e.g., managers) is a crucial asset in the post-acquisition phase. In contrast, the external knowledge gained from hiring managers in the external labor market is likely to be less relevant to the acquiring firm in relation to rebuilding the target firm's managerial team.

Last, we moved the discussion from the post-acquisition managerial turnover (Krug & Hegarty, 1997; Krug et al., 2014; Walsh, 1988) to the reconfiguration of managers in response to the managerial vacuum created by the acquisition. Work on managerial turnover (Krug & Hegarty, 1997; Krug et al., 2014; Walsh, 1988) and studies investigating the effect of managerial departures on post-acquisition firm performance (Bergh, 2001; Cannella & Hambrick, 1993) agree that managerial departures reduce the likelihood of acquisition success. However, most of this work (an exception is Krug & Aguilera, 2004) overlooks an important part of the managerial workforce that contributes to integration after acquisition—incoming managers. The immediate and frequent reconfiguration of managers observed in our data raises the question whether managerial reconfiguration mitigates the negative effects of managerial departures. Wider investigation of the entire managerial pool (i.e., managers who stay, leave, or join) could provide more insights into the successful management of acquisitions.

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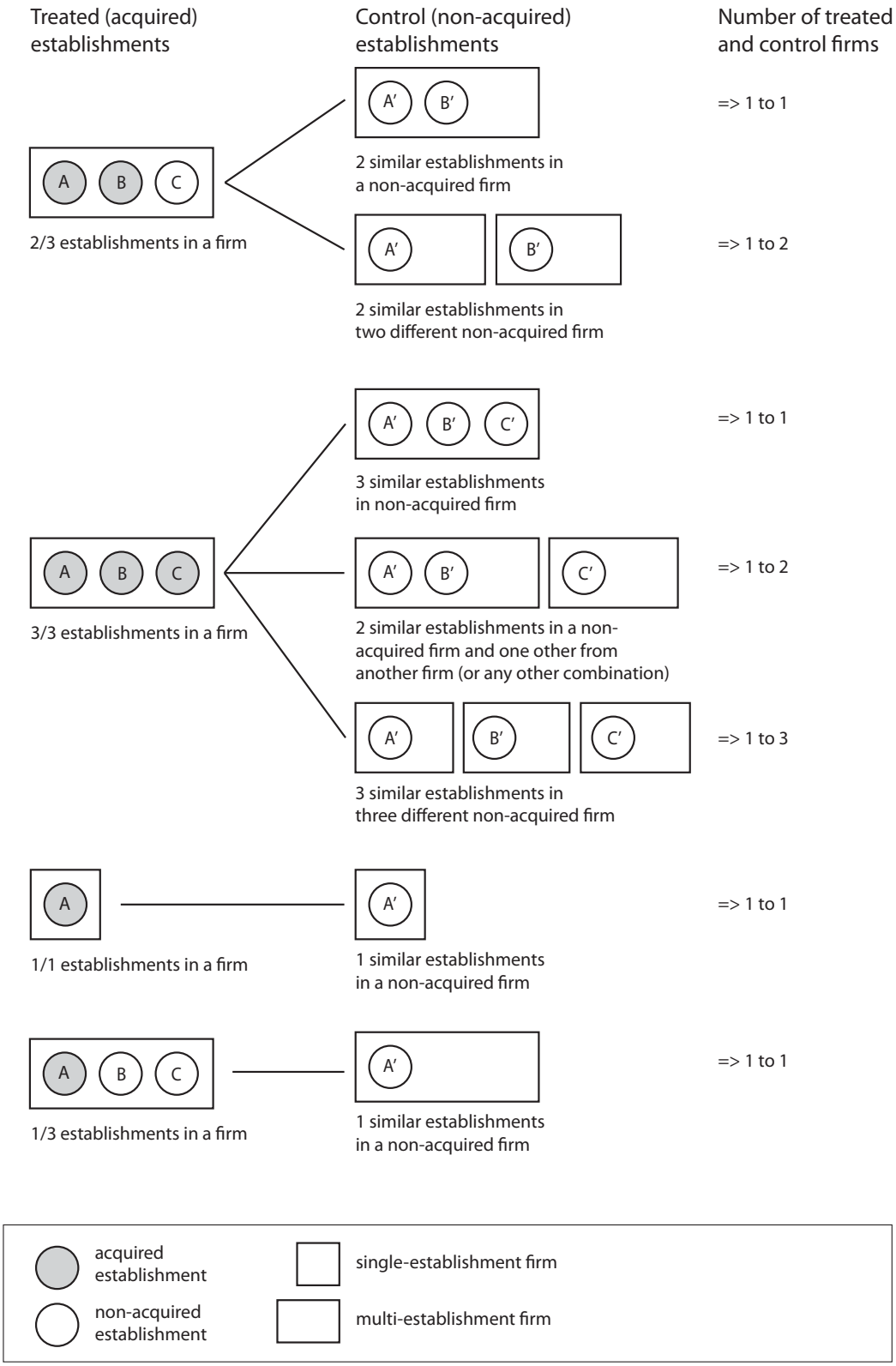
Chapter 1

# Appendices

# Appendix 1

## Potential matches



# Appendix 2

## Descriptive statistics of multi-establishment control firms with at least one manager in the year prior

| Variable | N | Mean | SD | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|---|---|
| (1) No. employees | 293 | 77.410 | 172.967 | 1 | . | . | . | . |
| (2) No. employees in t0 | 297 | 84.650 | 180.292 | 0.991 | 1 | . | . | . |
| (3) Average salary in establishment (DKK) | 297 | 267701.1 | 64618.58 | 0.186 | 0.186 | 1 | . | . |
| (4) Establishment age in t0 | 297 | 28.828 | 22.192 | 0.010 | 0.012 | 0.116 | 1 | . |
| (5) Managers in establishment | 297 | 4.973 | 11.726 | 0.695 | 0.700 | 0.222 | 0.042 | 1 |
| (6) Prop. managers | 293 | 0.087 | 0.073 | -0.185 | -0.186 | 0.141 | -0.074 | 0.077 |
| (7) Prop. high-knowl. workers | 293 | 0.108 | 0.198 | 0.175 | 0.182 | 0.376 | -0.002 | 0.105 |
| (8) Prop. intermediate-knowledge workers | 293 | 0.149 | 0.179 | 0.043 | 0.044 | 0.379 | 0.167 | 0.055 |
| (9) No. transferred managers | 297 | 0.094 | 0.498 | 0.219 | 0.206 | 0.033 | 0.070 | 0.402 |
| (10) No. hired managers | 297 | 0.384 | 1.407 | 0.710 | 0.686 | 0.167 | 0.014 | 0.635 |
| (11) No. promoted managers | 297 | 0.448 | 1.550 | 0.445 | 0.476 | 0.112 | 0.044 | 0.645 |
| (12) Any transfer | 297 | 0.054 | 0.226 | 0.100 | 0.093 | -0.031 | 0.091 | 0.194 |
| (13) Any hired | 297 | 0.182 | 0.386 | 0.320 | 0.303 | 0.176 | 0.036 | 0.318 |
| (14) Any promoted | 297 | 0.162 | 0.369 | 0.335 | 0.369 | 0.056 | 0.020 | 0.389 |

**Table continued**

| Variable | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
|---|---|---|---|---|---|---|---|---|---|
| (6) Prop. managers | 1 | . | . | . | . | . | . | . | . |
| (7) Prop. high-knowl. workers | -0.087 | 1 | . | . | . | . | . | . | . |
| (8) Prop. intermediate-knowledge workers | -0.029 | 0.034 | 1 | . | . | . | . | . | . |
| (9) No. transferred managers | 0.007 | -0.006 | 0.001 | 1 | . | . | . | . | . |
| (10) No. hired managers | -0.029 | 0.064 | 0.020 | 0.387 | 1 | . | . | . | . |
| (11) No. promoted managers | 0.009 | 0.013 | 0.113 | 0.160 | 0.475 | 1 | . | . | . |
| (12) Any transfer | 0.003 | -0.067 | 0.017 | 0.795 | 0.179 | 0.056 | 1 | . | . |
| (13) Any hired | 0.000 | 0.019 | 0.045 | 0.192 | 0.580 | 0.281 | 0.120 | 1 | . |
| (14) Any promoted | -0.088 | 0.039 | 0.026 | 0.193 | 0.336 | 0.659 | 0.098 | 0.220 | 1 |

The subset of multi-establishment control firms is generally similar to the acquired firms in terms of their composition too, although the control firms were slightly older (29 versus 21 years) and bigger (compare with Tables 2). Like acquired firms, around a third (34.4%) of employees worked in managerial, high-knowledge, or intermediate-knowledge positions. The average salary was slightly lower (DKK 267,701 or USD 38,765) in the control firms than in the acquired firms.

# Appendix 3

## Multivariate probit models contentious explanatory variables

| | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| Transfer | | z | se | p | | z | se | p |
| Target quality (log) | 0.139 | [0.30] | [0.466] | [0.765] | 0.292 | [0.62] | [0.472] | [0.536] |
| Relative size (log) | 1.054** | [3.27] | [0.322] | [0.001] | 1.025** | [3.07] | [0.334] | [0.002] |
| log no. employees in t-1 | 0.76 | [1.67] | [0.454] | [0.094] | 0.83 | [1.78] | [0.467] | [0.075] |
| log no. employees in t | -0.731 | [-1.67] | [0.437] | [0.094] | -0.798 | [-1.79] | [0.446] | [0.074] |
| no. manager in in t-1 | -0.266*** | [-4.56] | [0.058] | [0.000] | -0.285*** | [-4.61] | [0.062] | [0.000] |
| no. manager in in t | 0.223*** | [4.99] | [0.045] | [0.000] | 0.237*** | [5.05] | [0.047] | [0.000] |
| Prop. of high-knowl. worker (t-1) | 0.643 | [1.35] | [0.475] | [0.176] | 0.716 | [1.45] | [0.496] | [0.148] |
| Prop. of inter.-knowl. worker (t-1) | -0.255 | [-0.40] | [0.637] | [0.689] | -0.445 | [-0.69] | [0.648] | [0.492] |
| Prop. of managers in t-1 | 3.377** | [2.72] | [1.240] | [0.006] | 3.533** | [2.75] | [1.287] | [0.006] |
| Rural area | 0.128 | [0.63] | [0.204] | [0.529] | 0.143 | [0.68] | [0.209] | [0.495] |
| Related acquisition | -0.174 | [-0.73] | [0.238] | [0.464] | . | . | . | . |
| Year controls | . | . | . | . | YES | YES | YES | YES |
| _cons | -3.732 | [-0.65] | [5.725] | [0.515] | -5.854 | [-1.01] | [5.798] | [0.313] |
| Promotion | | . | . | . | . | . | . | . |
| Target quality (log) | -0.19 | [-0.60] | [0.317] | [0.549] | -0.12 | [-0.36] | [0.336] | [0.721] |
| Relative size (log) | 0.985* | [2.28] | [0.433] | [0.023] | 1.107* | [2.41] | [0.460] | [0.016] |
| log no. employees in t-1 | -0.125 | [-0.41] | [0.305] | [0.683] | 0.0728 | [0.22] | [0.324] | [0.822] |
| log no. employees in t | 0.326 | [1.29] | [0.253] | [0.199] | 0.16 | [0.61] | [0.263] | [0.543] |
| no. manager in t-1 | -0.0804 | [-1.91] | [0.042] | [0.057] | -0.0654 | [-1.51] | [0.043] | [0.131] |
| no. manager in t | 0.148*** | [4.41] | [0.034] | [0.000] | 0.147*** | [4.25] | [0.035] | [0.000] |
| Prop. of high-knowl. worker (t-1) | -0.787 | [-1.71] | [0.459] | [0.086] | -0.764 | [-1.56] | [0.489] | [0.118] |
| Prop. of inter.-knowl. worker (t-1) | -0.381 | [-0.71] | [0.534] | [0.476] | -0.34 | [-0.60] | [0.568] | [0.549] |
| Prop. of managers in t-1 | -0.512 | [-0.40] | [1.270] | [0.687] | -0.631 | [-0.47] | [1.352] | [0.641] |
| Rural area | 0.15 | [0.80] | [0.187] | [0.423] | 0.241 | [1.25] | [0.193] | [0.212] |
| Related acquisition | -0.0474 | [-0.20] | [0.234] | [0.839] | . | . | . | . |
| Year controls | . | . | . | . | YES | YES | YES | YES |
| _cons | -13.80* | [-2.57] | [5.359] | [0.010] | -15.43** | [-2.70] | [5.706] | [0.007] |
| Hiring | . | . | . | . | . | . | . | . |
| Target quality (log) | -0.0146 | [-0.05] | [0.324] | [0.964] | 0.0408 | [0.12] | [0.335] | [0.903] |
| Relative size (log) | 0.396 | [0.90] | [0.441] | [0.370] | 0.461 | [1.03] | [0.447] | [0.303] |
| log no. employees in t-1 | 1.485*** | [3.47] | [0.428] | [0.001] | 1.573*** | [3.66] | [0.430] | [0.000] |
| log no. employees in t | -1.241** | [-3.05] | [0.407] | [0.002] | -1.331** | [-3.25] | [0.410] | [0.001] |
| no. manager in t-1 | -0.165** | [-3.20] | [0.052] | [0.001] | -0.162** | [-3.09] | [0.052] | [0.002] |
| no. manager in t | 0.253*** | [6.10] | [0.041] | [0.000] | 0.255*** | [6.02] | [0.042] | [0.000] |
| Prop. of high-knowl. worker (t-1) | -0.783 | [-1.53] | [0.511] | [0.126] | -0.793 | [-1.50] | [0.529] | [0.134] |
| Prop. of inter.-knowl. worker (t-1) | -0.0218 | [-0.04] | [0.568] | [0.969] | -0.0351 | [-0.06] | [0.583] | [0.952] |
| Prop. of managers in t-1 | 1.321 | [1.07] | [1.238] | [0.286] | 1.62 | [1.28] | [1.263] | [0.200] |
| Rural area | -0.0931 | [-0.49] | [0.190] | [0.624] | -0.068 | [-0.35] | [0.192] | [0.723] |
| Related acquisition | -0.365 | [-1.60] | [0.229] | [0.110] | . | . | . | . |
| Year controls | . | . | . | . | YES | YES | YES | YES |
| _cons | -7.036 | [-1.28] | [5.476] | [0.199] | -8.107 | [-1.46] | [5.561] | [0.145] |
| atrho21 Constant | -0.184 | [-1.28] | [0.144] | [0.200] | -0.261 | [-1.55] | [0.169] | [0.121] |
| atrho31 Constant | -0.606*** | [-3.55] | [0.171] | [0.000] | -0.567*** | [-3.51] | [0.162] | [0.000] |
| atrho32 Constant | -0.06 | [-0.46] | [0.130] | [0.644] | -0.085 | [-0.63] | [0.135] | [0.529] |
| *N* | 336 | . | . | . | 336 | . | . | . |

*Number of draws set to 50, seed-value is kept at default, i.e. 123456789.* * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Rural area denotes targets that are located in a rural area. As rural areas are less economically dense than other areas, the variable controls for the external labor market. Related acquisition takes the value one if the acquirer the target are from the same industry. Relatedness may affect the integration and the resource re-configuration choices.*

Chapter 2

# Team Diversity and the Mobility of R&D Workers after Acquisitions

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# Abstract

Since knowledge is often embedded in employees, R&D worker mobility is a primary concern in the context of acquisitions in knowledge-intensive industries. While the reasons for post-acquisition mobility of R&D workers are widely studied, the premise of extant work is that the mobility is determined by the characteristics of the acquirer or the acquirer-target dyad. In this paper we investigate how the characteristics of R&D workers and their embeddedness in teams in the acquisition target affect post-acquisition mobility. We find great heterogeneity in the firm-specificity of R&D workers' human capital which affects their post-acquisition mobility. We find also that R&D workers' post-acquisition mobility is *predetermined* largely by the organizational design of the target prior to acquisition, specifically R&D team expertise diversity.

# Introduction

The mobility of human capital is a major concern in acquisitions (Ernst & Vitt, 2000; Hussinger, 2007), and firms in knowledge intensive industries where access to knowledge is often the main driver of the acquisition (Paruchuri, Nerkar, & Hambrick, 2006; Ranft & Lord, 2002). Several studies examine the performance implications of acquisitions and post-acquisition mobility (Kapoor & Lim, 2007; Paruchuri et al., 2006; Ranft & Lord, 2002), and propose loss of status (Paruchuri et al., 2006) and disruption to the target's routines and dynamics (Ernst & Vitt, 2000; Hussinger, 2007) as two of the main reasons why employees leave following an acquisition.

Extant work on post-acquisition mobility mainly assumes that human capital is largely transferrable across firms. However, the more general body of work on human capital mobility shows that this is often not the case (Campbell, Coff, & Kryscynski, 2012; Coff, 1997; Kryscynski, Coff, & Campbell, 2021). Rather, much of the human capital embedded in employees is firm-specific, and therefore is less valuable in the labor market (Coff, 1999b) although the strand of studies on post-acquisition mobility tends to overlook this possibility. Moreover, as the firm-specificity of human capital develops over time (Morris, Alvarez, Barney, & Molloy, 2017), the transferability of human capital, and thus employees' external options must be predetermined prior to acquisition. This aspect is not addressed in the existing literature which focuses mostly on how the characteristics of the acquisition and the acquirer-target dyad affect the post-acquisition mobility of employees.

The present paper investigates how the human capital configuration in the target prior to acquisition affects the post-acquisition mobility of its employees. Specifically, we examine (1) how the diversity of the target's R&D team expertise affects the mobility of R&D workers post-acquisition, and (2) how the characteristics of the individual R&D team members affects this relationship by reducing the asymmetries related to information on their human

capital in the labor market. We focus on R&D workers for two main reasons. First, R&D workers are critical for both an acquisition and the firms' post-acquisition innovative performance (Hitt, Hoskisson, & Ireland, 1990; Hitt, Hoskisson, Ireland, & Harrison, 1991; Kapoor & Lim, 2007; Paruchuri et al., 2006). Second, R&D worker tend to work in teams rather individually (e.g., Palomeras & Melero, 2010) with the result that at least some team members will develop complementary, less transferable human capital (Huckman & Pisano, 2006; Palomeras & Melero, 2010; Pisano, Bohmer, & Edmondson, 2001). Building on the idea that knowledge is embedded in individuals and organized in teams (Grant, 1996; Kogut & Zander, 1992), and that "the embeddedness of such knowledge within a team and organization structures" increases the complementarity of knowledge (Palomeras & Melero, 2010, pp. 882–883), we theorize that R&D workers are less likely to leave targets with more expertise-diverse R&D teams. Furthermore, we suggest that the characteristic of individual positions and tenure provide information on R&D workers' general human capital and their willingness to make firm-specific investments—a characteristic attractive to future employers (Campbell, Coff, et al., 2012; Morris et al., 2017). This information are expecially valuable if it is difficult to evaluate the human capital (i.e., in expertise-diverse R&D teams). Therefore, we hypothesize that R&D workers with core expertise and longer tenure will be more likely to leave a more diverse R&D team compared to R&D workers with more peripheral expertise and shorter tenure.

To test our theory, we construct a novel individual-level dataset based on employer-employee register information provided by Statistics Denmark. These data provide detailed information on individual job positions, salaries, and education since 1980. Our final sample includes 1,024 R&D workers based on the definition in Kaiser, Kongsted, Laursen, and Ejsing (2018), who worked in an establishment in a knowledge-intensive industry that was acquired during the period 2009 to 2015. Supporting our hypotheses, we find that as target

R&D team diversity increases (a) R&D workers are less likely to leave, but that (b) R&D workers with core expertise, and (c) R&D workers with longer tenure are more likely to leave.

This study makes several contributions. It contributes to the literature on post-acquisition mobility in three main ways. First, we account for the possibility that employees possess non-transferrable human capital which introduces the labor market into the picture. Second, by showing that mobility post-acquisition is predetermined at least partly by the target's organizational design, we move the discussion from acquisition characteristics and acquirer-target dyad characteristics to target characteristics pre-acquisition. Third, our findings show that the effect of R&D team diversity and mobility is contingent on the characteristics of the R&D team members. This suggests that the effects of acquisitions are not only heterogenous among employees (Paruchuri et al., 2006; Walsh, 1989) but need to be seen in relation to the characteristics of the organization. By investigating R&D team members we contribute also to the human capital mobility literature. Although it is well-known that much employee human capital is complementary and dependent on colleagues' human capital (Groysberg & Lee, 2008; Palomeras & Melero, 2010; Pisano et al., 2001), the mobility literature tends to focus on individual employees. Third, our findings have implications for work on the effects of mobility on post-acquisition performance which tends to treat mobility as exogenous and independent of the target's characteristics (e.g., Bergh, 2001).

# Background

## Post-acquisition mobility

Acquisitions are important means for accessing new markets and the human capital embedded in target firms (Capron, Dussauge, & Mitchell, 1998; Ernst & Vitt, 2000; Graebner, 2004). In the knowledge-intensive industries,

R&D workers are important resources and one of the main drivers of acquisitions (Paruchuri et al., 2006; Ranft & Lord, 2002). The expected retention of the target firm's human capital affects the likelihood and price of the acquisition (Coff, 1999a; Younge, Tong, & Fleming, 2014). Because much of the value of the acquisition depends on retention of R&D workers, their mobility after the acquisition is a key concern (Ernst & Vitt, 2000; Hussinger, 2007; Kapoor & Lim, 2007; Ranft & Lord, 2002).

Several studies have investigated post-acquisition mobility of R&D workers and the conditions under which acquisitions lead to more or less favorable outcomes (Ernst & Vitt, 2000; Hussinger, 2007; Kapoor & Lim, 2007; Paruchuri et al., 2006; Ranft & Lord, 2002). The mobility rates of R&D workers post-acquisition vary between around 30 percent within the first 3 years (Ernst & Vitt, 2000; Hussinger, 2007) to 59 percent within 5 years of the acquisition (Paruchuri et al., 2006). Higher rates of departure after acquisition are commonly suggested to be caused by disruption to the workforce and the routines (Hussinger, 2007) and (fear of) uncertainty and change that accompany an acquisition (Cartwright & Cooper, 1993; see also Paruchuri & Eisenman, 2012, p. 1514 ref. to anxiety). These fears include loss of influence, a change in position, location, or task, and that the individual's "values, goals, and strategies for goal attainment do not fit with those of the organization" (Holtom, Mitchell, Lee, & Inderrieden, 2005, p. 340).

## Factors influencing post-acquisition mobility

To better understand the heterogeneity in R&D workers' post-acquisition mobility, extant work explores the characteristics of the acquisition and the firms involved in the transaction. Examples include the relative sizes of acquirer and target (Kapoor & Lim, 2007), their knowledge overlaps (technological proximity) (Ernst & Vitt, 2000), similarities in terms of coordination routines (Kapoor & Lim, 2007), and their different cultures (Ernst & Vitt, 2000). In general, large differences between target and acquirer are harmful (i.e., they

increase mobility and reduce productivity) (Ernst & Vitt, 2000; Paruchuri et al., 2006), while greater similarities reduce the negative effects of acquisition on R&D workers (Ernst & Vitt, 2000; Kapoor & Lim, 2007). Studies investigating the acquirer's characteristics show that acquisition experience has no statistical significant effect on post-acquisition departure of R&D workers (Ernst & Vitt, 2000). This contrasts with the main work on acquisition which suggests that prior acquisition experience eases the integration process and reduces negative effects of an acquisition (e.g., Zollo & Singh, 2004). A few studies investigate Schweiger et al.'s (1987) proposed heterogeneous effect of acquisition on different types of R&D workers (see Paruchuri et al., 2006). For instance, Hussinger (2007) shows that high-performing and more experienced R&D workers are less likely to leave after an acquisition. Investigating the effect of acquisition integration, Paruchuri et al. (2006, p. 557) show that the reduction in productivity is greater among R&D workers who suffer loss of status and centrality, suggesting that "the effects of the integration need to be considered in light of their differential effects on different groups of [R&D workers]".

To summarize, the extant literature considers the post-acquisitions mobility as a result of acquisition, and the extent of mobility as dependent predominantly on the characteristics of the acquisition and the acquirer, and the difference between the acquirer and the target. However, by focusing on the dyad-level or the acquirer-level, this body of work ignores the possibility that R&D workers possess human capital that is non-transferable across firms, i.e., firm-specific human capital (FSHC).

## Firm-specific human capital

The human capital embedded in employees generally falls into two types: general human capital and FSHC. The former includes the knowledge, skills, and abilities embedded in employees that are transferable across firms (e.g., a university education); the latter refers to the knowledge, skills, and abilities

embedded in employees that are valued more by the focal firm than other firms (Becker, 2009). Thus, FSHC is human capital that it not transferable across firms. Since general human capital is valuable to a range of firms, it is generally viewed as valued more highly on the labor market than FSHC. However, a focal firm can extract greater value from FSHC than from general human capital (Becker, 2009). The literature provides an extensive discussion on the value to firms of FSHC (Barney, 1991; Coff & Kryscynski, 2011), how employees can be incentivized to make firm-specific investments (Wang & Barney, 2006; Wang, He, & Mahoney, 2009), and how employees extract rents from their FSHC (e.g., Molloy & Barney, 2015). An extensive review of this literature is beyond the scope of this manuscript. In the context of this paper, it is important to know that FSHC (1) develops over time and (2) often develops in parallel with general human capital (e.g., Raffiee & Coff, 2016), and that (3) investing in FSHC is costly for the employee (Morris et al., 2017) because (4) firm-specificity is generally seen as lowering the value of human capital in the labor market. Also, since firms organize their employees' embedded human capital in teams (Grant, 1996), FSHC may be team-specific or team-dependent. For instance, Huckman and Pisano (2006) suggest that the performance of surgeons differs among hospitals depending on surgeons' familiarity with hospital-specific assets such as other employees or team structures. Colleagues are important also because they affect the individual's performance (Groysberg, Lee, & Nanda, 2008; Groysberg & Lee, 2008).

# Theory development

## Firm-specific human capital and post-acquisition mobility

Since the firm-specificity of employees' human capital affects their outside opportunities by reducing the value of their human capital in the labor market, it has been suggested that FSHC reduces the likelihood that employees will

leave the firm (Campbell, Coff, et al., 2012; Wang & Barney, 2006). Because FSHC develops over time, it is unlikely that within the focal firm (i.e., the acquisition target) all employees will possess the same extent of FSHC. Consequently, we expect to see differences in employees' post-acquisition mobility: Employees with more general human capital and less FSHC will be more likely to leave after an acquisition compared to employees with more FSHC and less general human capital. Moreover, to the extent that some employees possess more transferable human capital than others, we would expect that the likelihood to leave after an acquisition is largely pre-determined prior to the acquisition, rather than being determined by the characteristics of the acquisition. In what follows, we propose factors influencing the extent to which R&D workers possess FSHC, thereby pre-determining their likelihood to leave post-acquisition.

## Team human capital embeddedness

One of the advantages of obtaining human capital through an acquisition rather than from the labor market is that the human capital can be acquired bundled in teams (see Coff, 1999a). Since human capital is often developed within teams and dependent on colleagues (Groysberg & Lee, 2008; Palomeras & Melero, 2010; Pisano et al., 2001), we expect differences in mobility to be predetermined specifically by the configuration of the target's human capital.

Extant work on R&D worker mobility suggests that "the embeddedness of […] knowledge within a team and organization structures" affects the interdependence (or complementarity) of the knowledge in the team (Palomeras & Melero, 2010, pp. 882–883). In turn, this complementarity reduces the value of R&D workers' knowledge for other firms, and thus reduces R&D workers' inter-firm mobility. In other words, the more embedded the R&D workers' human capital within the team, the greater its specificity and the lower its transferability across firms. Therefore, we expect that the team embeddedness of

R&D workers' human capital prior to the acquisition will predetermine the likelihood that R&D workers will leave during the acquisition.

While several studies assess the embeddedness of knowledge in teams based on knowledge outputs such as patents[1], we define the embeddedness of human capital (and thus its firm-specificity[2]) based on how targets organize R&D workers' expertise in teams. We describe this as "R&D team expertise diversity" or "R&D team diversity". The idea is that the human capital involved in teams with diverse expertise (compared to more homogeneous teams) will tend to be complementary and need "to be combined with the [human capital of other R&D workers] to develop its full potential value" (Palomeras & Melero, 2010, p. 884). Put differently, in more heterogeneous R&D teams compared to more homogenous R&D teams, we expect the tasks involved in a project to be more distributed among R&D team members (and thus more complementary). For example, a team which includes production engineers, environmental engineers, electrical engineers, and bio-chemical engineers is considered more diverse than a team that is made up entirely of construction engineers. Since it is unlikely that the a production engineer could handle all the environmental engineering or electrical engineering tasks, project completion will require the production engineer to exploit the human capital

[1] Palomeras and Melero (2010, p. 884) measure complementary knowledge, defined as "needing […] to be combined with the [knowledge of other R&D workers] to develop its full potential value" (Palomeras & Melero, 2010, p. 884), as "the number of [R&D workers] listed in the patent document in order to capture the degree of complementarity of knowledge of the [R&D workers] working on the innovation". In our study, complementary knowledge is considered at the team-level and measured as R&D worker expertise rather than based on their knowledge output.

[2] We consider team-specific human capital to be firm-specific since unless all the members of the team move jointly to another firm (described as a lift-out, Groysberg & Abrahams, n.d.), the team is specific to the firm (see also Huckman & Pisano, 2006).

in the team (other types of engineering skills). Since project completion depends on the complementary human capital embedded in the team, the individual human capital is, at least to some extent, team-specific. However, if all team members are construction engineers it will be more likely that each individual's task will be relatively similar, and more likely that all team members could be substitutes which makes them less dependent on fellow team members. The dependence on other team members of R&D workers in diverse teams makes it likely that these employees will create less value in a different firm where other human capital resources are available. This results in them having fewer outside options making them less likely to leave. This leads to the following hypothesis:

*Hypothesis 1: The higher the target's R&D team expertise diversity the lower the R&D workers' likelihood to leave the firm post-acquisition.*

## Information on R&D workers' general human capital

While the embeddedness in teams of R&D workers' human capital increases its firm-specificity, some R&D worker human capital will be general and will have value in the labor market. One of problems related to labor markets is that "the individual applicant's productive capabilities [i.e., their general human capital] are hard to determine prior to hiring" (Spence, 1974, p. 296). To reduce information asymmetries related to the value and quality of R&D workers' (general) human capital, labor markets rely on various signals and evidence (Spence, 1973, 1974). These include employee characteristics such as education and prior wage (Spence, 1973), and on characteristics of the former employer (Groysberg & Lee, 2009; Groysberg et al., 2008). For example, the employer's reputation enables "greater access to clients and resources" (Groysberg & Lee, 2009, p. 744) and this effect can persist if the employee leaves the former employer (Beatty et al., 1996) which increases the value of his/her human capital (see also Campbell, Ganco, et al., 2012). Since resources and relationships are not dispersed evenly across the organization, the ability

to benefit from the employer's contact and resources will vary between employees. While difference in access to resources should be smaller in the context of specific types of human capital such as R&D workers, some employees may be more strongly associated to the reputation of their employer.

Firms often have a reputation for a specific expertise. Consider the case of a firm famous for its 3D image processing: although we may not know exactly what the firm does, we have a reasonable idea of the expertise possessed by its employees. In addition, we have a good idea of the firm's quality. In evaluating employees' human capital, labor markets can use the firm's reputation to derive information about the individual's quality, unless the employee's expertise is in a different area. In the case of R&D workers, this suggests that labor markets have more information on the human capital quality of R&D workers working on the target's core technology (i.e., core expertise) and less information on the human capital of R&D workers with more peripheral expertise. Consequently, R&D workers with core expertise may be better able to overcome the mobility barriers posed by the target's organizational design, i.e., R&D team diversity. Therefore, we expect R&D workers with core expertise to be more likely than R&D workers with peripheral expertise to leave targets with diverse R&D teams.[3] We hypothesize that:

*Hypothesis 2: The higher the target's level of R&D diversity the higher the likelihood that R&D workers with core expertise will leave the firm after acquisition.*

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[3] R&D workers with expertise in the core technology are likely also to be valued more highly by the acquirer. While R&D worker mobility "in a human-capital intensive target implies a loss of critical capabilities" (Coff, 2002, p. 109), loss of R&D workers with core expertise might be especially costly for the acquirer and result in greater efforts to retain them. Although a "battle for talent" may occur between the acquirer (trying to retain) and competitors (trying to attract), in this paper we focus less on the conditions under which one or other firm "wins". We are interested in whether the effect of team diversity varies by R&D worker.

## Willingness to make firm-specific investments

Although tenure is commonly associated with and often used to measure FSHC (see Raffiee & Coff, 2016), recent work suggests that under certain conditions "workers' investments in firm-specific skills may actually increase their market value" (Campbell, Coff, et al., 2012, p. 382). This is primarily because FSHC is more valuable than general human capital to the focal firm (Becker, 2009). Firms want their employees to make firm-specific investments, but since not all employees are willing to make costly[4] investment in FSHC, "an employer seeking a worker who is willing and able to make substantial firm-specific investments may target people who have made such investments elsewhere, even if the prior investments are not transferable, because workers' past firm-specific investments signal the willingness and ability to make future investments" (Campbell, Coff, et al., 2012, pp. 381–382). The willingness and ability to make such investments comprise general human capital (Morris et al., 2017). Also as the above quote indicates, to invest in FSHC requires the employee to be of a certain quality (i.e., to possess general human capital such as ability and intellect) in order to be retained by the firm, allowing firm-specific investments (Morris et al., 2017). Employees with FSHC are likely also to be highly skilled. Since FSHC is developed in parallel with general human capital, it is difficult to separate these two types (Morris et al., 2017). Indeed, employees with longer tenure perceive their skills as more general rather than firm-specific (Raffiee & Coff, 2016).

As the willingness and ability to make firm-specific investments increases the value of the employee in the labor market, we expect R&D workers with

[4] Investments in FSHC are costly to the employee because this type of capital is not transferable to other firms. However, investment in general human capital increases the employee's value in the labor market.

longer tenure to be less constrained by the target's organizational design compared to their shorter tenured counterparts, due to their greater general human capital. R&D workers with longer tenure should therefore be more likely to leave more diverse R&D teams.

> *Hypothesis 3: To the extent that longer tenure reduces other mobility barriers by providing information on the willingness to make firm-specific investments, tenure increases the likelihood that, post-acquisition, an R&D worker will leave a target with a more diverse R&D team.*

# Research design

## Data

To test the hypotheses, we construct an individual-level dataset based on employer-employee linked register data provided by Statistics Denmark. We use information from the Danish Register of Labor (IDA in Danish). IDA includes annual information on the establishments owned by a firm (i.e., subsidiaries), and all of its employees.[5] IDA is recognized internationally as a source of reliable data for social science research and has been used for similar studies on scientists' mobility (Kaiser, Kongsted, Laursen, & Ejsing, 2018) and individual pay (Grimpe, Kaiser, & Sofka, 2019).

The data contain information on the firm owner of each establishment which we use to identify acquisitions in Denmark during the period 2009 to 2015 based on changes to firm ownership of an establishment in year *t* compared to *t-1*. To be more meaningful, we restrict our sample to establishments with at least five employees in the year prior to the acquisition. Divested establishments are excluded to reduce the probability that a mobility event is

[5] Statistics Denmark records the annual employment of each individual, in the last week of November.

unrelated to the acquisition (e.g., leaving the firm due to its closure). We exclude establishments that were the object of more than one acquisition over the sample period. This allows us to attribute the observed effect to a specific acquisition.

**Identifying employees**. We link the establishment-level and employee-level data to identify employees working in any establishment (acquired or non-acquired) in a given year between 2008 and 2016. We exclude: employees who joined the target in the year the acquisition was completed (year *t0*) to exclude joiners; employees younger than 17 years in any year; and employees older than 60 in 2008. We impose the last restriction to mitigate the risk that an observed mobility event is due to (early) retirement.[6] We restrict the sample also to employees with full-time jobs to avoid contract-work and short-term employees. Finally, we exclude employees who worked in more than one acquired establishment during the sample period to reduce the confounding effects of different acquisitions.

**Identifying R&D workers**. We identify all R&D workers working in an acquisition target using the occupation classification and information on the highest level of education completed. Our definition of R&D workers follows Kaiser et al. (2018, p. 1942) who define R&D workers as "individuals with a master's or doctoral degree in technical, natural, veterinary, agricultural, or health science" in job functions requiring high- and medium-knowledge. The definition of R&D workers also individuals with a bachelors level engineering degree who work in high- and medium-knowledge requiring job functions since these individuals are also involved in patenting activity. Data on highest level of education completed are obtained from the education database

[6] The average retirement age in Denmark is 65. Everyone who was resident in Denmark for at least 40 years is entitled to a state pension; those who were residents for shorter periods receive a reduced amount.

(UDDA). Job functions are identified using the Danish occupation classification which is based on the International Standard Classification of Occupations (ISCO). It provides information on employee positions i.e., manager, professional requiring high-level knowledge (e.g., engineer, software developer, lawyer), medium-level knowledge (technician, associate professional), basic knowledge (administrative and customer service work), manual laborer, other type of laborer (other wage-earners), and non-primary appointment. To create our control variables, we categorize all employees not identified as R&D workers into: managers, high-knowledge workers, medium-knowledge workers, and others.

## Sample

Common concerns in mobility studies include endogeneity and problems related to differentiating between voluntary and involuntary turnover. The latter concern is important since layoffs can occur after an acquisition with the result that mobility might be driven by involuntary rather than voluntary turnover. This concern is reduced for the case of R&D workers, especially in knowledge intensive industries and R&D intensive establishments. However, we try to reduce the potential effect of involuntary mobility by imposing various sampling restrictions identified by creating a matched group of comparable employees working in comparable, non-acquired establishments. This also allows us to confirm that overall mobility differences between the acquired and non-acquired firms observed in our sample are in line with observations from prior studies. The comparison group and the sampling restrictions imposed to reduce the effects of potential involuntary mobility in the data are described in appendix A.

The sample used for the analysis includes 1,024 R&D workers in acquired targets in the information and communication technology (ICT), manufacturing, and knowledge based service (KBS) sectors. These are the most knowledge-intensive, private sectors in the Danish economy. Since we are interested in capturing heterogeneity in R&D team diversity, and R&D workers

employed in R&D labs, we restricted the sample to establishments with at least five R&D workers in the year prior to acquisition. We excluded R&D workers who left and became unemployed in the year of acquisition (this excludes also employees who moved abroad or took early retirement) to limit the probability of observing involuntary departure (see appendix A for a description of the sampling restrictions). These restrictions reduce the risk of overestimating post-acquisition mobility. Any remaining sample bias would be against the predictions. Table 1 presents the sample descriptive statistics and pair-wise correlations.

Table 1 shows that the average R&D worker is aged 44 years and earns approximately USD80,000 (DKK506,112). Around one in five R&D workers is female. The average R&D worker has worked around 7 years in the focal establishment,

**Table 1: Descriptive statistics and correlation matrix of sample used in the analysis**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *mean* | 0.142 | 0.192 | 0.960 | 506112.5 | 6.791 | 19.146 | 5.506 | 43.756 | 0.838 | 0.737 | 1.025 | 51.358 |
| *SD* | 0.349 | 0.394 | 0.196 | 182457.3 | 7.175 | 8.493 | 3.044 | 9.865 | 0.369 | 0.440 | 0.687 | 41.852 |
| (1) Mobility | 1 | 0.001 | -0.060 | -0.041 | -0.192 | -0.099 | 0.108 | -0.093 | 0.004 | 0.077 | -0.173 | -0.048 |
| (2) Female | 0.001 | 1 | -0.077 | -0.157 | -0.066 | -0.093 | 0.012 | -0.132 | -0.014 | 0.004 | 0.038 | -0.010 |
| (3) Full-time | -0.060 | -0.077 | 1 | 0.119 | 0.018 | -0.043 | 0.031 | -0.056 | -0.009 | -0.043 | 0.007 | 0.040 |
| (4) Salary | -0.041 | -0.157 | 0.119 | 1 | 0.236 | 0.263 | 0.025 | 0.270 | 0.018 | 0.016 | -0.042 | -0.075 |
| (5) Establishment tenure | -0.192 | -0.066 | 0.018 | 0.236 | 1 | 0.480 | -0.418 | 0.540 | -0.034 | -0.091 | 0.244 | 0.107 |
| (6) Years in labor market | -0.099 | -0.093 | -0.043 | 0.263 | 0.480 | 1 | 0.044 | 0.779 | -0.045 | -0.088 | 0.107 | -0.054 |
| (7) Prior mobility | 0.108 | 0.012 | 0.031 | 0.025 | -0.418 | 0.044 | 1 | -0.124 | 0.017 | 0.026 | -0.183 | -0.066 |
| (8) Age | -0.093 | -0.132 | -0.056 | 0.270 | 0.540 | 0.779 | -0.124 | 1 | -0.058 | -0.137 | 0.143 | 0.064 |
| (9) Core expertise | 0.004 | -0.014 | -0.009 | 0.018 | -0.034 | -0.045 | 0.017 | -0.058 | 1 | 0.725 | -0.241 | 0.116 |
| (10) Dominant expertise | 0.077 | 0.004 | -0.043 | 0.016 | -0.091 | -0.088 | 0.026 | -0.137 | 0.725 | 1 | -0.339 | -0.097 |
| (11) R&D team diversity | -0.173 | 0.038 | 0.007 | -0.042 | 0.244 | 0.107 | -0.183 | 0.143 | -0.241 | -0.339 | 1 | -0.042 |
| (12) R&D worker in firm (t-1) | -0.048 | -0.010 | 0.040 | -0.075 | 0.107 | -0.054 | -0.066 | 0.064 | 0.116 | -0.097 | -0.042 | 1 |

*n = 1024 R&D workers in acquired establishments*

spent 19 years in the labor market, and been employed in 6 different firms. Approximately 14 percent of R&D workers leave within less than a year of the acquisition.

# Measures and statistical method

## Variables

**Dependent variable.** To test whether individuals differ in their post-acquisition mobility, we construct a variable which takes the value 1 if the individual changes employers in the year following the acquisition. For individuals with multiple employers, we select the primary employer as defined by the statistical office. We estimate the probability of interfirm mobility within the three years after the acquisition. To avoid estimating the probability of leaving another workplace during the post-acquisition period, the variable has missing values after the employee has left the focal acquisition target. Since the data end in 2016, for R&D workers who remained until 2016 the variable takes the value 0.

**Explanatory variables.** *Post* denotes the post-acquisition period. The dichotomous variable takes the value 1 starting with the year of the acquisition. *Post* takes the value 0 for the pre-acquisition period. *R&D team diversity* is based on R&D workers' positions (at the 4-digit level) in the target in the year before the acquisition. This measure captures diversity in terms of (expertise) variety, and is calculated using the Shannon-Weiner index (H)—known also as the Teachman index (Harrison & Klein, 2007). H is defined as:

$$H = -\sum[(p_i) * \ln(p_i)]$$

where $p_i$ is the proportion of the total sample in the job position $i$. Unlike the Herfindahl index, the Shannon index puts less emphasis on the relative size of different position types and more weight on the total number of different positions. Therefore, the Shannon index is better at capturing diversity in terms

of 'richness'. R&D team diversity increases with the number of different types of R&D workers. In the sample of acquired R&D workers, the index varies between 0 (not diverse) and 2.33 (high diversity) with a mean of 1.087 (SD .683, median .91, see Figure 1).

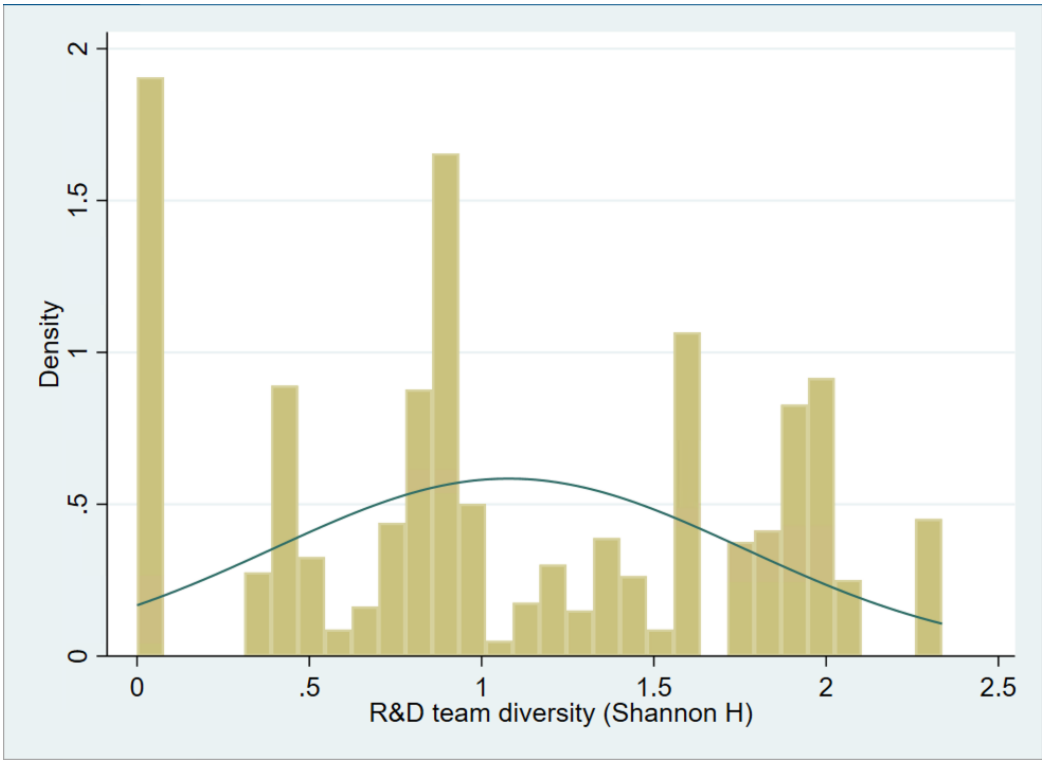


**Figure 1: Distribution of the R&D team diversity measure**

The variable *core expertise* is a dichotomous variable which takes the value 1 if an R&D worker holds one of the most 'populated' R&D positions in the establishment and zero otherwise. To assess whether an R&D worker has core expertise, we first calculate the average number of R&D workers per position (3-digit level) in the establishment in the year prior to acquisition. Then, for each establishment we identify the R&D workers in the most populated position in the establishment based on the mean split. Most R&D workers (84%) have core expertise. As an alternative measure, we identified only R&D workers working in the single most populated position (*dominant expertise*) using the 4-digit occupation codes.

**Control variables.** To control for individual characteristics, we include dummy variables for gender (*female*) and whether the individual holds a fulltime position (*full time*), count variables for years in the labor market, tenure in the establishment, and the log of the yearly salary (*log salary*). We control for prior mobility by including a variable *prior mobility* counting prior inter-firm mobility from 1980. For the panel, we selected primary appointments if the individual had held several different positions in the same year. Since R&D workers can be employed at two different hierarchical levels we include a dummy for *intermediate-knowledge worker*. The following variables capture some of the heterogeneity among acquisitions: (1) workplace size, (2) related acquisition or not, (3) workplace growth, and (4) location of the workplace in a rural area. *Workplace size*—measured as the log transformed number of employees in the year prior to acquisition—is included to reduce concern that diversity is underestimated for smaller establishments (Biemann & Kearney, 2010). Workplace size also controls for level of integration (Pablo, 1994) which could lead to more or fewer changes associated with the acquisition. This applies also to whether the target was acquired by a related firm which usually is measured by an overlap in the SIC codes (e.g., Huang, Zhu, & Brass, 2017). The Danish industry codes used for our classifications are similar to the SIC codes. Whether in terms of employment the establishment is growing, stays the same, or is shrinking gives an indication of workplace performance. We include this variable to control for potential performance differences in the target and the motivation (from the buyer perspective) to acquire or (from the target perspective) to sell the workplace. We include the average salary of employees in the establishment to control for differences in target quality. We control for location characteristics since rural areas compared to city or metropolitan areas offer different external employment opportunities. Employees in targets in rural areas may be less inclined to leave compared to employees in targets in city areas. We include year dummy variables to capture time trends.

## Statistical method

Given the dichotomous outcome variable, we test the hypotheses using random effects panel-probit models which control for establishment and time effects and account for individual differences in the likelihood of leaving. The inclusion of acquisition year dummy variables accounts for differences between years. Standard errors are clustered at the establishment level to account for unequal variance within groups. Note that this specification can also be considered a discrete-time duration model with time-varying covariates (Jenkins, 2005).

# Analysis and results

## R&D team diversity

Our first hypothesis suggests that R&D workers will be less likely to leave an acquisition target if they are part of a diverse R&D team. Table 2 presents the results. Model 1 includes only the control variables; Model 2 includes the variable of interest. We expect the coefficient of *R&D diversity* in Model 2 to be negative and significant. The results are in line with hypothesis 1 that R&D diversity reduces mobility of R&D workers after acquisition. We find also that R&D workers with longer tenure are less likely to leave, supporting prior arguments that firm-specificity creates mobility barriers. We find no effects of gender (female), acquisition relatedness, or target quality.

Figure 2 depicts the predicted probabilities of mobility at different levels of target R&D diversity in the post-acquisition period only. At the lowest levels of diversity (Shannon index = 0), the predicted probability of leaving is 14.26 percent ($p$ = .001). Around the medium level (Shannon index = 1), the predicted probability is approximately seven percentage points lower (6.67 %, $p$ <.001). At a high level of diversity (Shannon index = 2), the predicted probability of a R&D worker leaving is approximately 2.65 percent ($p$ = .059); suggesting weaker effects at higher levels of diversity.

| . | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se |
| R&D team diversity (est.) | . | . | . | -0.494* | [-2.54] | [0.195] |
| Establishment tenure | -0.0452* | [-2.49] | [0.0182] | -0.0414* | [-2.24] | [0.0185] |
| Female | -0.0756 | [-0.53] | [0.142] | -0.0639 | [-0.45] | [0.141] |
| Salary (log) | -0.126 | [-0.49] | [0.255] | -0.126 | [-0.47] | [0.267] |
| Years in labor market | -0.0150+ | [-1.72] | [0.00870] | -0.0164+ | [-1.88] | [0.00872] |
| Prior mobility | 0.0381+ | [1.72] | [0.0222] | 0.0335 | [1.49] | [0.0225] |
| Intermediate know. Worker | -0.144 | [-0.71] | [0.203] | -0.0801 | [-0.39] | [0.203] |
| No. R&D worker (t-1) | -0.00529+ | [-1.81] | [0.00293] | -0.00796* | [-2.49] | [0.00319] |
| Av. salary in establishment (t-1, log) | 0.655 | [1.07] | [0.614] | 0.808 | [1.26] | [0.643] |
| Related acquisition | -0.158 | [-0.36] | [0.442] | -0.307 | [-0.67] | [0.460] |
| Establishment size (t-1, log) | 0.0793 | [0.87] | [0.0907] | 0.211+ | [1.90] | [0.111] |
| Establishment age, sq | -0.000328 | [-1.17] | [0.000279] | -0.0000402 | [-0.15] | [0.000268] |
| Rural (t-1) | -0.301 | [-1.30] | [0.231] | -0.114 | [-0.51] | [0.223] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES |
| _cons | -7.068 | [-0.87] | [8.087] | -9.006 | [-1.07] | [8.428] |
| / | . | . | . | . | . | . |
| lnsig2u | -0.182 | [-0.27] | [0.667] | -0.130 | [-0.20] | [0.651] |
| *N* | 2518 | . | . | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period.*

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table 2: The effect of R&D diversity on the post-acquisition mobility of R&D workers**

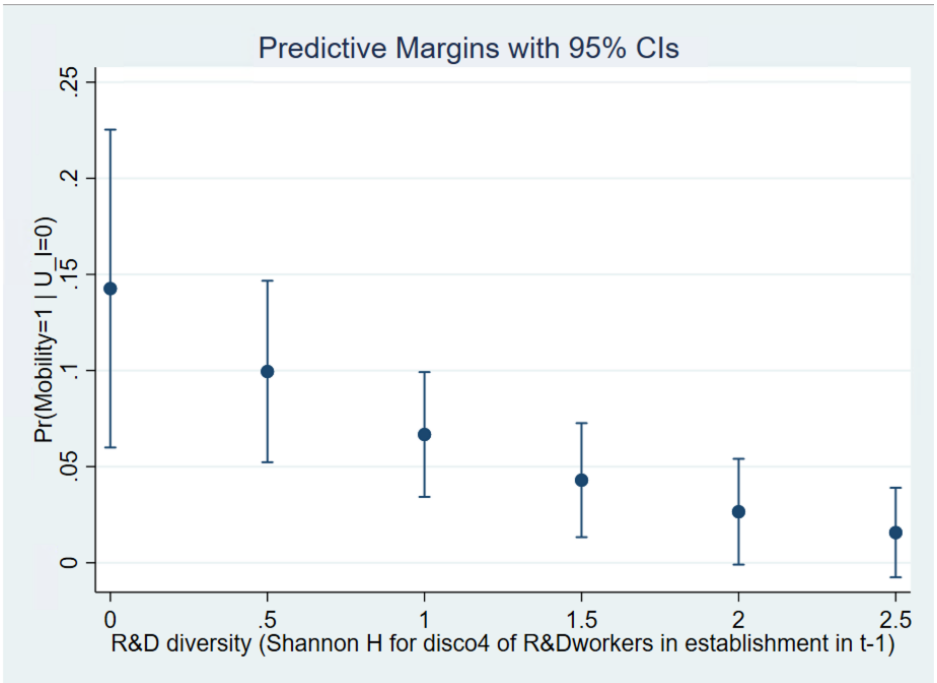


**Figure 2: Predictive Margins at different levels of R&D team diversity**

## Core expertise and R&D team diversity

To test whether R&D workers with core expertise are more likely to leave more diverse targets (Hypothesis 2), we use the sample of acquired R&D workers in the post-acquisition period to avoid three-way interactions. Table 3 Model 1 presents the results of the models without the interaction term. Consistent with the previous results, the coefficient of R&D team diversity is negative and significant; the coefficient of core function is small and insignificant suggesting that R&D workers with core expertise generally are not more or less likely to leave compared to other R&D workers. Model 2 includes the interaction term of interest i.e., *core function x R&D diversity*. The coefficient is

| . | **Model 1** | . | . | **Model 2** | . | . |
|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se |
| Core expertise | -0.0127 | [-0.09] | [0.146] | -0.359 | [-1.09] | [0.330] |
| Core expertise X R&D diversity | | | | 0.29 | [1.17] | [0.248] |
| R&D team diversity | -0.496* | [-2.52] | [0.197] | -0.745* | [-2.42] | [0.307] |
| Establishment tenure | -0.0414* | [-2.24] | [0.0185] | -0.0408* | [-2.20] | [0.0185] |
| Female | -0.0638 | [-0.45] | [0.141] | -0.0565 | [-0.40] | [0.140] |
| Salary (log) | -0.126 | [-0.47] | [0.267] | -0.127 | [-0.47] | [0.266] |
| Years in labor market | -0.0164+ | [-1.88] | [0.00872] | -0.0160+ | [-1.84] | [0.00868] |
| Prior mobility | 0.0335 | [1.49] | [0.0225] | 0.0341 | [1.52] | [0.0225] |
| Intermediate know. Worker | -0.0863 | [-0.41] | [0.210] | -0.0887 | [-0.43] | [0.208] |
| No. R&D worker (t-1) | -0.00797* | [-2.50] | [0.00319] | -0.00789* | [-2.46] | [0.00320] |
| Av. salary in establishment (t-1, log) | 0.809 | [1.26] | [0.643] | 0.793 | [1.24] | [0.640] |
| Related acquisition | -0.306 | [-0.67] | [0.460] | -0.294 | [-0.64] | [0.459] |
| Establishment size (t-1, log) | 0.212+ | [1.89] | [0.112] | 0.208+ | [1.86] | [0.112] |
| Establishment age, sq | -0.0000391 | [-0.15] | [0.000269] | -0.0000474 | [-0.18] | [0.000268] |
| Rural (t-1) | -0.113 | [-0.50] | [0.226] | -0.118 | [-0.53] | [0.224] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES |
| _cons | -9.004 | [-1.07] | [8.430] | -8.486 | [-1.01] | [8.410] |
| / | . | . | . | . | . | . |
| lnsig2u | -0.129 | [-0.20] | [0.652] | -0.144 | [-0.22] | [0.662] |
| *N* | 2518 | | | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period.*
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**Table 3: R&D workers with core expertise and the likelihood of leaving a target after acquisition**

positive but insignificant. It seems that R&D workers with core expertise are not more likely to leave as R&D team diversity increases. This does not support Hypothesis 2.

Since more than 83 percent of R&D workers have core expertise, it might be that our measure is not capturing the intended variation. We re-estimated the models using the alternative measure capturing only R&D workers in the most populated i.e., dominant position. This is a more narrowly defined measure. The results are presented in Table 4. Model 1 shows the direct effects of the variables on mobility, Model 2 includes the interaction term of interest (*dominant expertise x R&D diversity*). Model 1 shows that R&D workers in the

| . | **Model 1** | . | . | **Model 2** | . | . |
|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se |
| Dominant expertise | 0.113 | [0.85] | [0.134] | -0.415 | [-1.39] | [0.298] |
| R&D diversity X dominant expertise | . | . | . | 0.433$^{+}$ | [1.83] | [0.237] |
| R&D team diversity (est.) | -0.458$^{*}$ | [-2.32] | [0.197] | -0.777$^{**}$ | [-2.98] | [0.261] |
| Establishment tenure | -0.0412$^{*}$ | [-2.23] | [0.0184] | -0.0395$^{*}$ | [-2.15] | [0.0184] |
| Female | -0.062 | [-0.44] | [0.141] | -0.0444 | [-0.31] | [0.141] |
| Salary (log) | -0.129 | [-0.48] | [0.268] | -0.146 | [-0.54] | [0.270] |
| Years in labor market | -0.0163$^{+}$ | [-1.87] | [0.00871] | -0.0166$^{+}$ | [-1.90] | [0.00870] |
| Prior mobility | 0.0332 | [1.48] | [0.0224] | 0.0338 | [1.50] | [0.0225] |
| Intermediate know. Worker | -0.0407 | [-0.20] | [0.209] | -0.0784 | [-0.38] | [0.209] |
| No. R&D worker (t-1) | -0.00788$^{*}$ | [-2.48] | [0.00317] | -0.00808$^{*}$ | [-2.52] | [0.00320] |
| Av. salary in establishment (t-1, log) | 0.8 | [1.25] | [0.643] | 0.805 | [1.27] | [0.636] |
| Related acquisition | -0.305 | [-0.67] | [0.456] | -0.262 | [-0.58] | [0.453] |
| Establishment size (t-1, log) | 0.207$^{+}$ | [1.87] | [0.111] | 0.206$^{+}$ | [1.86] | [0.111] |
| Establishment age, sq | -0.000043 | [-0.16] | [0.000268] | -0.0000546 | [-0.20] | [0.000268] |
| Rural (t-1) | -0.121 | [-0.54] | [0.225] | -0.123 | [-0.55] | [0.223] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES |
| _cons | -8.962 | [-1.06] | [8.418] | -8.324 | [-1.00] | [8.360] |
| / | . | . | . | . | . | . |
| lnsig2u | -0.132 | [-0.20] | [0.652] | -0.155 | [-0.23] | [0.662] |
| *N* | 2518 | . | . | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period.*
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**Table 4: R&D workers with dominant expertise and the likelihood of leaving a target after acquisition**

most populated position are not significantly more likely to leave. As before, the coefficient of R&D diversity is negative and significant in both models. Model 2 shows that R&D workers with dominant expertise are more likely to leave more diverse R&D teams which is in line with hypothesis 2. However the coefficient is significant only at the 10-percent level which provides only weak support for Hypothesis 2.

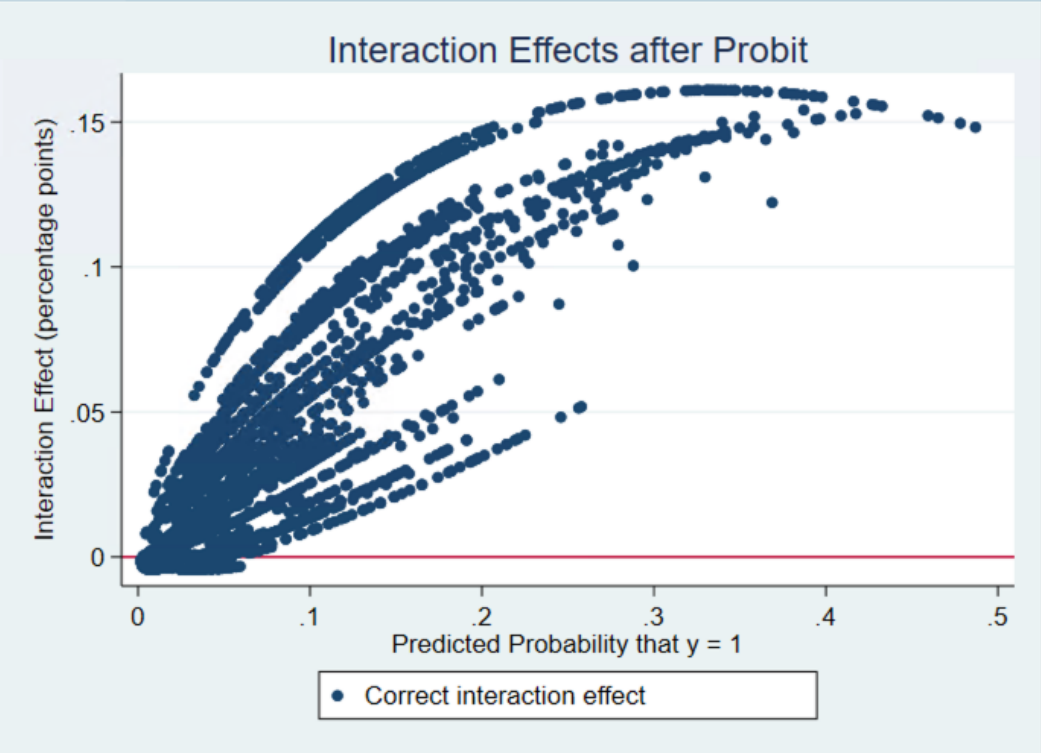


**Figure 3: Magnitude of the interaction effect (R&D team diversity X dominant expertise)**

Since Model 2 (Table 4) is a non-linear function, the interaction term is not directly interpretable. Following Ai and Norton (2003) and Norton, Wang, and Ai (2004), Figures 3 and 4 show the magnitude and significance of the interaction effect. The results are based on a pooled model including the same variables as Model 2 with standard-errors clustered at the individual establishment level. Figure 3 shows that most of the interaction effect occurs at the lower end of the predicted levels of mobility likelihood (approximately 90% up to .20), and is positive for almost all observations. The median effect is 4.19

percent (SD = 0.048, mean = 0.0568). In terms of significance (Figure 4), 37 percent of cases are significant at the 10-percent level (z>1.65) and 7 percent of cases are significant at the 5-percent level (z>1.96). Thus, the effect is driven by a small number of observations with a high mobility likelihood.

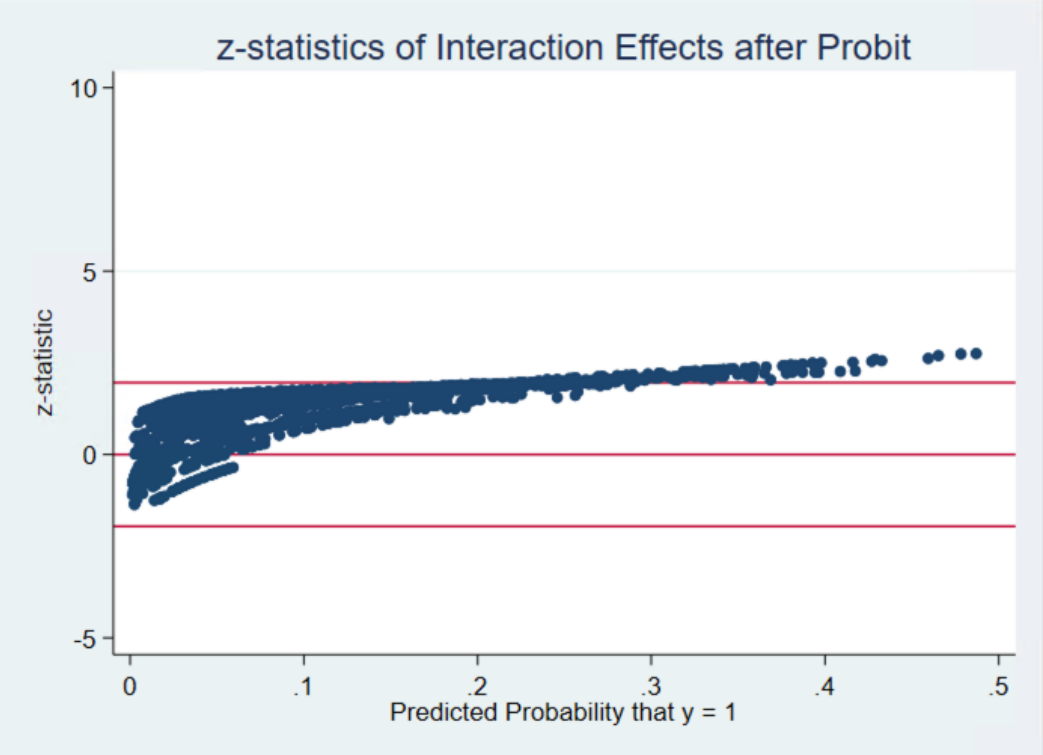


**Figure 4: Significance of the interaction effect (R&D team diversity X dominant expertise)**

## Tenure and R&D team diversity

Hypothesis 3 suggests that R&D workers with longer tenure in more diverse target firms will be more likely to leave. To test this hypothesis we estimate the likelihood of mobility including in the analysis the interaction terms of tenure and R&D diversity. The results are presented in Table 5 Model 2. Recall, that the previous results show that tenure decreases the R&D worker's likelihood of leaving the target firm. In Model 1 we include the results from Table 3 to allow comparability of the coefficients across models. Model 2 has a positive coefficient of the interaction term, significant at the 5-percent level.

This supports hypothesis 3 that longer tenure of R&D workers in more diverse targets makes them significantly more likely to leave.

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se |
| R&D team diversity (est.) | -0.494* | [-2.54] | [0.195] | -0.701** | [-2.92] | [0.240] |
| Establishment tenure | -0.0414* | [-2.24] | [0.0185] | -0.0929* | [-2.55] | [0.0364] |
| R&D diversity X tenure | . | . | . | 0.0437* | [2.03] | [0.0216] |
| Female | -0.0639 | [-0.45] | [0.141] | -0.0536 | [-0.40] | [0.135] |
| Salary (log) | -0.126 | [-0.47] | [0.267] | -0.0817 | [-0.32] | [0.257] |
| Years in labor market | -0.0164+ | [-1.88] | [0.00872] | -0.0181* | [-2.10] | [0.00863] |
| Prior mobility | 0.0335 | [1.49] | [0.0225] | 0.0378+ | [1.72] | [0.0220] |
| Intermediate know. Worker | -0.0801 | [-0.39] | [0.203] | -0.0561 | [-0.30] | [0.187] |
| No. R&D worker (t-1) | -0.00796* | [-2.49] | [0.00319] | -0.00667* | [-2.21] | [0.00302] |
| Av. salary in establishment (t-1, log) | 0.808 | [1.26] | [0.643] | 0.639 | [1.04] | [0.615] |
| Related acquisition | -0.307 | [-0.67] | [0.460] | -0.316 | [-0.70] | [0.448] |
| Establishment size (t-1, log) | 0.211+ | [1.90] | [0.111] | 0.178+ | [1.69] | [0.105] |
| Establishment age, sq | -0.0000402 | [-0.15] | [0.000268] | -0.0000343 | [-0.13] | [0.000258] |
| Rural (t-1) | -0.114 | [-0.51] | [0.223] | -0.108 | [-0.50] | [0.218] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES |
| _cons | -9.006 | [-1.07] | [8.428] | -7.169 | [-0.89] | [8.014] |
| / | . | . | . | . | . | . |
| lnsig2u | -0.13 | [-0.20] | [0.651] | -0.274 | [-0.42] | [0.653] |
| *N* | 2518 | . | . | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period.*
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

## Table 5: R&D workers' tenure and the likelihood of leaving a target after acquisition

Figure 5 shows the predictive margins of tenure at different levels of R&D diversity. In most cases, tenure reduces the negative effect of R&D diversity. Only in the most diverse R&D teams (Shannon H >=2) does tenure increase the likelihood of mobility. That is, for low and moderate levels of diversity, tenure has a negative effect and this effect is moderated positively such that as diversity increases the effect of tenure decreases.

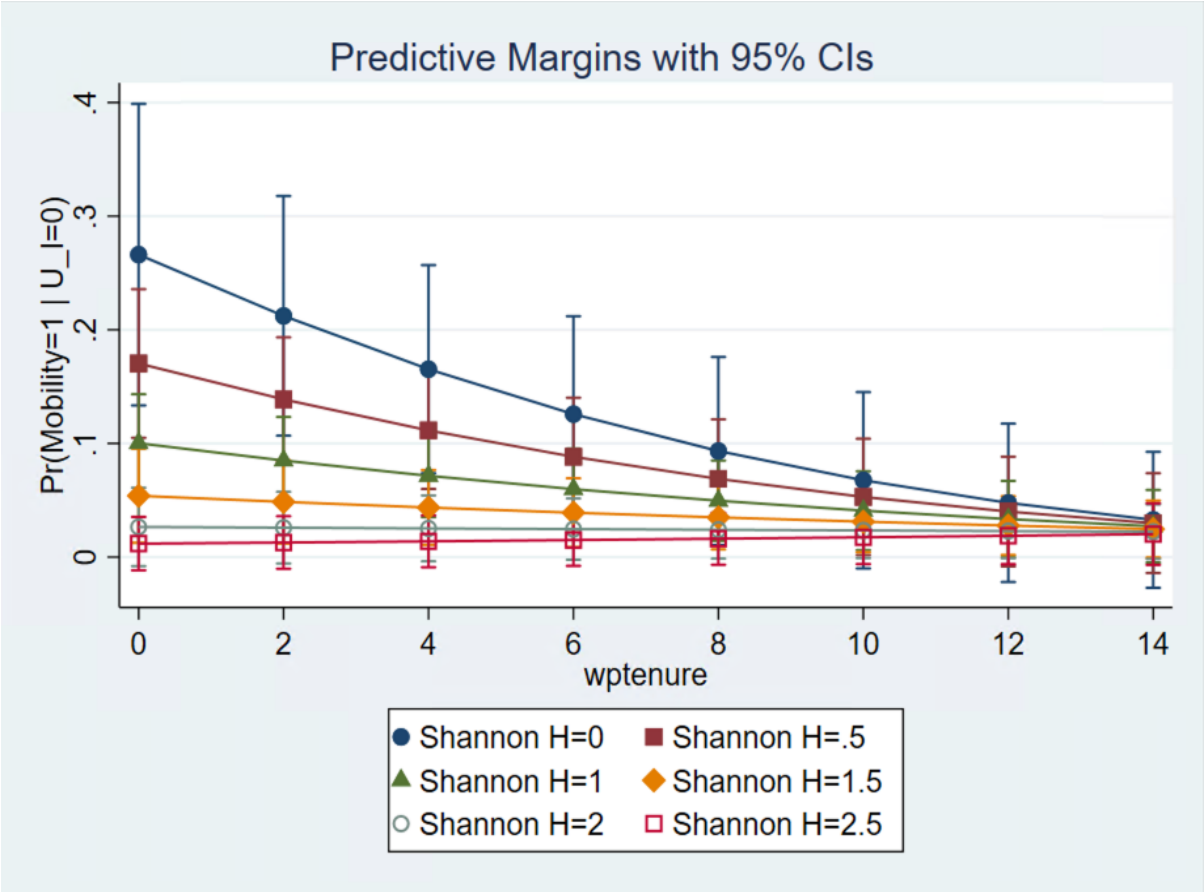


**Figure 5: Predictive margins of tenure at different levels of R&D diversity**

## Additional analysis

We conduct several additional analyses to test the robustness of our results. First, we use an alternative measure for R&D team diversity. One of the criticisms leveled at the Shannon index and many other entropy measures is that it provides an arbitrary value for diversity i.e., a Shannon value (H) of 2 is not twice as diverse as value of 1. To overcome this, scholars have proposed effective number of species (ENS) which can be derived from various indices and provides a more intuitive measure of diversity. Following Jost (2006), ENS can be calculated as:

$$\text{ENS} = \exp(-\sum[(p_i) * \ln(p_i)])$$

We re-estimate the models presented above using ENS as an alternative measure of R&D team diversity. The conclusions do not change.

We consider that not all firms evaluate R&D workers based on their immediate colleagues (i.e., in the same establishment) but rather relative to the whole firm's R&D workers, and examined the effects of diversity at firm level. That is, we measure diversity and working in a core (or dominant) position at firm not establishment level. The results are generally similar (see Appendix B Tables B1, B2, and B3). We found some differences in relation to hypothesis 2. Specifically, while we found that R&D workers with dominant expertise are more likely to leave more diverse R&D teams when measured at establishment level, we found no significant differences for dominant expertise at firm level. This might be due to the narrowness of the definition since we found significant differences for R&D workers with core expertise (and dominant experience defined at the 3-digit level). We found consistent but less significant results ($p < .1$) related to Hypothesis 3.

We re-estimated the models taking account only of year of acquisition. The results were consistent; the effects of tenure are more pronounced, see Appendix B Figure B1.

# Discussion

This study investigated how the characteristics of an acquisition target's R&D team affect R&D workers' likelihood to leave the firm after the acquisition. The main conclusion is that this is largely predetermined by the firm-specificity of the leaving R&D worker's human capital i.e., embeddedness in the team. Whether R&D workers can overcome the mobility constraints induced by the target's organizational design depends the information available to the labor market on their general human capital. Below, we set out the empirical findings that lead to this conclusion.

First, R&D target firm team diversity prior to acquisition reduces post-acquisition mobility of R&D workers. This effect is independent of target firm size which we controlled for in the models. The existing research mostly investigates how differences between target and acquirer affect post-acquisition outcomes, and assumes that R&D workers have similar external opportunities (Hussinger, 2012; Kapoor & Lim, 2007; Paruchuri et al., 2006). We contribute to this research in two ways. We show that a higher level of heterogeneity in the firm-specificity of R&D workers' human capital influences the value of their human capital in the labor market, and thus affects the likelihood they will leave the firm. Also, we move the discussion from post-acquisition mobility being affected by the characteristics of the transaction to it being determined largely by the target firm's characteristics prior to acquisition. This finding has implications for other studies where similar patterns are observed. For instance, studies of the effects of mobility on post-acquisition performance usually treat mobility as exogenous (e.g., Bergh, 2001). Our analysis suggests that performance variances might be explained in part by the target's characteristics which initially affect the mobility of human capital.

Second, while R&D team diversity reduces post-acquisition mobility on average, the effect varies depending on the R&D worker's characteristics related to their general human capital: R&D workers with longer tenure are more likely to leave as R&D team diversity increases. In addition, in diverse R&D teams, R&D workers working closer to the technical core of the target show a larger tendency to leave the firm post-acquisition. By reinforcing the idea that some employees are more affected than others by an acquisition (Paruchuri et al., 2006; Walsh, 1989), this study suggests that target-level and individual-level mobility constraints should not be examined in isolation. What matters is understanding how different mobility constraints interact and how initially non-constraining factors when combined result in new barriers and changes to existing barriers to mobility. Whether other individual-level characteristics—

such as experience (Hussinger, 2007), and firm-specificity (Campbell, Coff, et al., 2012)—vary also depending on other factors should be explored in future work.

The findings contribute also to the broader mobility literature by suggesting the way firms organize their human capital (e.g., in teams) as a source of firm-specificity. Thus, in addition to labor market frictions, (team independent) firm-specificity, (Campbell, Coff, et al., 2012), industry-specificity, non-compete agreements (Starr, Ganco, & Campbell, 2018), and wages (Ejermo & Schubert, 2018), so does the firm's human capital configuration in teams create mobility constraints. Acquisitions could provide an appropriate empirical context to study this in more depth since acquisition both seems to induce mobility while at the same time, reducing the set of possible reasons for departure. The context of acquisitions may make it easier to isolate potential effects (and moderators). Also, in contrast to other "mobility inducing events" such as divestitures, acquisitions—where the intention is to retain employees—have a smaller effect on labor market demand.

The acquisition context also suggests directions for future research on the emergence of firm-specific human capital. Extant work does not investigate how the way that firms organize their work affects the emergence of human capital within the firm. Human capital is dependent on the interactions among co-workers since these interactions provide different learning opportunities which contribute to creating firm-specific human capital (e.g., Pisano et al., 2001). However, how these interactions emerge is unclear. The research design of this study allows us to disentangle how workers choose to interact within the firm and the human capital created by these interactions. The acquisition context may also reveal other effects that otherwise would remain unobserved due e.g., to the two-sided selection of employees and employers.

Future research could examine whether R&D team diversity in the target firm has similar effects on the post-acquisition productivity of R&D workers.

Paruchuri et al. (2006) found that R&D workers with more peripheral knowledge relative to the acquirer become less productive. They conclude that "[t]he irony, of course, is that these may be precisely the [R&D workers who] make the acquisition worthwhile. However, […] the acquirer disproportionately disrupts these valuable technical resources" (Paruchuri et al., 2006, p. 546). If the effects of R&D team diversity on mobility are similar for post-acquisition productivity of R&D workers we would expect R&D workers' productivity to depend not only on worker characteristics but also on the organizational design, specifically their configuration in teams.

Last, the empirical exercise conducted to identify the study sample shows the importance of timing. Timing refers to whether a study includes employees present before or at the announcement or completion of the acquisition. Since the highest levels of mobility occur in the year of acquisition completion, we sampled R&D workers present in the year before acquisition completion (see appendix A). Many studies do not distinguish between announcement or completion of the acquisition, or fail to identify employees present in a specific year.[7] We would call for a distinction to be made between samples that refer to acquisition announcement and those that refer to acquisition completion.

# Conclusion and limitations

This study was motivated by the importance R&D workers for firms post-acquisition performance. It investigated how the organizational characteristics of the target affect post-acquisition mobility of R&D workers. We built on the idea that human capital embeddedness within teams limits R&D workers' mobility (Palomeras & Melero, 2010) and suggested that R&D workers with more

[7] The latter is the case in most studies that rely on patent data (Hussinger, 2007; Kapoor & Lim, 2007; Paruchuri et al., 2006). These studies usually compare time windows of three to five years before and after an acquisition.

general human capital are better able to overcome the mobility barriers induced by embeddedness in a team. We analyzed the mobility of R&D workers during the years 2009-2015 in acquired establishments in the manufacturing, ICT, and KBS sectors in Denmark—the most knowledge-intensive private sectors in the Danish economy. The findings show that (a) the more diverse a target's R&D team the less likely R&D workers will leave; (b) as R&D team diversity increases R&D workers with longer tenure are more likely to leave, suggesting that individual characteristics have an effect on organizational characteristics as a mobility constraint; (c) R&D workers closer to the technical core of the target show similar patterns.

Our research has some limitations. First, the theory we draw on applies to voluntary turnover. Similar to most human capital mobility studies which use patent data (Hussinger, 2007; Kapoor & Lim, 2007) or register and census data (Campbell, Di Lorenzo, & Tartari, 2020; Campbell, Ganco, et al., 2012; Carnahan, Agarwal, & Campbell, 2012), and similar to post-acquisition turnover studies which use data retrieved from (financial) reports (Krug & Hegarty, 2001; Krug & Hegarty, 1997; Walsh, 1989) we are unable to differentiate between voluntary and involuntary turnover. However, we employed different sampling restrictions such as excluding employees leaving who become unemployed. The findings presented in the appendix A make us confident that these restrictions reduce potential involuntary turnover. Our approach may provide the empirical foundations for future work on post-acquisition mobility using similar data.

Second, the R&D workers included in our sample may not be those involved in innovation and patenting activity. Other studies using similar data show that patenting firms are more likely to employ workers in R&D related functions (Kaiser, Kongsted, & Rønde, 2015) and find a high correlation between the firm's numbers of R&D workers and patents (r=.740) (Kaiser et al., 2018). These findings should mitigate such concerns. It should be noted also

that patents are an incomplete measure of innovation and R&D activities (Cohen, Nelson, & Walsh, 2000). Since our definition of R&D workers arguably is broader, it might better capture R&D workers rather than pure patent-based measures.

Our data also overcome the limitations related to identification R&D workers' mobility that occur when using patent data (Ge, Huang, & Png, 2016). Since we have information on year-to-year mobility of all R&D workers, we did not have to restrict our sample to R&D workers who patented in both the pre- and post-acquisition periods (Hussinger, 2007; Kapoor & Lim, 2007; Paruchuri et al., 2006). We also know whether and when mobility occurs regardless of whether the R&D worker patented in the post-acquisition period (Ernst & Vitt, 2000). This is a meaningful improvement on previous work on R&D worker's post-acquisition mobility. If LinkedIn data provide sufficient information on an individual's patenting history this could be an alternative source of data to study post-acquisition mobility of R&D workers. To check this, LinkedIn data could be linked to register and/or patent data to conduct a study similar to that conducted by Ge et al. (2016).

The work in this paper contributes both theoretically and empirically to the growing literature on post-acquisition mobility (Ernst & Vitt, 2000; Hussinger, 2007; Kapoor & Lim, 2007; Krug, Wright, & Kroll, 2014; Paruchuri et al., 2006; Ranft & Lord, 2002). First, we account for the possibility that R&D workers in acquisition targets possess firm-specific, and thus non-transferrable, human capital. Second, we show that post-acquisition mobility is predetermined largely prior to acquisition by the firm-specificity of R&D workers' human capital rather than being determined by the acquirer or target-acquirer dyad characteristics. Third, we propose the organization of R&D workers in teams as a source of firm-specific human capital. Thus, we contribute also to the broader literature on human capital mobility which mostly sees employee human capital as independent of team in which the employee is embedded

(e.g., Campbell, Ganco, et al., 2012; Carnahan et al., 2012; Starr et al., 2018). More research is needed on how firms organize their human capital, how this affects employee mobility, and how mobility constraints at different levels interact. We suggest there is a need for more careful sampling considerations to examine post-acquisition mobility. Finally, we suggest that the context of acquisitions would be useful for future research on the emergence of firm-specific human capital. The findings from the present study suggest that the organizational design of the workplace could affect who decides to remain in the firm and develop more firm-specific human capital.

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Chapter 2

# Appendices

# Appendix A: Sample construction and validation

## Matching comparable employees in comparable establishments

We use coarsened exact matching (CEM) and match an employee working in an establishment that will be acquired in the succeeding year to a similar employee working in a comparable establishment that will not be acquired, based on their characteristics in that year i.e., *t-1*. Our sample includes all employees present in an acquired establishment in the year before the acquisition, and a group of comparable employees working in comparable non-acquired establishments.[8] CEM is a nonparametric method used increasingly in mobility studies to create counterfactuals and improve comparability between groups (Di Lorenzo & van de Vrande, 2019; Hussinger, 2007). CEM has the advantage that acquired and non-acquired employees can be exactly matched on specific conditioning variables, some coarsened (Iacus, King, & Porro, 2012). Using the standard specification, CEM generates weights for the control observations depending on the quality of the match, ranging from 0 (not matched) to 1 (perfect match). Here, we use the one-to-one (k2k specification in STATA 16) matching specification and conduct the matching for each consecutive year prior to an acquisition, starting in 2008 and excluding from the

[8] An alternative is to sample on year of acquisition (t0) and match employees based on their characteristics in the previous year (t-1). Sampling employees present during but not before acquisition reduces the risk of observing mobility that is unrelated to the acquisition e.g., someone who wanted to leave anyway, and voluntary turnover e.g., someone who did not want to work for the acquirer. In appendix A, we show that this alternative approach risks underestimating post-acquisition mobility since most employees leave immediately after the acquisition. We show also how different sampling restrictions aimed at reducing observed voluntary turnover affect mobility rates. The chosen sample approach is the least restrictive and allows exploration of some of these effects.

pool of potential matches in the following year individuals which are "non-acquired" matches in a focal (or any prior year). We construct the panel including all years in the individual's employment history since 1980. This approach enables one match for each acquired employee in the sample. This means we do not have to rely on weights normally attributed to control observations depending on matching quality. The k2k matching specification increases the risk of losing observations which cannot be matched (normally less well matched observations are weighted lower). In our case, this is of less concern because of the number of observations that could be a match (the entire working population in Denmark).

**Matching criteria.** We match individuals on the following variables. Whether the match is exact or coarsened is indicated in parentheses. At firm level, we match on firm age (coarsened) and whether the firm has multiple workplaces (exact). At the establishment level, we match on industry sector (exact), location characteristics (exact, 4 groups (Asmussen, Nielsen, Goerzen, & Tegtmeier, 2018)), and number of employees (coarsened, quartiles). We use the 6-digit Danish Industry Code 2007 (DB07) to distinguish 19 different industry sectors[9]. These sectors are similar to the NACE classifications. The location classification in Asmussen et al. (2018) groups all 98 municipalities in Denmark into four groups: Global cities, metropolitan areas, population centers, and rural areas. We match on geographic characteristics because economic density can influence both employees' external options (demand) and thus their decision to leave the firm, and the availability of labor (supply).

At the establishment level, we also match on labor composition. Kapoor and Lim (2007) suggest that just as firms are not randomly selected as targets

[9] DB07 is based on the 4-digit NACE rev. 2 applying to all EU member states since 2008. NACE rev. 2 is based on the UN industry nomenclature ISIC rev. 4.

**Table A1: Descriptive statistics and correlation matrix of full (matched) sample**

| Variable | count | mean | sd | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Mobility t+1 | 73238 | 0.182 | 0.385 | 1 | . | . | . | . | . | . | . | . |
| (2) Female | 75844 | 0.343 | 0.475 | 0.018 | 1 | . | . | . | . | . | . | . |
| (3) Full time | 75844 | 0.849 | 0.359 | -0.135 | -0.166 | 1 | . | . | . | . | . | . |
| (4) Salary | 75844 | 350844.9 | 22674.8 | -0.129 | -0.188 | 0.310 | 1 | . | . | . | . | . |
| (5) Firm tenure | 75844 | 7.438 | 6.155 | -0.164 | -0.051 | 0.100 | 0.217 | 1 | . | . | . | . |
| (6) Year in labor market | 75844 | 20.520 | 9.787 | -0.153 | -0.062 | 0.193 | 0.272 | 0.451 | 1 | . | . | . |
| (7) Prior mobility | 75844 | 4.837 | 3.436 | 0.042 | -0.030 | 0.104 | 0.075 | -0.285 | 0.171 | 1 | . | . |
| (8) High performer | 75844 | 0.113 | 0.316 | -0.032 | -0.022 | 0.102 | 0.361 | 0.015 | -0.108 | -0.017 | 1 | . |
| (9) Age | 75844 | 42.594 | 12.123 | -0.124 | -0.058 | 0.116 | 0.248 | 0.417 | 0.808 | 0.079 | -0.061 | 1 |

for acquisition deals, the human resources employed at the time of the deal are also not random. Not all employees are equally valuable to the firm. To capture relevant employees, prior studies investigate post-acquisition mobility of managers or R&D workers. Reflecting prior sampling choices and the heterogeneity among different employee types, we match acquired to non-acquired employees working in an establishment with a similar labor composition. We match on whether the establishment employs less than one, less than five, or more than five managers; whether the establishment employs less than one, less than five, or more than five R&D workers; and the ratio of high-knowledge workers in the establishment relative to the total number of employees working in the establishment (coarsened, 5 groups). To capture differences in establishment quality, we match on average salary in the workplace (coarsened, 5 groups). At the individual level, we match on job classification (exact, see above), years in the labor market (coarsened, quartiles), gender (exact), and education (below Bachelors level, Bachelors, Masters, and higher). Lastly, we match on whether the employee is an R&D worker (exact). Matching was achieved for approximately 80 percent of observations.

## Employee information

**The full sample** includes 37,922 employees working in an establishment that will be acquired in the following year matched to an equal number of similar employees working in comparable establishments that will not be acquired over the sample period. Of these in total 75,844 employees (37,922 to-be-acquired and 37,922 non-acquired employees) 4,198 are R&D workers, and 4,628 employees work in managerial positions. Thirty-four percent of employees are female. As shown in the descriptive statistics in Table A1, employees are on average 43 years old, have 21 years of work experience, and a firm tenure of 7 years. The average salary is DKK350,845 (USD50,800) and most of employees work in full-time positions (85%). The average mobility is with 18 percent a little higher than in other years. For example, the mobility rate in year *t-1* is 15 percent (not significantly different between groups, $p$=.0624). The difference between the mobility rates in year *before* and *of* the acquisition is largely driven by employees in acquisition targets (27 % in acquired establishments vs 17% in non-acquired establishments, $p$<.0001). On average, an employee changed employer 5 times over the past.

**R&D workers.** To give a finer grained description of the sample, we show the summary statistics for R&D workers in the year prior to acquisition separately in Table A2. The percentage of female

**Table A2: Descriptive statistics and correlation matrix of R&D workers**

| Variable | count | mean | sd | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Mobility t+1 | 4097 | 0.159 | 0.365 | 1 | . | . | . | . | . | . | . | . |
| (2) Female | 4198 | 0.222 | 0.416 | 0.034 | 1 | . | . | . | . | . | . | . |
| (3) Full time | 4198 | 0.937 | 0.243 | -0.069 | -0.142 | 1 | . | . | . | . | . | . |
| (4) Salary | 4198 | 491708.000 | 190395.400 | -0.092 | -0.190 | 0.195 | 1 | . | . | . | . | . |
| (5) Firm tenure | 4198 | 6.936 | 5.422 | -0.141 | -0.124 | -0.011 | 0.310 | 1 | . | . | . | . |
| (6) Year in labor market | 4198 | 19.205 | 8.550 | -0.092 | -0.163 | -0.031 | 0.256 | 0.383 | 1 | . | . | . |
| (7) Prior mobility | 4198 | 5.691 | 3.157 | 0.079 | 0.062 | 0.013 | -0.042 | -0.333 | 0.041 | 1 | . | . |
| (8) High performer | 4198 | 0.169 | 0.375 | -0.035 | 0.035 | 0.065 | 0.482 | 0.148 | 0.006 | -0.023 | 1 | . |
| (9) Age | 4198 | 44.125 | 10.346 | -0.070 | -0.173 | -0.109 | 0.222 | 0.422 | 0.770 | -0.120 | 0.074 | 1 |

R&D workers is lower than the percentage of women in the full sample (22% vs 34%). The average salary of R&D workers is higher than the full sample (DKK 491,708 ~ USD72,000), reflecting the sampling on highly skilled employees. The mobility rate in the year of the acquisition is a little lower than that of full sample (16% vs 18%), yet again higher than in other years. In the year of the acquisition, the mobility rate increases by approximately 50 percent compared to the prior year (12%). Again, the increase is largely due to increased mobility among R&D workers in acquired establishments rather than R&D workers in non-acquired establishments.

## Sampling restrictions aimed at reducing involuntary turnover post-acquisition

To investigate the effect of acquisitions on employee mobility in more depth we calculate the percentage of employees who left the firm in a given year. Figure A1 presents mobility rates for the full sample, R&D workers, and managers broken down by groups (acquired and non-acquired). Across functions, the effect of acquisition is mostly visible in the year of the acquisition. Mobility in acquired establishments is around five to ten percentage points higher than in comparable non-acquired establishments. Overall, it seems that R&D workers' mobility is less affected by an acquisition compared to employees in managerial or other positions. The biggest difference in mobility rates between acquired and matched non-acquired establishments is observed for managers. In the year of the acquisition, the mobility rate is nearly twice as high for managers in acquired establishments (22% vs 13%).

Another interesting observation is that an acquisition involves the transfer of some employees to another establishment belonging to the acquiring firm. This affects 2,087 among 29,480 employees (7%) who do not leave in the year of acquisition. Thus, studies that focus solely on whether an employee remains in the target firm may overestimate post-acquisition mobility. Employees in non-R&D and non-managerial positions make up 80 percent of all transfers.

Managers and R&D workers are less often transferred between establishments (13% and 7%, respectively) most likely because the fractions of R&D workers and managers are relatively small. Taking account of these differences, R&D workers who stay in the target are more likely than other employees to be transferred across establishments (9% vs 6%) but less likely to be transferred than managers (15%).

**Individual-level sample restrictions.** A possible explanation for high post-acquisition mobility is employee lay-off. While we are unable to identify involuntary and voluntary turnover, we can identify individuals who leave for unemployment or early retirement, or disappear

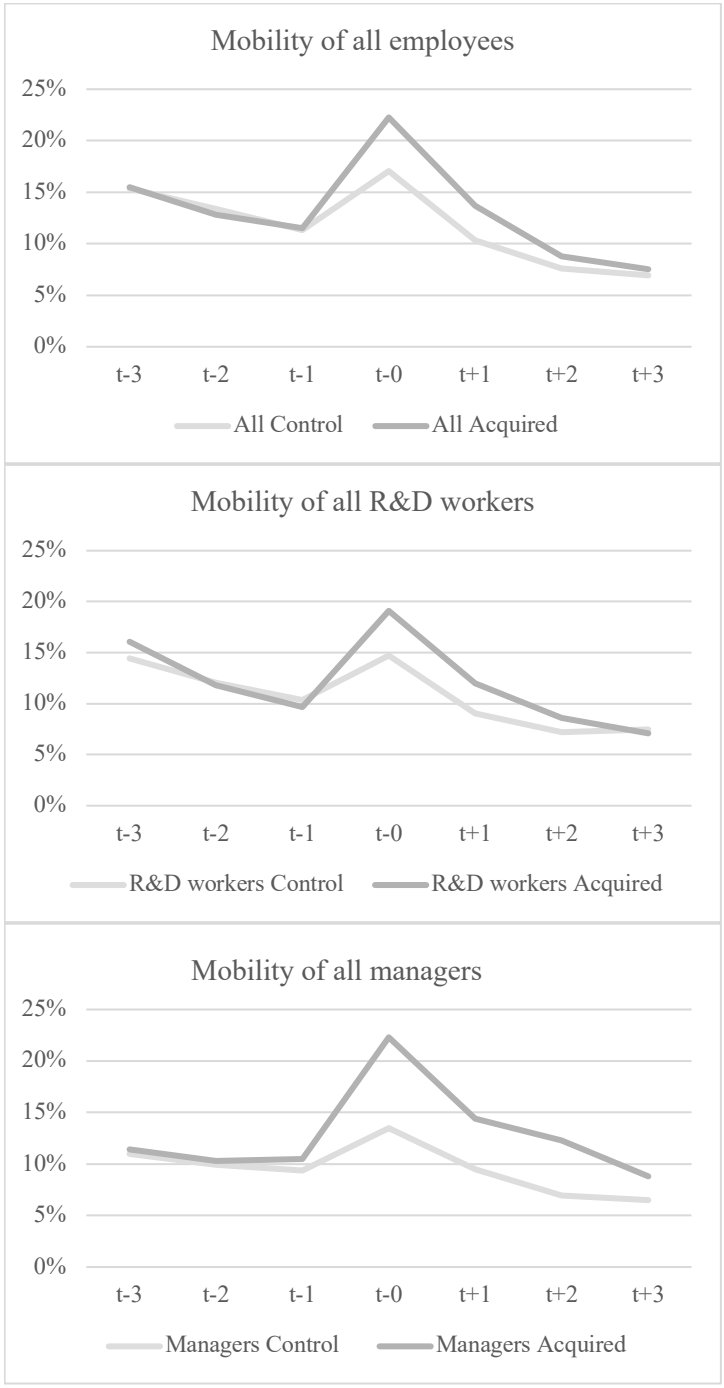


**Figure A1: Mobility rates of the un-restricted sample**

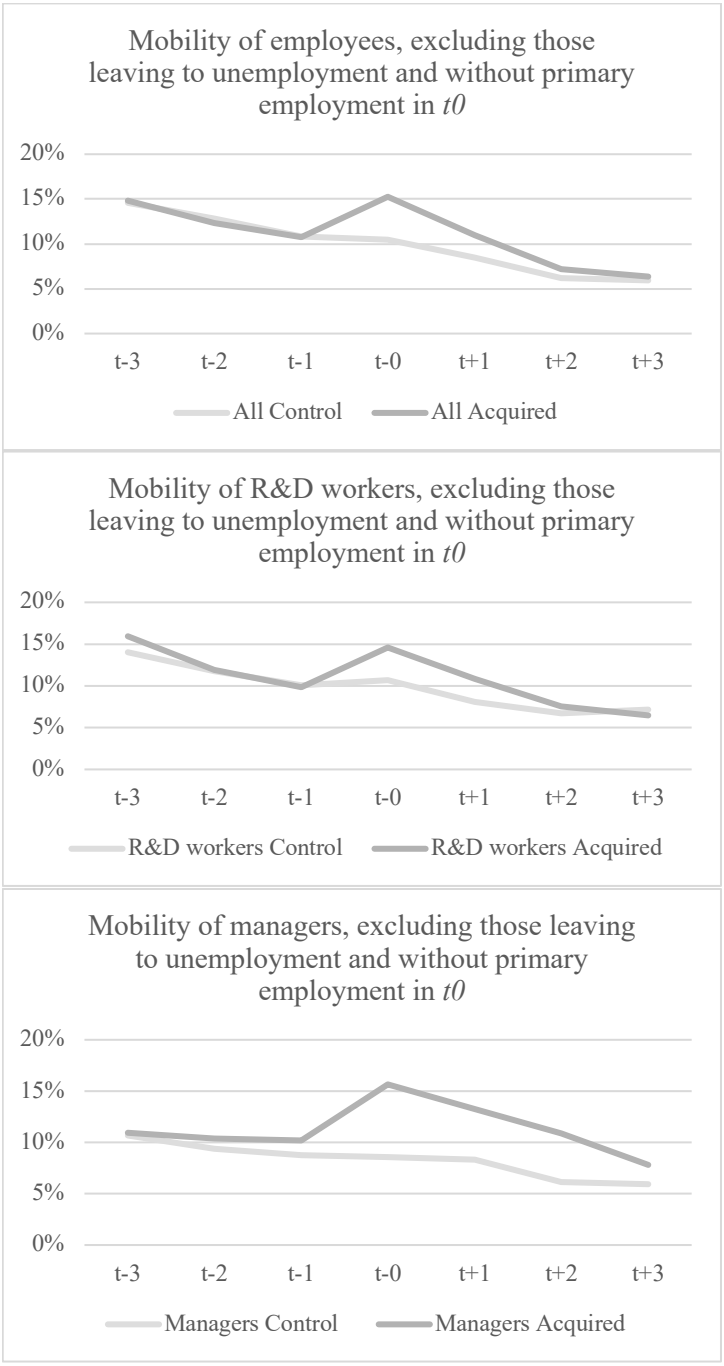


**Figure A2: Mobility rates of sample excluding employees leaving to unemployment or without primary employment in t0**

from the Danish labor market (which includes individuals taking jobs in some other country). We also exclude employees whose employment in the year of acquisition is secondary employment. Figure 2A presents mobility rates for the restricted sample (similar to Figure 1). Excluding employees that move out of the labor force and those whose job in the year of the acquisition is not the employee's main employment reduces mobility rates across all years for all employees, not just employees in acquired establishments. Mobility rates mostly stabilize across years, the exception being the year of the acquisition. Specifically, across employee types, the restriction reduces the mobility rate in the acquisition year by seven percentage points or by 31 percent (from 22% to 15%). The difference is similar for managers (6 percentage points or a 30% decrease in mobility) but is smaller for R&D workers (4

percentage points or a 14% decrease in mobility). This is likely because fewer R&D workers are affected by the restriction (6% of R&D workers are excluded vs 9% of employees in other positions).

An alternative restriction is to exclude all employees who leave immediately after acquisition. This restriction maintains mobility constant in the year of the acquisition. Figure 3 shows that mobility rates in the year after acquisition are similar. The observed effect of the sampling restriction is comparable also for R&D workers and managers. The difference between acquired and non-acquired employees remains wider and wider for longer for managers but is less pronounced for other types of employees.

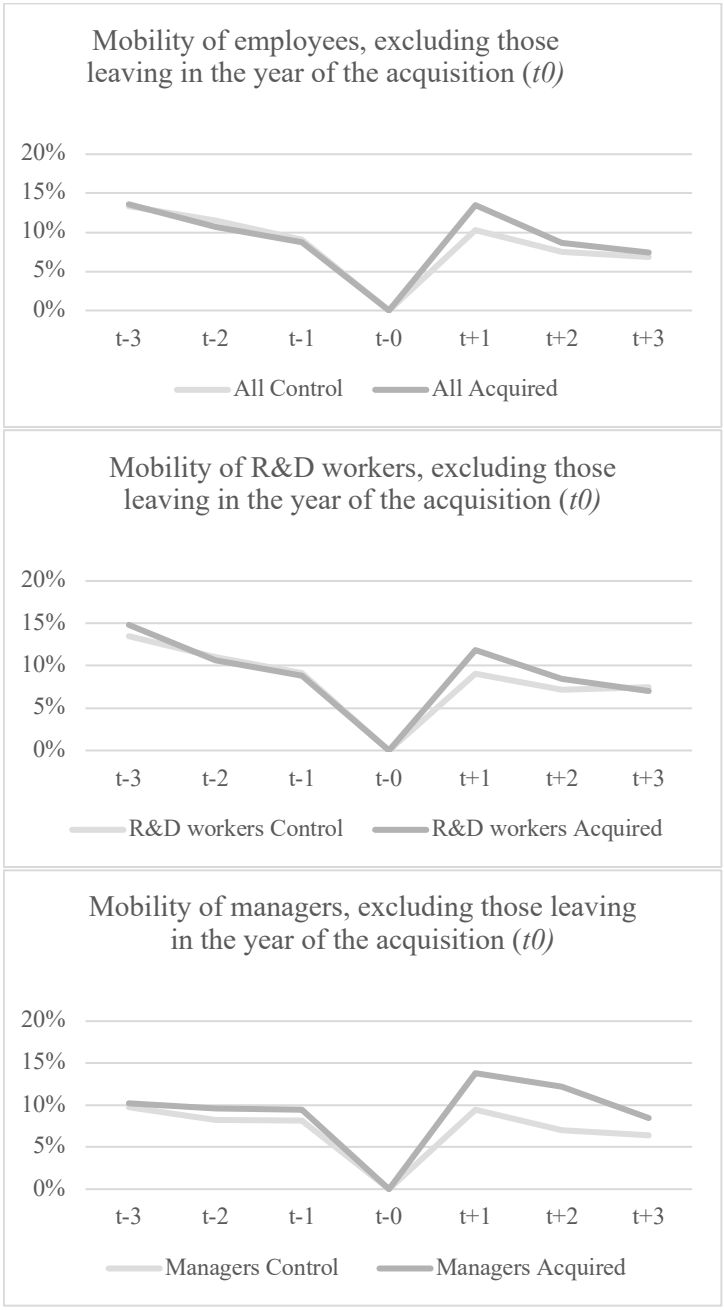


**Figure A3: Mobility rates of sample excluding employees leaving in the year of acquisition, t0**

Comparing all three sets of mobility rates (no restriction, excluding leavers to unemployment, excluding immediate leavers), we see that excluding mobility to unemployment reduces mobility in both the post-acquisition period and

in the year of the acquisition. This sampling restriction also reduces mobility in the pre-acquisition period where it is around one–two percentage points lower than without the restriction or when excluding employees that leave for unemployment. Excluding employees that leave to become unemployed produces post-acquisition mobility rates (with exception of t0) similar to the mobility rates in Figure 1 i.e., the rates without this sampling restriction. Therefore, any of our sampling restrictions make the sample more conservative in terms of an acquisition effect on mobility. Excluding all employees who (voluntarily or involuntarily) leave immediately on acquisition may underestimate post-acquisition mobility. Excluding employees who leave into unemployment is the less severe assumption/restriction. We therefore consider this a more appropriate restriction.

**Firm-level sample restrictions.** By excluding employees leaving to unemployment or leaving immediately on acquisition we tried to exclude employee lay-offs based on individual characteristics. Since excluding employees who (voluntarily or involuntarily) leave immediately on acquisition may underestimate mobility, we did not impose this restriction. However, overall mobility in a target in the year of the acquisition is a firm-level restriction that has a similar but less severe effect. Targets with very high or abnormal departure rates in the year of the acquisition may be subject to layoffs. Excluding employees working in such targets should reduce the likelihood of observing employee lay-offs. We define as abnormal mobility rates above the 75th percentile in an industry sector. Employees working in these targets are excluded. In line with the assumption that acquirers want to keep the most valuable human capital e.g., R&D workers, this restriction has almost no effect on R&D workers. That is, targets with at least five R&D workers are hardly affected by this restriction. Therefore, we consider exclusion of employees that leave for unemployment and withdrawal from the labor market as the most appropriate.

## Final sample

R&D workers are more likely to work in specific industries. In the analysis, we limited the sample to acquisitions in the ICT, manufacturing, and KBS sectors. These three sectors have the highest proportions of high- and intermediate-knowledge workers[10]. To capture R&D workers in establishments with a meaningful number of R&D activities, we restrict the sample to establishments with at least five R&D workers in the year prior to acquisition. We exclude R&D workers leaving for unemployment and those whose employment in the firm in the year of acquisition was not their primary job (this also includes employees who move abroad or choose early retirement) to limit the probability of observing involuntary departure. Overall, the sample includes 1,024 R&D workers in acquired establishments and 1,008 R&D workers in non-acquired establishments. Table A3 presents the descriptive statistics of the employees in the matched non-acquired establishments, and Table 1 presents the descriptive statistics of the R&D workers in acquired establishments. Note that as expected the observed mobility is lower than in the full sample of R&D workers without sampling restrictions.

Table A3 shows that one in five R&D workers is female. The average salary of R&D workers is higher than the average salary for the full sample (DKK 491,708 ~ USD72,000), reflecting the high skills of R&D employees. The mobility rate in the year of the acquisition is slightly lower than for the full sample (16% vs 18%) but higher than in other years. In the year of the acquisition, the mobility rate increases by approximately 62 percent compared to the previous year (12%).

[10]Across industry sectors, the average is 17.73%. ICT has an average knowledge-intensity of 23.96%, KBS 40.01%, and manufacturing 18.52%. The other two industry sectors with values above the overall mean are education (27.32%) and public administration and defense (20.77%) which are public sectors. The number of acquisitions in these sectors is low.

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *mean* | 0.113 | 0.186 | 0.951 | 499111.1 | 5.477 | 19.034 | 5.832 | 42.907 | 0.867 | 0.742 | 22.105 |
| *SD* | 0.317 | 0.389 | 0.215 | 166706.8 | 5.648 | 8.319 | 2.979 | 9.596 | 0.340 | 0.678 | 31.014 |
| (1) Female | 1 | 0.031 | -0.007 | -0.101 | -0.137 | -0.087 | 0.111 | -0.112 | 0.011 | -0.057 | -0.028 |
| (2) Mobility | 0.031 | 1 | -0.224 | -0.191 | -0.080 | -0.127 | 0.103 | -0.138 | -0.016 | -0.080 | -0.053 |
| (3) Full-time | -0.007 | -0.224 | 1 | 0.184 | -0.039 | -0.031 | -0.036 | -0.087 | 0.034 | 0.052 | 0.042 |
| (4) Salary | -0.101 | -0.191 | 0.184 | 1 | 0.316 | 0.270 | -0.074 | 0.264 | 0.006 | 0.046 | -0.005 |
| (5) Establishment tenure | -0.137 | -0.080 | -0.039 | 0.316 | 1 | 0.357 | -0.344 | 0.350 | 0.020 | -0.007 | -0.078 |
| (6) Years in labor market | -0.087 | -0.127 | -0.031 | 0.270 | 0.357 | 1 | 0.100 | 0.770 | -0.048 | 0.018 | -0.101 |
| (7) Prior mobility | 0.111 | 0.103 | -0.036 | -0.074 | -0.344 | 0.100 | 1 | -0.023 | -0.039 | -0.058 | -0.080 |
| (8) Age | -0.112 | -0.138 | -0.087 | 0.264 | 0.350 | 0.770 | -0.023 | 1 | -0.018 | 0.028 | -0.037 |
| (9) Core function | 0.011 | -0.016 | 0.034 | 0.006 | 0.020 | -0.048 | -0.039 | -0.018 | 1 | -0.303 | -0.060 |
| (10) R&D team diversity | -0.057 | -0.080 | 0.052 | 0.046 | -0.007 | 0.018 | -0.058 | 0.028 | -0.303 | 1 | 0.492 |
| (11) No. R&D worker in firm (t-1) | -0.028 | -0.053 | 0.042 | -0.005 | -0.078 | -0.101 | -0.080 | -0.037 | -0.060 | 0.492 | 1 |

*n = 1008 R&D workers in non-acquired establishments in the ICT, manufacturing and KBS sector*

**Table A3: Descriptive statistics, R&D workers in non-acquired establishments**

| | **Model 1** | . | . | **Model 2** | . | . | **Model 3** | . | . | **Model 4** | . | . |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se | Coeff | z | se | Coeff | z | se |
| Post | . | . | . | 0.395*** | [4.22] | [0.0935] | 0.243*** | [3.77] | [0.0644] | 0.133+ | [1.69] | [0.0786] |
| Acquired | . | . | . | . | . | . | 0.0712 | [0.97] | [0.0733] | -0.0766 | [-0.88] | [0.0875] |
| Post X acquired | . | . | . | . | . | . | . | . | . | 0.225* | [2.20] | [0.102] |
| Female | -0.0344 | [-0.24] | [0.143] | -0.0478 | [-0.60] | [0.0802] | -0.0292 | [-0.48] | [0.0602] | -0.0302 | [-0.50] | [0.0607] |
| Salary, log, t-1 | -0.159 | [-0.61] | [0.259] | -0.174 | [-1.31] | [0.132] | 0.0121 | [0.12] | [0.104] | 0.0066 | [0.06] | [0.105] |
| Establishment tenure | -0.0426** | [-2.60] | [0.0164] | -0.0379*** | [-3.85] | [0.00985] | -0.0343*** | [-5.15] | [0.00666] | -0.0344*** | [-5.19] | [0.00662] |
| Years in labor market | -0.0145 | [-1.62] | [0.00894] | -0.0110* | [-2.41] | [0.00456] | -0.0120*** | [-3.66] | [0.00329] | -0.0121*** | [-3.66] | [0.00331] |
| Prior mobility | 0.0390+ | [1.68] | [0.0232] | 0.0116 | [1.11] | [0.0104] | 0.0203* | [2.49] | [0.00815] | 0.0204* | [2.50] | [0.00816] |
| Intermediate know. | -0.226 | [-1.10] | [0.206] | 0.000748 | [0.01] | [0.104] | 0.150* | [2.13] | [0.0704] | 0.151* | [2.14] | [0.0709] |
| No. RD worker in t-1 | -0.00342 | [-1.31] | [0.00261] | -0.000667 | [-0.51] | [0.00130] | -0.000545 | [-0.53] | [0.00103] | -0.000559 | [-0.55] | [0.00102] |
| Av. salary in establishment (t-1) | 0.100 | [0.17] | [0.589] | -0.0312 | [-0.10] | [0.306] | -0.0542 | [-0.27] | [0.198] | -0.0624 | [-0.32] | [0.197] |
| Related acquisition | -0.305 | [-0.67] | [0.457] | -0.0947 | [-0.45] | [0.209] | -0.362** | [-2.71] | [0.134] | -0.366** | [-2.73] | [0.134] |
| Establishment size, log | 0.0182 | [0.22] | [0.0843] | -0.0617 | [-1.35] | [0.0458] | -0.0506+ | [-1.95] | [0.0259] | -0.0495+ | [-1.91] | [0.0258] |
| Establishment age, sq | -0.000389 | [-1.23] | [0.000317] | -0.000294+ | [-1.70] | [0.000173] | -0.000166+ | [-1.66] | [0.0000998] | -0.000176+ | [-1.74] | [0.000101] |
| Rural | -0.0693 | [-0.32] | [0.213] | -0.182+ | [-1.67] | [0.109] | -0.136+ | [-1.90] | [0.0714] | -0.140+ | [-1.96] | [0.0717] |
| Establishment growth controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| _cons | 0.347 | [0.04] | [7.920] | 2.268 | [0.56] | [4.014] | 0.223 | [0.08] | [2.673] | 0.529 | [0.20] | [2.664] |
| / | . | . | . | . | . | . | . | . | . | . | . | . |
| lnsig2u | -0.193 | [-0.24] | [0.807] | -2.731** | [-3.19] | [0.857] | -2.517*** | [-5.11] | [0.493] | -2.479*** | [-5.15] | [0.481] |
| *N* | 2518 | | | 4549 | | | 8908 | | | 8908 | | |
| *Sample* | *R&D workers in acquired establishments, post-period* | | | *R&D workers in acquired establishments, pre- and post-period* | | | *R&D workers in acquired and matched non-acquired establishments in the pre- and post-period* | | | *R&D workers in acquired and matched non-acquired establishments in the pre- and post-period* | | |

*Employees moving to unemployment are excluded, Standard errors clustered by establishments.*

*+ p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.*

*Acquisition* is a dichotomous variable taking the value 1 if an individual has worked in an acquired workplace during the sample period and 0 otherwise. Post takes the value 1 from the year after the matching onwards, i.e., for employees in acquired establishments, that is with the year of the acquisition. Other variables are descripted in the Method section.

**Table A4: Panel probit models testing the effect of acquisitions on mobility**

## Sample validation

To investigate whether our sample is consistent with the observations made in other studies of post-acquisition mobility, we investigate the effect of acquisitions on mobility. The effect is expected to be positive. Analogous to the main analysis, we use a random-effects probit model with standard-errors clustered by establishment. Table A4 presents the results. Model 1 is the model including only the control variables and using the sample of acquired R&D workers in the post-acquisition period. In line with the assumption that R&D workers with longer establishment tenure accumulate more firm-specific knowledge, the coefficient of *tenure in establishment* is negative and significant. The coefficient of *prior mobility* is positive and significant at the 10-percent level, suggesting that R&D workers that were mobile in the past will be more likely to leave after acquisition. Model 2 includes both pre- and post-acquisition periods. Again, only acquired R&D workers are included in the analysis. The coefficient of *post* is positive and significant. Thus, we reject the null-hypothesis that acquisition does not increase mobility. Models 3 and 4 include the R&D workers in matched non-acquired establishments. In Model 3, the coefficient of *post* are positive and significant. The coefficient of *acquired* is insignificant, suggesting that acquired R&D workers are generally not less likely to leave the firm (selection effect). In Model 4 the coefficient of the interaction term *post X acquired* is significant and positive, supporting the common assumption that acquisitions increase R&D workers' mobility.

The magnitude and significance of the interaction effect in Figure s A4 and A5 is in line with Ai and Norton (2003) and Norton, Wang, and Ai (2004) respectively. The results are based on a pooled model that incudes the variables included in model 4 with standard-errors clustered at the individual-establishment level. Figure A4 shows that most of the interaction effect occurs at the lower end of the predicted levels of mobility likelihood (90% up to .16), and the effect is positive for all observations. In terms of significance (Figure A5),

approximately 95 percent of cases show significant results (z > 1.65, corresponding to p < .1) with 90 percent of cases significant at the 5%-level.

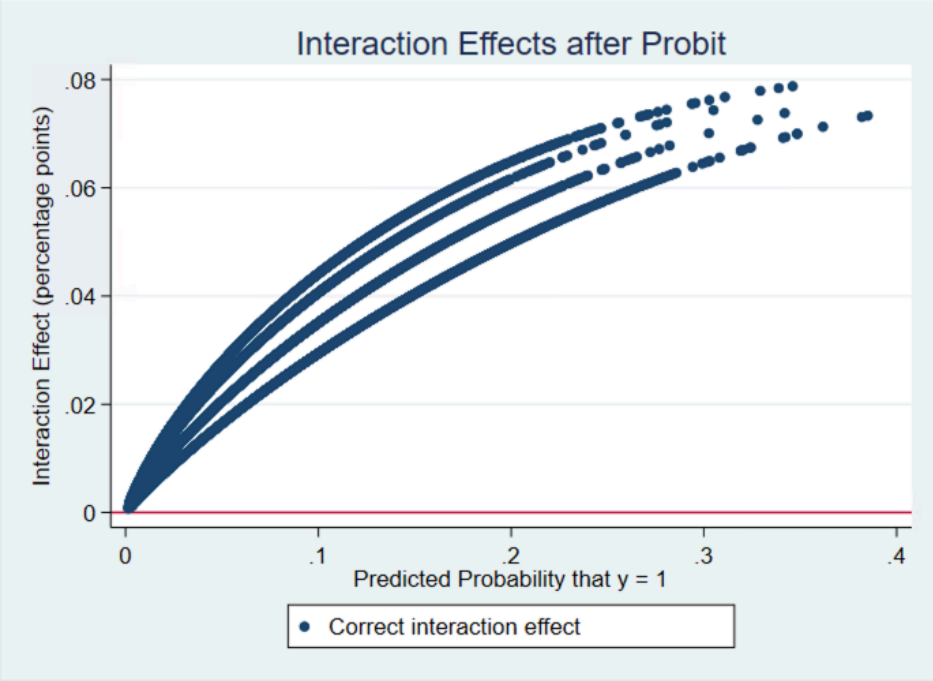


**Figure A4: Magnitude of the interaction effect (Acquired X post)**

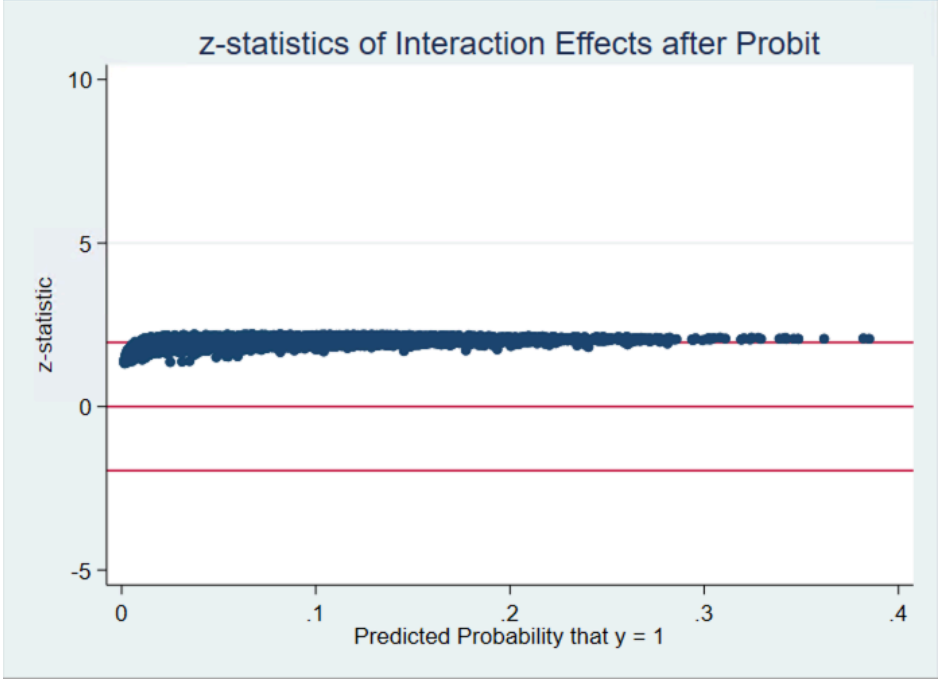


**Figure A5: Significance of the interaction effect (Acquired X post)**

# Appendix B: Additional analyses

| . | **Model 1** | . | . | **Model 2** | . | . |
|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se |
| R&D team diversity (firm) | . | . | . | -0.711** | [-3.09] | [0.230] |
| Establishment tenure | -0.0470** | [-2.63] | [0.0179] | -0.0371* | [-2.11] | [0.0176] |
| Female | -0.0522 | [-0.36] | [0.144] | -0.0273 | [-0.20] | [0.139] |
| Salary (log) | -0.125 | [-0.48] | [0.259] | -0.111 | [-0.40] | [0.275] |
| Years in labor market | -0.0141 | [-1.59] | [0.00887] | -0.0160+ | [-1.83] | [0.00874] |
| Prior mobility | 0.0390+ | [1.72] | [0.0227] | 0.031 | [1.38] | [0.0224] |
| Intermediate know. Worker | -0.161 | [-0.76] | [0.210] | 0.0265 | [0.14] | [0.194] |
| No. R&D worker (t-1) | -0.00495 | [-1.56] | [0.00317] | -0.00723* | [-2.16] | [0.00335] |
| Av. salary in establishment (t-1, log) | 0.591 | [0.87] | [0.683] | 0.651 | [0.91] | [0.719] |
| Related acquisition | -0.205 | [-0.47] | [0.434] | -0.367 | [-0.78] | [0.472] |
| Establishment size (t-1, log) | 0.0696 | [0.76] | [0.0913] | 0.257* | [2.17] | [0.119] |
| Firm age, sq | -0.211 | [-1.08] | [0.196] | -0.105 | [-0.56] | [0.187] |
| Rural (t-1) | -0.365 | [-1.43] | [0.255] | -0.0062 | [-0.03] | [0.238] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES |
| _cons | -5.673 | [-0.61] | [9.304] | -6.878 | [-0.70] | [9.835] |
| / | . | . | . | . | . | . |
| lnsig2u | -0.158 | [-0.23] | [0.683] | -0.147 | [-0.22] | [0.659] |
| *N* | 2518 | . | . | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period. Diversity is calculated at the firm-level.*

$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**Table B1: The effect of R&D diversity (firm-level) on post-acquisition mobility of R&D workers**

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| DV = Mobility | Coeff | z | se | Coeff | z | se | Coeff | z | se |
| Dominant expertise (firm, 4-digit) | -0.383 | [-1.11] | [0.344] | . | . | . | . | . | . |
| R&D diversity X dominant expertise, 4-digit | 0.363 | [1.37] | [0.265] | . | . | . | . | . | . |
| Dominant expertise (firm, 3-digit) | . | . | . | -0.542 | [-1.51] | [0.359] | . | . | . |
| R&D diversity X dominant expertise, 3-digit | . | . | . | 0.669* | [2.43] | [0.275] | . | . | . |
| Core expertise (firm) | . | . | . | . | . | . | -0.727+ | [-1.76] | [0.412] |
| Core expertise X R&D diversity | . | . | . | . | . | . | 0.575* | [1.96] | [0.293] |
| R&D team diversity (firm) | -0.948** | [-3.23] | [0.293] | -1.221*** | [-3.48] | [0.351] | -1.216** | [-3.24] | [0.375] |
| Establishment tenure | -0.0368* | [-2.07] | [0.0178] | -0.0380* | [-2.17] | [0.0175] | -0.0370* | [-2.09] | [0.0177] |
| Female | -0.00925 | [-0.07] | [0.139] | -0.0301 | [-0.21] | [0.141] | -0.00786 | [-0.06] | [0.137] |
| Salary (log) | -0.115 | [-0.41] | [0.281] | -0.101 | [-0.38] | [0.268] | -0.1 | [-0.36] | [0.274] |
| Years in labor market | -0.0159+ | [-1.83] | [0.00871] | -0.0143+ | [-1.65] | [0.00867] | -0.0153+ | [-1.78] | [0.00864] |
| Prior mobility | 0.0314 | [1.39] | [0.0226] | 0.0338 | [1.53] | [0.0222] | 0.0314 | [1.41] | [0.0224] |
| Intermediate know. Worker | 0.0229 | [0.12] | [0.198] | 0.146 | [0.72] | [0.203] | 0.00731 | [0.04] | [0.202] |
| No. R&D worker (t-1) | -0.00722* | [-2.13] | [0.00339] | -0.00672* | [-2.02] | [0.00333] | -0.00699* | [-2.10] | [0.00333] |
| Av. salary in establishment (t-1, log) | 0.651 | [0.91] | [0.716] | 0.562 | [0.80] | [0.703] | 0.645 | [0.90] | [0.715] |
| Related acquisition | -0.372 | [-0.78] | [0.478] | -0.369 | [-0.79] | [0.470] | -0.36 | [-0.76] | [0.474] |
| Establishment size (t-1, log) | 0.251* | [2.12] | [0.118] | 0.248* | [2.11] | [0.117] | 0.248* | [2.09] | [0.119] |
| Firm age, sq | -0.106 | [-0.56] | [0.188] | -0.105 | [-0.57] | [0.186] | -0.0951 | [-0.50] | [0.190] |
| Rural (t-1) | -0.0216 | [-0.09] | [0.235] | -0.0588 | [-0.25] | [0.232] | -0.0108 | [-0.05] | [0.238] |
| Workplace growth controls | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Acquisition year controls | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| _cons | -6.434 | [-0.65] | [9.835] | -5.304 | [-0.55] | [9.620] | -6.282 | [-0.64] | [9.791] |
| / | . | . | . | . | . | . | . | . | . |
| lnsig2u | -0.16 | [-0.24] | [0.666] | -0.195 | [-0.29] | [0.676] | -0.172 | [-0.26] | [0.674] |
| *N* | 2518 | . | . | 2518 | . | . | 2518 | . | . |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period. Diversity is calculated at the firm-level.*

*Note on variables: Dominant expertise (4-digit) is calculated at the firm level and based on the 4-digit occupation code similar to the variable used in the main specification (see Table 4). Dominant expertise (3-digit) is calculated at the firm level based on the 3-digit occupation code. This variable, thus lies approximately in the middle of core expertise (also based on the 3-digit occupation code) and dominant expertise at the 4-digit level.*

*Interpretation: Model 1 shows that R&D workers with dominant expertise (4-digit) are not more likely to leave firms with a more diverse set of R&D workers. Model 2 and Model 3 show that, when the set of expertise is defined as dominant or core is larger (based on 3-digit level), R&D workers with this expertise are more likely to leave firms with more diverse R&D workers.*

$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

**Table B2: Positions and R&D workers' likelihood of leaving after an acquisition**

| | Model 1 | | |
|---|---|---|---|
| DV = Mobility | Coeff | z | se |
| R&D team diversity (firm) | -0.890** | [-3.22] | [0.276] |
| Establishment tenure | -0.0876* | [-2.24] | [0.0391] |
| R&D diversity X tenure | 0.0408+ | [1.75] | [0.0233] |
| Female | -0.0214 | [-0.16] | [0.134] |
| Salary (log) | -0.0614 | [-0.23] | [0.267] |
| Years in labor market | -0.0175* | [-2.02] | [0.00864] |
| Prior mobility | 0.0354 | [1.61] | [0.0220] |
| Intermediate know. Worker | 0.0289 | [0.16] | [0.181] |
| No. R&D worker (t-1) | -0.00627* | [-1.99] | [0.00316] |
| Av. salary in establishment (t-1, log) | 0.525 | [0.76] | [0.686] |
| Related acquisition | -0.379 | [-0.82] | [0.462] |
| Establishment size (t-1, log) | 0.229* | [2.06] | [0.111] |
| Firm age, sq | -0.0804 | [-0.45] | [0.179] |
| Rural (t-1) | -0.0046 | [-0.02] | [0.233] |
| Workplace growth controls | YES | YES | YES |
| Acquisition year controls | YES | YES | YES |
| _cons | -5.742 | [-0.62] | [9.333] |
| / | . | . | . |
| lnsig2u | -0.272 | [-0.41] | [0.657] |
| *N* | 2518 | | |

*Employees moving to unemployment and without primary employment in t0 are excluded; targets with at least five R&D workers. All models include R&D workers in acquired targets in the post-acquisition period.*

$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

## Table B3: Tenure and R&D workers' likelihood of leaving after an acquisition

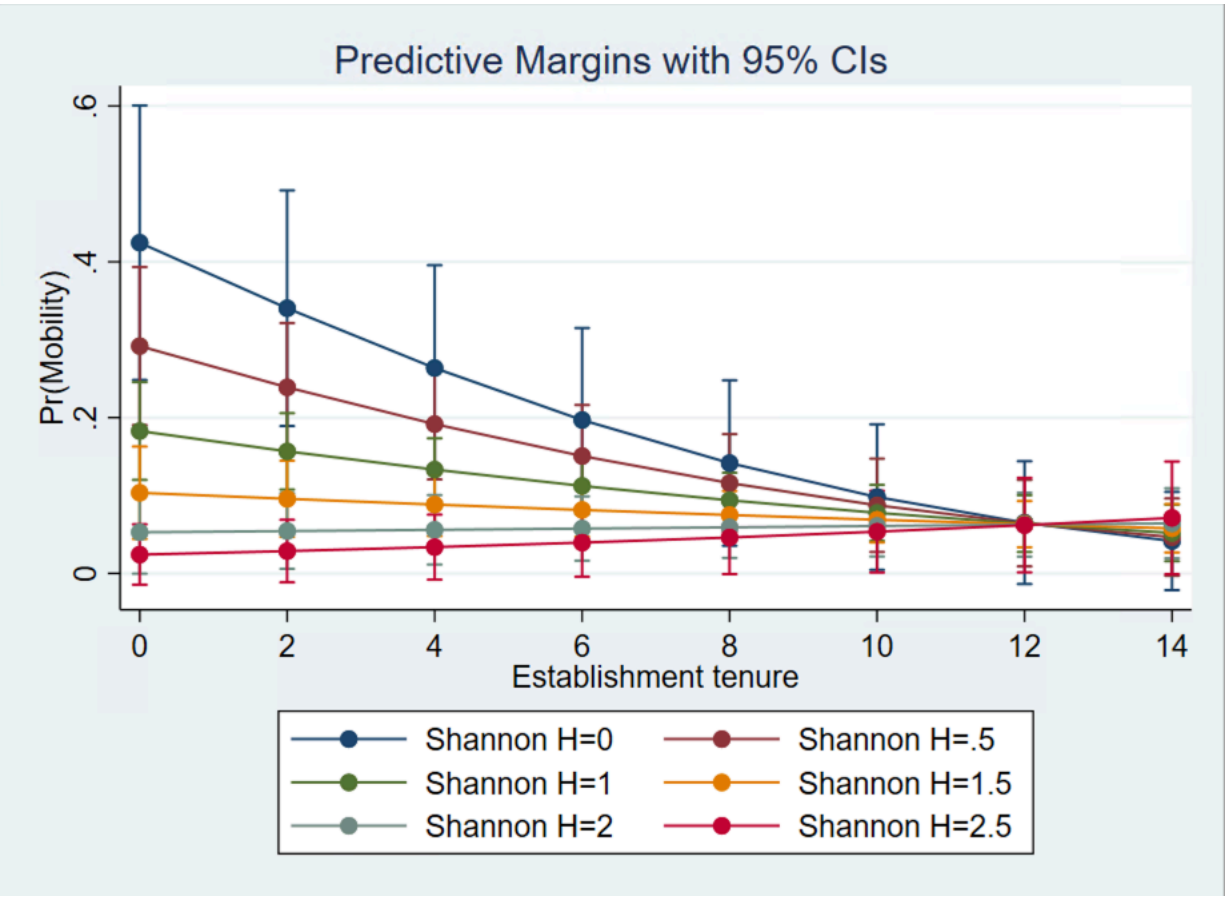


**Figure B1: Predictive margins of tenure at different levels of R&D diversity in the year of the acquisition**

Chapter 3

# Is industry-specific knowledge important for new venture success?

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# Abstract

We examine the population of new ventures in Danish knowledge-intensive sectors from 2009-2015. Although we replicate findings that new ventures employing individuals with industry experience are more likely to survive, our results cast doubt as to whether employee industry-specific knowledge is the underlying causal mechanism—as advanced in the current literature. We base this on the following findings: (a) only a small fraction of new ventures hire industry experience, (b) knowledge workers often switch industries, (c) new subsidiaries of established firms exhibit similar patterns, (d) industry experience correlates with future turnover, and (f) realized turnover is a better predictor of venture survival than industry experience. We propose that turnover is the causal mechanism underlying the industry experience-survival relationship and that industry experience correlates with venture survival because of assortative matching (i.e., employers with industry experience are better able to identify ventures that are more likely to succeed).



## Keywords

New ventures, industry experience, labor mobility, venture survival, industry-specific knowledge

## Acknowledgement

We thank Gary Dushnitsky, Mosche Barach, H.C. Kongsted, Francesco Di Lorenzo and seminar participants at the BYU-Utah Winter Strategy Conference and the University of Minnesota for helpful comments.

# Introduction

The primary asset of many new ventures—especially those in knowledge-based industries—is the knowledge and experience of their founders and initial employees (Agarwal, Echambadi, Franco, & Sarkar, 2004; Brüderl, Preisendörfer, & Ziegler, 1992; Klepper & Sleeper, 2005). Several studies show that ventures are more likely to survive (Brüderl et al., 1992; Cooper, Gimeno-Gascon, & Woo, 1994; Delmar & Shane, 2006; Gimeno, Folta, Cooper, & Woo, 1997) and grow (Agarwal, Campbell, Franco, & Ganco, 2016; Colombo & Grilli, 2005) if founded or staffed by individuals with previous industry experience. The conclusion drawn from these studies is that new ventures benefit from hiring employees with previous industry experience because of their industry-specific knowledge (Brüderl et al., 1992; Delmar & Shane, 2006; Honoré & Ganco, 2020). Yet, if industry-specific knowledge is beneficial and hirable, why do not all ventures have industry-specific knowledge?

We aim to advance the literature by examining this question through a systematic investigation of the origins of the talent in new ventures, the likelihood that it leaves, and its destination if it leaves. This allows us to assess if the current interpretation that employee industry-specific knowledge enhances venture success is consistent with all of these data. This is an open question because, despite theorizing about industry-specific *knowledge*, studies usually measure industry-specific *experience* without confirming that industry-specific knowledge is the underlying mechanism versus plausible alternatives. Moreover, it allows us to gain an understanding of the prevalence of industry experience in new ventures. The nature of our investigation also provides us with empirical grounding to identify potential alternative mechanisms that could lead to the correlation between employee industry experience and venture survival.

To draw these empirical insights, we utilize an especially rich and comprehensive data set that tracks the population of new ventures and all of their

employees in Denmark. These data provide the work history of all employed by a new venture (including the founder if this is their primary employment) and their work history if they leave a venture.[1] In addition, the richness of these data allows us to calibrate industry experience of new venture employees to a meaningful counterfactual. The comparison group is the population of new establishments of existing companies (i.e., new subsidiaries) and the industry experience of their employees.

Our investigation focuses on knowledge-intensive workers in knowledge intensive industries because employees' industry-specific knowledge appears especially pertinent in these settings. Although we replicate existing findings and show that industry experience is associated with venture survival, we find that only a small fraction of employees who join new ventures have experience in the same industry as the new venture. We also find that only 16 percent of new ventures have at least one knowledge-intensive worker with industry experience. Moreover, this pattern seems not just to reflect new ventures' resource constraints because it holds for new ventures and new subsidiaries of existing companies. Although new subsidiaries have more employees with industry experience, the difference is largely due to redeployment of existing employees. We also find that knowledge-intensive workers who leave new ventures or new subsidiaries are more likely to move outside of the industry than stay within the industry.

Our findings show high levels of mobility among knowledge-intensive workers across industries, which questions the conclusion of the benefits or pervasiveness of industry-specific knowledge. Although extant work emphasizes the importance of industry specific knowledge, our findings cast doubt

[1] Compared to many studies, our data provide information on occupation type. The granularity of the data mean that we do not have to infer employees' occupation characteristics based on wage data, or consider all initial hirings to be of equal importance to the venture—both of which are common assumptions in previous analyses.

on whether possession of industry-specific knowledge is the underlying casual mechanism for the well-documented relationship between employee industry experience and new venture survival. We find evidence of an alternative causal mechanism—turnover. Industry experience correlates with the likelihood of future turnover; and, in turn, turnover is a better predictor than industry experience of venture survival. This leads us to propose that the underlying mechanism leading to the correlation between industry experience and survival is a selection effect. Employees with industry experience are better able to assess the likelihood of venture success compared to employees without industry experience. As a result, they are more likely to join new ventures poised to succeed. Although this prediction is consistent with the entire set of empirical relationships that we present, we must rely on future research to test it because we derive this hypothesis from the data that we present.

Our efforts are one step towards the identification of the causal mechanism underlying the industry-experience venture-survival relationship, which is consistent with recent calls for building cumulative body of knowledge (Bettis, Helfat, & Shaver, 2016; Shaver, 2020). We also discuss how the insights from our efforts have implications for other studies in the field of strategic human capital, which hypothesize how individuals' experience affect firm competitiveness.

# Background

Human capital is a key asset allowing firms to create and maintain competitive advantage. This is especially relevant in knowledge intensive industries where not all knowledge can be codified and is instead embedded in firm employees. This makes the firm's knowledge pool dependent on its recruitment and retention of employees, which highlights the importance of employees' prior experience.

The literature on human capital and new ventures suggests that an employee's prior industry experience benefits the new venture by enabling exploitation of industry-specific knowledge and existing opportunities, and fostering recognition of new opportunities. Numerous studies associate prior industry experience of the founding team and initial hires with greater success (Agarwal et al., 2004; Chatterji, 2009; Colombo & Grilli, 2005; Cooper et al., 1994). The type of experience vital to venture success includes knowledge about technology (Agarwal & Shah, 2014), markets (Agarwal et al., 2004; Klepper & Sleeper, 2005), regulation and marketing (Chatterji, 2009). Also, the stream of work on spin-offs or intra-industry venture establishment, assumes that former employees leverage their prior knowledge in the new venture (Klepper & Thompson, 2010).

The labor mobility literature argues that industry experience benefits are not limited to founders but also apply to new hires because "hiring facilitates a firm's overall 'absorptive capacity' in a knowledge domain (Cohen & Levinthal, 1989)" (Singh & Agrawal, 2011, p. 147). Learning from hiring refers to the idea that newly recruited employees with experience in another firm carry their knowledge to the new employer and further exploit their ideas (Singh & Agrawal, 2011). The following findings support the idea that new ventures benefit from their new hires' prior industry experience. First, industry-specificity increases employee compensation which suggests that industry-specific employees perform better in a focal industry than employees with less industry-specific experience (Honoré & Ganco, 2020; Parent, 2000). Second, new ventures whose founders have extensive industry experience attract more experienced employees (Honoré & Ganco, 2020).

The positive relationship between industry experience and survival of new ventures proposed in the entrepreneurship literature reflects all these potential benefits of industry-specific knowledge (Brüderl et al., 1992; Cooper et al., 1994; Delmar & Shane, 2006). We turn to the data to examine the industry

experience and staffing of new ventures to better understand of the nature of this relationship.

# Research design

## Data and sample

We construct a comprehensive dataset based on matched employee-employer register data (or IDA data) provided by Statistics Denmark. IDA provides annual information on firms, the establishments (i.e., subsidiaries) belonging to a firm, and all employees working in establishments belonging to a firms.[2] The quality and reliability of these Danish data have been acknowledged internationally (see Dahl, 2011) and have been recognized as a reliable data source in social science (Kaiser, Kongsted, Laursen, & Ejsing, 2018; Sørensen, 2007).

Similar to the United States (US), Denmark has flexible labor regulations which make hiring (and firing) of employees easier than in most other European countries. In terms of the conditions for starting a venture, the World Bank (2018, 2020) ranks Denmark 34$^{th}$ in the world, which is lower than the United Kingdom (UK) (14$^{th}$) but higher than the US (49$^{th}$). Both UK and US data have been used to study new ventures; because Denmark ranks between these two nations, we consider it a suitable context for our study.

Our data include information on date of the firm's legal creation. We use this information to identify new establishments created in year *t* by a firm created in the same year.[3] We refer to this type of new establishment as a *new*

[2] Statistics Denmark registers individual employment in the last week of November each year.

[3] An establishment is defined as the same establishment in the following year if one of the following conditions is met 1) owner and industry remain the same, 2) owner and at least 30% of the workforce remain the same, or 3) 30% of the workforce and address code or industry remain the same.

*venture*. We also use this information to identify new establishments created by existing firms, henceforth referred to as *new subsidiaries*. We use the sample of new subsidiaries to provide a meaningful counterfactual in order to calibrate human capital in new ventures. Our sample includes all new establishments (new ventures and new subsidiaries) created between 2009 and 2015 with at least five employees (Dahl, 2011).[4] We exclude establishments that had an owner in the year prior to establishment creation to eliminate takeovers of closed establishments in the same industry and establishments created via separation (either internal or external to the company).

We link the establishment-level and employee-level data to identify employees working in the establishment in the year of its creation. We exclude employees younger than 16 years in any year and older than 60 in 2008 which mitigates the risk that employees leave the labor market because of (early) retirement. Finally, we exclude the spouses of establishment owners who work in the same new establishment, and individuals on sick-leave, maternity leave, or for other reasons are temporarily outside of the workforce.[5] The sample includes 41,189 individuals in 5,028 new establishments.

## Industry sampling

To further restrict our sample, we use Statistics Denmark's grouping that segments the economy into 19 sectors. The segments are based on the 4-digit NACE rev. 2, which is based on the UN industry nomenclature ISIC rev. 4 and applies to all EU member states since 2008. Appendix Table A1 presents the 19 sectors. Because most studies discuss the importance of industry expe-

[4] A 2007 municipal reform led to a change in address codes and overestimation of newly created establishments in that year. 2015 was the most recent year of establishment account statistics when we initiated this project. Other statistics are available until 2016.

[5] The restrictions described here are rarely binding and do not affect our results substantively.

rience with respect to skilled jobs, our focus is on three sectors with proportions of high-knowledge jobs (defined by occupation classification) above the mean.[6] These are information and communication technologies (ICT), knowledge-based services (KBS), and manufacturing. These three sectors account for approximately 12 percent of new establishments in Demark between 2009 and 2015. Although the accommodation and catering, and wholesale and retail sectors account for almost two-thirds of new establishments, these sectors have very low levels of knowledge intensity.

Focusing on the ICT, KBS, and Manufacturing sectors provides a sample of 665 new establishments employing 4,691 individuals. New establishments are relatively small-sized: across all three sectors, new establishments have an average of 7.92 employees with establishments in the 10$^{th}$ and 90$^{th}$ percentiles employing respectively 5 and 13 employees. The average size of a new establishment does not differ significantly between new ventures and new subsidiaries ($p$ = .78, two-sided).

To measure industry experience, we use Statistics Denmark's 6-digit classification, which categorizes the economy into 726 industries and is a more refined classification than the sector measure. Based on this 6-digit classification, the number of industries lies roughly in the middle of the US SIC-level-3 and SIC-level-4 codes which group establishments in 413 and 1,005 industries, respectively. We provide an example of the grouping used to define in-

[6] The Danish occupation classification is based the International Labor Organization International Standard Classification of Occupations, and categorizes individuals as: employed, unemployed, and outside the workforce. Employed is split among self-employed, working spouses, and employees at different skill levels. The skill level provides information on job position, e.g., employees in managerial positions, highest-knowledge requiring (professional, e.g., engineer, software developer, lawyer), medium-knowledge requiring (technician and associate professional), and basic-knowledge requiring positions (ordinary office and customer service work), manual labor, labor without further specifications (other wage-earners), and non-primary appointments.

dustry experience. We consider an employee working in "Architectural activities" (DB07 71.11.00) as employed in a different industry from an employee working in "Consulting engineering activities with production and machinery technique" (DB07 71.12.20), "Mounting and delivery of ready-made production plants" (DB07 71.12.30), "Geologic surveying activities and prospecting, chartered surveyors, etc." (DB07 71.12.40), or "Other technical consultancy" (DB07 71.12.90). However, all are included in the KBS sector. Appendix A Table A2 provides examples of KBS sector industry classifications.

# Analysis and findings

## Survival of new establishments

To calibrate that our data are consistent with existing research, we start by confirming that employee industry experience is positively associated with new venture survival. Because our analysis focuses on knowledge-based industries, we expect the industry experience from the following occupational categories to be most valuable: (1) high-knowledge workers (e.g., engineer, software developer, lawyer), (2) intermediate knowledge workers (e.g., technician, associate professional), and (3) managers. We consider these our *focal employees*.

To analyze the relationship between industry experience and venture success, we use venture survival as our dependent variable and industry experience as our independent variable. Venture survival takes the value 1 if the venture survives for the first three years after its establishment and 0 if the venture ceases to exist within three years of establishment (because we focus on new ventures, we do not code acquisitions as failures). We define ventures with industry experience as establishments that employed at least one focal employee, including founders, whose previous job was in the same industry based on the 4-digit industry classification. We include in the model the number of employees in *t0* to control for the initial size of the new venture. The rural-area dummy accounts for potential differences in the labor market options of employees in new ventures located in rural or more populated areas, which might affect the venture's employee composition. We include dummies for year of establishment to control for time period effects. Because sector dummies neither improved model fit nor changed interpretation of the coefficients, we do not include them in our specifications.

Table 1 presents the results. For ventures with an employee with industry experience, the odds of venture survival are more than twice as high as for ventures without such experience (odds ratio = 2.18). The simple descriptive

statistics are in line with this result. Eighty-eight percent of new ventures with industry experience survive for at least one year after establishment compared to 78 percent of ventures without such experience. This confirms that our data are consistent with prior research (Brüderl et al., 1992; Cooper et al., 1994; Delmar & Shane, 2006).

| | **Model 1** | | | **Model 2** | | |
|---|---|---|---|---|---|---|
| | β (logit) | OR | p | β (logit) | OR | p |
| At least one focal employee with industry experience | | | | 0.7797 | 2.1808 | .037 |
| No. employees in *t0* (log) | -0.4779 | 0.6201 | 0.131 | -0.4714 | 0.6241 | 0.129 |
| Venture in rural area | -0.0483 | 0.9528 | 0.848 | 0.0016 | 1.0016 | 0.995 |
| Year of establishment controls | YES | YES | Insig, except 2015 | YES | YES | Insig, except 2015 |
| Constant | 1.0176 | 2.7666 | 0.179 | 0.8385 | 2.3131 | 0.259 |
| Pseudo R^2 | 0.054 | | | 0.0661 | | |
| Log pseudolikelihood | -196.0187 | | | -193.5976 | | |

n=309 new ventures
DV = Survival within the first 3 years after establishment
Logistic regression with robust standard errors.

**Table 1: Venture survival within the first three years**

To investigate whether more industry experience is advantageous, we identify new ventures with at least two focal employees previously employed in the same industry. Re-estimation of the survival analysis in Table 1 shows that the estimated coefficient of ventures with two or more employees with industry experience is not significantly different from the coefficient of ventures with one focal employee with industry experience. In our data, more employees with industry experience is not associated with increased survival.

*Take-away #1: Industry experience is associated with new venture survival. However, more industry experience does not increase survival.*

## Workforce in new establishments

Having confirmed the experience-performance relationship, we provide a more complete description of the composition of the workforce in the new venture. Table 2 presents data on the occupation classifications of employees in the year of venture establishment pooled across the three focal sectors. We break down the data for each occupation classification of the focal workers. We combine all other occupation categories into an "other" category, which we use as our reference group. Occupations in this category include basic knowledge workers, manual workers, and other wage earner without further job descriptions.

| Worker type | |
|---|---|
| High-knowledge | 15.22% |
| Intermediate-knowledge | 7.45% |
| Manager | 3.56% |
| Other | 73.76% |
| Total | 100.00% |

*Determined by employment in year of establishment, n = 2161 (employees) in 309 new ventures*

**Table 2: Occupation classifications of employees in new ventures**

In line with our sampling choice, approximately 15 percent of the workforce is in the high-knowledge category. An additional 11 percent of the workforce has a managerial or intermediate-knowledge position. The remaining three quarters of the workforce (74%) are in other occupation classifications. Based on an average venture size of eight, this suggests that a venture has one high-knowledge worker and one intermediate-knowledge worker or manager.

## Origins of employees in new ventures

Having described the nature of the data that underlies our analyses, we investigate the origins of new venture workforces. To assess this, we identify the industry in which the employee worked immediately before joining the

new establishment.[7]

We define employees as coming from "the same industry" if their previous employment was in the same 4-digit industry in line with the analysis in Table 1. To provide more fine-grained insights, we identify whether the employee worked previously in a related industry, an unrelated industry, or was previously not employed in the Danish economy. We measure industry relatedness based on occupation overlaps across industries. Appendix B describes how we build this measure and two alternative measures, which provide similar insights. We define employees as coming from "other" if they were not employed in Denmark immediately before recruitment by the new venture. These individuals might have been unemployed, retired (early), in full-time education, or working in in another country (outside the Danish labor force).

| Worker type | From same industry | From related industry | From unrelated industry | From other | Total |
|---|---|---|---|---|---|
| High-knowledge | 13.07% | 38.91% | 36.47% | 11.55% | 100% |
| Intermediate-knowledge | 11.18% | 30.43% | 47.83% | 10.56% | 100% |
| Manager | 14.29% | 45.45% | 32.47% | 7.79% | 100% |
| Other | 9.28% | 15.06% | 42.66% | 33.00% | 100% |

*n = 2161 (employees) in 309 new ventures*

**Table 3: Origin of employees in new ventures**

Table 3 presents data for the 2,161 employees in new ventures. A small fraction (13%) of high-knowledge employees come from within the same industry; 39 percent come from a different but related industry. More than a third of high-knowledge employees come from an unrelated industry (36%),

[7] The literature uses various approaches to measuring industry experience including dichotomous measures indicating whether the prior employment was in the same industry, and counts of years spent working in an industry. Most strategic human capital studies rely on industry experience measures based on immediate prior employment as do we. To check sensitivity, we also employed used longer time periods of 4 years (e.g., Dahl & Reichstein, 2007) and 10 years to define industry experience. The findings are mostly unchanged using these alternative measures.

and the remaining 12 percent of high-knowledge workers were not in the Danish workforce immediately before joining the new venture. We find a similar pattern for intermediate-knowledge and managerial workers, with respectively only 11 percent and 14 percent coming from the same industry. The majority of intermediate-knowledge workers come from unrelated industries; whereas the majority of managers come from related industries.

Although the proportion of talent coming from the same industry is low for focal employees (i.e., employees in high-knowledge, intermediate-knowledge, and managerial positions), as expected, their numbers are higher than in the "other" category. Only 9 percent of workers in other occupations come from the same industry with 15 percent coming from a different but related industry. This is statistically different from focal employees ($p = .021$, $p < .0001$, respectively).

To investigate whether new ventures with related-industry experience have survival advantages, we identify new ventures without a focal employee with industry experience but with at least one focal employee with related-industry experience. The survival analysis shows that these establishments do not have a survival advantage (see Appendix A, Table A3).

Table 4 presents the percentage of ventures with at least one employee with industry experience for each occupation category. We find that only 11 percent of new ventures have at least one high-knowledge worker with industry experience. Fewer new ventures have an intermediate-knowledge worker (6%) or manager (3%) with prior industry experience. The fraction of new ventures with an employee with industry experience in the "other" category is larger than in the other occupation groups (25%)—likely, because most employees fall into this category. However, this is a relatively low number in absolute terms, also these are generally not the employees considered in the literature as providing industry-specific knowledge to the venture.

| Industry experience | New ventures |
|---|---|
| At least one high-knowledge worker with industry experience | 10.68% |
| At least one intermediate-knowledge worker with industry experience | 5.50% |
| At least one manager with industry experience | 2.91% |
| At least one focal employee (i.e., high-knowledge, intermediate knowledge, or manager) with industry experience | 15.86% |
| At least one other employee with industry experience | 25.24% |
| At least one employee with industry experience | 34.95% |

*n = 309 new ventures*

**Table 4: New venture industry experience**

*Take-away #2: Although industry experience is associated with new venture survival, only a minority of new ventures (16%) hire focal employees with industry experience.*

## New subsidiary industry experience

A possible reason for the small number of employees with industry experience is that new ventures find it difficult to attract workers with the desired type of experience because they are new, small, and potentially risky places to work. To assess whether this is the main reason for the limited level of industry experience among initial employees, we examine industry experience in new subsidiaries. Recall that new subsidiaries are new geographic locations for existing companies. We expect the degree of their risk or uncertainty to be lower compared to new ventures, and also expect that new subsidiaries will be less resource constrained because they are part of an expanding going concern. Table 5 presents these data in similar format to Table 4.[8]

[8] Subsidiaries surviving for at least 2 years (68%) and subsidiaries with industry experience surviving at least two years (80%) is higher than in the case of new ventures (61% and

| Industry experience | New subsidiaries |
|---|---|
| At least one high-knowledge worker with industry experience | 16.85% |
| At least one intermediate-knowledge worker with industry experience | 8.71% |
| At least one manager with industry experience | 3.37% |
| At least one focal employee (i.e., high-knowledge, intermediate knowledge, or manager) with industry experience | 23.60% |
| At least one other employee with industry experience | 34.27% |
| At least one employee with industry experience | 49.44% |

*n = 356 new subsidiaries*

**Table 5: New subsidiary industry experience**

We find parallels between new ventures and new subsidiaries in relation to the proportion of establishments with at least one focal employee with industry experience. The minority of new subsidiaries have one or more focal employees with industry experience (24%). We observe some differences between new ventures and new subsidiaries in terms of employee categories with industry experience. The proportion of subsidiaries with at least one focal employee with industry experience is around 50 percent higher compared to new ventures (24% compared to 16%).

## Origins of employees in new subsidiaries

If we change the unit of analysis from venture to employee, we also observe similarities between employees in new ventures and new subsidiaries.

74% respectively). Although we find some differences in overall survival rates between new ventures and new subsidiaries ($p$=.083), we find no significant differences in the survival rates of new subsidiaries with industry experience and new ventures with industry experience ($p$=.507). We also find few differences in job classifications between new ventures and new subsidiaries. New ventures employ more managers than new subsidiaries (3.56% of positions compared to 2.49% of positions, $p$=.031).

Table 6 panel A shows that 23 percent of high-knowledge employees in new subsidiaries come from within the same industry compared to 13 percent for new ventures ($p$=.0002), and 30 percent come from a related industry, compared to 39 percent for new ventures. Overall, we find that the number of high-knowledge workers coming from the same or a related industry is similar for new ventures and new subsidiaries. However, this is still a minority of all high-knowledge workers and represents just over a third of the workforce. The majority of high-knowledge employees in new subsidiaries come from unrelated industries.

We find a similar pattern for intermediate-knowledge and managerial workers. Although the numbers of intermediate-knowledge and managerial

**A. All new subsidiaries**

| Worker type | From same industry | From related industry (p15) | From unrelated industry | From other | Total |
|---|---|---|---|---|---|
| High-knowledge | 23.40% | 29.80% | 33.20% | 13.60% | 100.00% |
| Intermediate-knowledge | 22.01% | 32.54% | 35.89% | 9.57% | 100.00% |
| Manager | 22.22% | 34.92% | 36.51% | 6.35% | 100.00% |
| Other | 12.91% | 13.77% | 44.65% | 28.67% | 100.00% |
| Total | 15.97% | 19.01% | 41.46% | 23.56% | 100.00% |

*n = 2530 (employees) in 356 new subsidiaries*

**B. New subsidiaries of firms with only one other establishment**

| | New subsidiaries (first expansion) | | | | |
|---|---|---|---|---|---|
| Worker type | From same industry | From related industry | From unrelated industry | From other | Total |
| High-knowledge | 20.75% | 31.84% | 32.78% | 14.62% | 100.00% |
| Intermediate-knowledge | 16.97% | 36.36% | 36.97% | 9.70% | 100.00% |
| Manager | 18.97% | 37.93% | 36.21% | 6.90% | 100.00% |
| Other | 11.25% | 15.78% | 42.88% | 30.09% | 100.00% |

*n = 2016 (employees) in subsidiaries owned by firms with one existing establishment*

**Table 6: Origin of employees in new subsidiaries**

workers coming from the same industry are higher for new subsidiaries compared to new ventures, the majority of intermediate-knowledge and managerial workers come from unrelated industries.

To investigate further whether resource constrains are at least a partial explanation for the staffing differences observed between new subsidiaries, we focus on new subsidiaries of firms with only one other establishment (i.e., first time expansions). This type of new subsidiary constitutes the majority of new subsidiaries (approximately 75%). This is consistent with only a fraction (4.9%) of subsidiary-owning firms employing more than 100 employees, and is typical of the Danish economy (i.e., a few very large and many small firms). Table 6 panel B presents these results.

As in the full sample of new subsidiaries, resource constraints should be less of a concern than in new ventures but more of a concern than in large firms. In terms of staffing, the subsample of small firm new subsidiaries has a lower percentage of employees from the same industry than the full population of new subsidiaries. The percentage of high-knowledge employees coming from the same industry in small-firm subsidiaries is about two percentage points lower than for the full population of new subsidiaries, yet about eight percentage points higher than for the population of new ventures (respectively 21%, 23%, and 13%). For intermediate-knowledge workers and managers the difference in between small-firm subsidiaries and the full population of new subsidiaries is about 5% and 3%, respectively. For these worker types, we find no significant differences in terms of industry-experience compared to new-venture employees ($p > .1$). Nevertheless, overall small-firm subsidiaries hire more focal employees with industry experience than new ventures ($b = 0.069$, $t = 3.27$, $p = .001$) similar to the full population of new subsidiaries.

The findings raise the question whether the differences between new subsidiaries and new ventures in terms of within-industry hiring are due to transfers of existing employees from other subsidiaries (i.e., redeployment or internal hiring) rather than new hires. In the full population of new subsidiaries, 33 percent of focal employees with industry experience worked at the same employer prior to joining the new subsidiaries. Redeployed focal employees represent eight percent of all focal employees in subsidiaries and four percent of focal employees in small-firm subsidiaries. Although small-firm subsidiaries hire about three percent more focal employees with industry experience than new ventures, this difference is however not different from zero ($t = 1.71$, $p = .089$). Overall, when looking at the entire pool of new-hired employees, the percentage of employees hired from the same industry in nearly identical in small-firm subsidiaries and new ventures ($b < 0.0002$, $t = 0.0126$, $p = .990$). Thus, much of the staffing differences observed between new ventures and new subsidiaries stem from redeployment of existing employees to new establishments.

| | From same industry | From related industry | From unrelated industry | From other |
|---|---|---|---|---|
| Focal employees joining existing establishments | 16.28% | 30.65% | 44.92% | 8.16% |
| Any employee joining existing establishment | 9.98% | 21.05% | 50.65% | 18.32% |

*n = 811,537 (employees) joining existing establishments of which 282,298 are focal employees*

**Table 7: Origin of employees in existing establishments in ICT, KBS and manufacturing**

Finally, to further calibrate our findings, we compare recruitment of focal employees with industry experience by new ventures and new subsidiaries to recruitment of focal employees by existing establishments. Across the ICT, KBS, and manufacturing industries we find that approximately 16 percent of

newly-hired focal employees come from the same industry, and 31 percent and 45 percent, respectively, from related and unrelated industries (Table 7). As for new ventures and new subsidiaries, the proportion of focal employees from the same and related industries is higher if we exclude "other" employees. Overall, the proportion of focal employees coming from the same or a related industry is similar among existing establishments, (small-firm) subsidiaries, and new ventures (between 47% and 54%).

*Take-away #3a: The level of hiring industry experience of focal employees is higher in new subsidiaries compared to new ventures; yet still reflects a minority of hires. However, internal hires account for much of this difference.*

*Take-away #3b: The level of hiring industry experience of focal employees (excluding internal hires) does not differ for new ventures and new subsidiaries of companies making their first expansion.*

*Take-away #3c: The level of hiring industry experience of focal employees for new ventures does not differ substantively from that in existing companies.*

Taken together, the results suggests that while resource constraints might partly explain why new ventures have only a few employees with prior industry experience, it is likely not the sole reason. The hiring differences between new ventures and new subsidiaries is minimal. Also, hiring of industry experience does not differ much between new ventures and ongoing establishments.

## Employees' occupational origins

Although we see that new subsidiaries hire larger proportions of their high-knowledge, intermediate-knowledge, and managerial workforce from the same industry, this does not explain why hires with this experience represent only a fraction of the total workers. It might be that subsidiaries and new ventures hire employees with other types of experience. For instance, employees

with experience in a specific occupation should be able to apply at least part of their knowledge to a similar occupation even in a different industry.

To explore whether employees remain in the same occupation despite switching industries—and thus might bring other valuable knowledge to the venture—we group occupation codes (DISCO, 3-digit level) into the following categories: management, admin, sales and service, information technology (IT), engineering and science, social science and education, and other. See Appendix C for details and discussion. This grouping is independent of industry and hierarchical ranking. Therefore, our occupation grouping captures the individual's broader type of expertise (e.g., technical, administrative, managerial), rather than the knowledge acquired in a specific occupation. Because we do not have information on prior occupation for employees not previously part of the Danish labor force, we exclude these observations from the analysis.

We group together employees in new ventures and employees in subsidiaries because we observe minor differences between these groups.[9] Overall, the majority of new establishments (72%) have at least one employee with occupation experience.

[9] Although the number of employees in each position category with position experience is approximately 6% lower on average in new subsidiaries compared to new ventures, this difference is not statistically significant ($p > .1$, two-tailed). For instance, 73% of managers joining a new subsidiary were previously employed as managers (compared to 88% of managers joining a new venture, $p > .1$, two-tailed). The percentage of employees with position experience is higher for those joining from the same or a related industry compared to those joining from an unrelated industry. These differences are insignificant and slightly smaller for subsidiaries compared to new ventures.

Table 8 presents the occupation experience of focal employees in new establishments in different occupation categories, according to whether they join from the same, a related, or an unrelated industry. We find that most focal employees (80%) joining a new establishment remain within their occupation category. This increases slightly for employees joining from the same or a related industry compared to those from an unrelated industry (84% vs. 74%, p = .002, two sided). Thus, a change of industry rarely coincides with a change in occupation.

| **Occupation category** | **Percentage of employees who had the same occupation in their prior job** | | |
|---|---|---|---|
| | Employees coming from same or related industries | Employees coming from rom unrelated industries | Total |
| Manager | 82.69% | 73.08% | 79.49% |
| Admin | 86.84% | 83.33% | 85.71% |
| Sales/service | 81.36% | 66.67% | 75.25% |
| IT | 79.01% | 65.22% | 75.96% |
| Engin./ Tech/ Science | 93.69% | 74.42% | 88.31% |
| SocialScience/ Edu | 76.27% | 75.61% | 75.89% |
| Other | 70.00% | 85.71% | 79.17% |
| Total | 83.90% | 73.79% | 80.09% |

*n = 658 focal employees in new establishments with known origin, of which 410 employees from the same or related industries.*

**Table 8: Occupation experience of focal employees in new establishments**

To investigate whether occupation expertise is valuable for the new venture, we re-estimate the survival model including a variable for percentage of focal employees with occupation experience. The estimated coefficient of the percentage of focal employees with occupation experience is insignificant ($p$ = .147, OR = 1.728) but the coefficient of industry experience is almost the same as in Table 1 (results available on request). This is in line with the descriptive statistics showing that the numbers of occupation-experienced employees in ventures that survive for at least three years compared to those that do not are

not significantly different (1.83 versus 1.67, $t = 0.6979$, $p = .486$, $n = 309$). Thus, having employees with occupation experience appears to be an imperfect substitute for industry experience.

*Take-away #4: Hires without industry experience tend to have occupation experience.*

## Destinations of departing employees

Another possibility for why we see relatively few new establishments with industry experience is that these are growing industries and there is not a sufficient number of high-knowledge, intermediate-knowledge, and managerial workers within these industries to satisfy the need of existing companies and new entrants. Therefore, companies have to look outside the industry to recruit talent. If industry-specific experience and skills are important and these industries are growing, then once these workers have made the transition to the growing industry, we would expect this talent to remain within the industry.

To investigate this, we track what happens to focal employees employed in new establishments at time of founding who decide to leave the venture. Because there are few differences across categories, we combine the data on new ventures and new subsidiaries, across knowledge-based job classifications (focal employees). For employees who leave, we record their next employment and whether it was in the same industry, a different but related industry, an unrelated industry, or "other" (i.e., not part of the Danish economy). We focus on departures within the first two years of establishment founding because the turnover rate for new ventures is high and substantial numbers of initial employees leave within two years. Table 9 presents these data.

| | To same industry | To related industry | To unrelated industry and other | Total | Turnover |
|---|---|---|---|---|---|
| From same industry | 44.44% | 28.40% | 27.16% | 100.00% | 44.94% |
| From related industry | 11.79% | 59.49% | 28.72% | 100.00% | 56.11% |
| From unrelated industry and other | 9.51% | 30.99% | 59.51% | 100.00% | 62.71% |
| Total | 15.36% | 40.54% | 44.11% | 100.00% | 57.31% |

*n = 560 employees who leave a new establishment within two-years after establishment*

**Table 9: Origin and destinations of focal employees in new establishments**

We find no evidence that our previous results reflect a process where talent permanently redeploys to a new industry. Among focal employees from a related industry, only 12 percent leave for employment in the same industry and among focal employees from an unrelated industry or from outside the workforce only 10 percent remain in the same industry after leaving the new establishment. We find a relatively high proportion (44%) from the same industry move to other employment in that industry. However, the majority move to another industry. In addition, we find that more than half (51%) of the employees that leave a new establishment within the first two years come from an unrelated or "other" category. Those from a related or the same industry show lower turnover rates.

> *Take-away #5: Hiring from outside the industry does not represent a permanent transition to the new industry: leavers from new establishments are likely to move to a different industry.*

Tables 3, 4, 6, 7 and 9 taken together show that there is significant switching across industries among high-knowledge, intermediate-knowledge, and managerial workers. Employees within these occupations who work in new establishments appear not to be bound by industry experience. Moreover, industry switching is prevalent for hires by ongoing operations, not just new establishments.

These empirical relationships present a conundrum. If industry specific knowledge is so valuable as the literature argues, why do we observe so much cross-industry mobility, and especially mobility across unrelated industries? The data in Table 9 hint at a possible answer. Turnover rates differ depending on the focal employee's industry of origin; therefore, it might be that industry experience captures the likelihood of future turnover and not industry-specific experience.

## Turnover and industry of origin

We turn to the data to examine this possibility. First, we conduct a more precise examination of variation in turnover by industry origin. Table 10 presents focal employee turnover rates in each of the first three years of a new establishment. The turnover rate in year *t* is defined as the number of initial focal employees who leave the establishment during year *t* divided by the number of initial focal employees working in the establishment at the beginning of year *t*. In other words, the fraction of focal employees still working in the new establishment at the beginning of year *t* that leaves their job in year *t*.

| Year | From the same industry | From related industry | From unrelated industry & other |
|---|---|---|---|
| t+1 | 27.94% | 35.89% | 42.22% |
| t+2 | 26.09% | 41.46% | 41.50% |
| t+3 | 18.39% | 25.93% | 32.06% |

*n=2275; 1339 focal employees in new establishments*

**TABLE 10: Mobility of focal employees in new establishments within the first two years**

Table 10 presents annual turnover rates broken down by whether the employee comes from the same industry, a related industry, an unrelated industry, or "other" (including not previously in the Danish workforce). Across all years, we find that focal employees from the same industry have lower turnover rates compared to focal employees from a related industry, and compared

to focal employees from an unrelated industry or employees from outside of the workforce. For example, in year *t+1*, turnover rates vary between 28 percent (same industry) and 42 percent (unrelated industry and other).

*Take-away #6: Employees with industry experience are less likely to leave new establishments.*

Because the data show that industry experience corresponds with lower turnover, this raises the possibility that higher turnover of employees from a different industry (whether related or unrelated) reduces the survival of new ventures compared to industry-experience of focal employees increasing new venture survival. To examine this, we return to the estimation of new venture survival in Table 1 to examine whether turnover is a better predicter of survival than industry experience.

We estimate a specification that includes two additional variables to the specification in Table 1. The first is the count of focal employees who leave the new establishment within the first three years (or up to the year prior to firm failure in the case of a non-surviving establishment). The second is the count of other employees who leave the new establishment within the first three years (or up to the year prior to establishment failure, if the establishment does not survive). We include the latter variable because we found it to be correlated strongly with new establishment survival ($r$ = -0.34) but not with count of focal employee turnover ($r$ = -0.06). Table 11 Model1 presents these results.

The estimated coefficients of the number of focal employees and other employees leaving within three years are both negative ($p < .001$). Lower realized turnover is associated with a higher likelihood of new venture survival. The loss of one additional focal employee or the loss of one additional "other" employee decreases the odds of survival by about half. However, in this specification, the estimated coefficient of a focal employee with industry experience

is not different from zero ($p$ = .082), although approximately the same in magnitude.

Although these results question the effect of previous industry experience on survival, it might be that the correlation between previous industry experience and focal employee turnover inflates the standard errors in these estimates. If multi-collinearity drives the increase in the standard errors, then we should be cautious about this conclusion. To investigate this, we estimate specifications that exclude, first, industry experience and then focal employee turnover. If collinearity is driving the increase in the standard error for industry experience, then the p-values of the estimates should be smaller once the other variable is removed from the specification.

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | Odds Ratio | p | β | Odds Ratio | p | β | Odds Ratio | p |
| At least one focal employee with industry experience | 0.741 | 2.098 | 0.082 | 0.259 | 1.296 | 0.548 | | | |
| No. turnover focal employees within 3 years | -0.824 | 0.439 | 0.000 | | | | -0.780 | 0.458 | 0.000 |
| No. turnover other employees within 3 years | -0.701 | 0.496 | 0.000 | -0.385 | 0.680 | 0.000 | -0.722 | 0.486 | 0.000 |
| No. employees in t0 (log) | 3.854 | 47.198 | 0.004 | 1.696 | 5.454 | 0.008 | 3.936 | 51.190 | 0.004 |
| Rural area | -0.028 | 0.973 | 0.921 | 0.156 | 1.169 | 0.562 | -0.038 | 0.963 | 0.891 |
| Year of establishment controls | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Constant | -3.724 | 0.024 | 0.062 | -1.732 | 0.177 | 0.145 | -3.694 | 0.025 | 0.073 |
| Pseudo-R^2 | 0.26 | | | 0.153 | | | 0.252 | | |
| Wald chi^2 | 29.958 | | | 41.603 | | | 26.489 | | |
| Log pseudo likelihood | -153.485 | | | -175.518 | | | -154.99 | | |

*n = 309 new ventures. DV = Survival within the first 3 years after establishment. Logistic regression with robust standard errors.*

**TABLE 11: Turnover and venture survival in the first 3 years**

Table 11 Model 2 drops focal employee turnover from the specification in Model 1. We find that the magnitude and significance of the coefficient and the p-value of other employee turnover remain similar but that the magnitude of the coefficient of industry experience decreases and the p-value of industry experience increases substantially ($p = .55$). This is not consistent with collinearity of industry experience and focal employee turnover inflating the standard errors in Model 1. If we drop industry experience from the specification in Model 1 (Table 11 Model 3), we find that the estimated coefficients of number of focal employees and other employees leaving within three years and their p-values are stable. Taken together this calls into questions whether industry experience affects new venture survival, once we account for employee turnover.

*Take-away #7: Realized turnover is a better explanation for venture survival than hiring a focal employee with industry experience.*

# Discussion

> Industry-specific experience yields knowledge about profitable niches and increases productivity. (Brüderl et al., 1992, p. 229)

> Because a founding team with industry experience has acquired this knowledge, ventures founded by experienced teams are more likely to survive. (Delmar & Shane, 2006, p. 223)

Extant work infers that industry-specific *knowledge* is the underlying theoretical mechanism that leads to the relationship between employee industry experience and new venture survival. However, our empirical findings suggest that the importance of employee industry-specific knowledge for new venture success has been overstated for the following three reasons.

First, we found that industry-specific experience is rare among focal employees (i.e., high-knowledge, medium-knowledge, and managerial employees) in new ventures.[10] Only a small fraction of focal employees has industry experience and only a minority of new ventures has at least one focal employee with industry experience. Recall, we do not restrict our analysis to founders—who might or might not have industry experience—but also consider focal initial employees hired by the new venture. Previous research suggests that new ventures may be unable to hire employees with industry-specific knowledge due to resources constraints (e.g., Baker & Nelson, 2005). We find similar hiring patterns for focal employees in relation to new subsidiaries—especially new subsidiaries of firms making their first expansion, and existing organizations.

Second, we find that focal employees who leave new establishments rarely move to employment in the same industry. This suggests that industry experience is less valuable than claimed. If industry experience were so valuable, we would expect leavers to seek to leverage their experience in the same industry. Otherwise, we would have to assume that employees do not understand where their skills will be valuable.

Third, to the extent that industry-specific knowledge is valuable, we would expect that more knowledge would be better. However, we find that ventures with more than one focal employee with industry experience fare no better than ventures with only one focal employees with industry experience. It could be that a certain threshold of industry-specific experience is sufficient to reap the benefits and that higher levels provide no more advantages. Although this is plausible and consistent with our data, it is inconsistent with previous find-

[10] The quality of our data allows us to define focal employees based on the occupation type, rather than on wage data. This means we do not have to consider all initial employees as focal employees. We focus only on initial employees in knowledge-intensive positions.

ings. For instance, Honoré and Ganco (2020) find that ventures whose founding teams have industry experience are more likely to hire additional employees with industry experience (Honoré & Ganco, 2020), and Ruef et al.(2003) show that people working together in new ventures are demographically similar. Moreover, an industry-specific experience threshold does not address the question of why so few new ventures hire at least one person with industry experience.

Our analyses also provides evidence of an alternative causal mechanism for the relationship between previous industry experience and venture survival: industry experience captures the likelihood of future turnover. We find that employees with industry experience are less likely to leave new establishments compared to employees from a related or unrelated industry. We find also that the impact of industry experience on venture survival is muted if we control for realized turnover.

Although we provide evidence that realized turnover—not industry-specific knowledge—leads to the relationship between industry experience and venture survival, it leaves open the question why industry experience correlates with realized turnover. We posit that this reflects assortative matching in venture staffing. We expect that individuals will not leave their current position to work in a new venture if they believe the new venture is likely to fail, which is common given the riskiness of new ventures. We expect that focal employees with industry experience are especially sensitive to this because they already work in the industry and have a better ability to assess the viability of a new venture. Therefore, employees with industry experience are less likely to consider jobs in new ventures more prone to fail. Employees lacking industry experience are likely to make this assessment only after taking the job; thus, they experience higher turnover. In other words, industry experience reflects "selection." It is not a "treatment" of bring industry-specific knowledge as argued in the literature.

To provide additional empirical grounding for this possible explanation, we want to rule out the explanation that increased turnover associated with industry experience captures another effect related to the industry or individual. For example, if the overall likelihood of turnover varies by industry or sector, the effect we find might reflect that the sectors central to our inquiry have higher turnover rates. Likewise, some individuals might change their jobs frequently (i.e., job hoppers) and a large number of those individuals have industry experience.

| | β | Std. Error | Odds Ratio | p |
|---|---|---|---|---|
| Number of jobs per years since 1999 | 1.973 | 0.377 | 7.189 | 0.000 |
| From same industry | -0.56 | 0.180 | 0.570 | 0.002 |
| High-knowledge | -0.34 | 0.221 | 0.712 | 0.124 |
| Intermediate-knowledge | 0.099 | 0.242 | 1.105 | 0.681 |
| Years in the labor market | 0.002 | 0.009 | 1.002 | 0.855 |
| Female | 0.371 | 0.160 | 1.449 | 0.020 |
| Salary (hour) | -0.001 | 0.001 | 0.999 | 0.117 |
| New venture | -0.253 | 0.166 | 0.777 | 0.127 |
| Rural area | -0.022 | 0.185 | 0.978 | 0.903 |
| Year of establishment controls | YES | YES | YES | YES |
| Constant | 0.762 | 0.451 | 2.143 | 0.091 |
| Pseudo-R^2 | 0.125 | | | |
| Wald chi^2 | 128.598 | | | |
| Log pseudo likelihood | -768.711 | | | |

*n = 1339 focal employees in new establishments. DV = Mobility within the first 3 years after establishment. Logistics regression with standard errors clustered by new establishments.*

**Table 12: Job-hoppers and mobility in the first 3 years**

To assess this possibility, we return to 1339 individuals that form the sample in Table 10, and regress turnover (i.e., an individual leaves the new venture within three years) on whether an individual has industry experience, the frequency in which they have changed jobs, and a number of controls. Directly

controlling for the frequency with which an individual has changed jobs controls for the aforementioned sector and individual effects.[11] Table 12 presents these results.

The estimates in this table show that focal employees with industry experience are less likely to turnover, once controlling for these other factors. The odds of a focal employee with industry experience leaving the new establishment is 57 percent ($p = .002$) less than an individual lacking industry experience. We find that job-hopping has a statistically significant and meaningful effect. An increase in the number of jobs per years in the workforce increases the odds of turnover by over seven times ($p < .001$). Although individuals' previous proclivity to switch jobs or the underlying rate of turnover in the industry in which they previously worked appear to affect turnover, there is a still an effect of industry experience on turnover.

Although the potential for assortative matching between individuals and new ventures (Honoré & Ganco, 2020; Mostafa & Klepper, 2018) is discussed in the literature, the theory in these articles predicts that employees' industry-specific knowledge aids venture success once a match is made. The theory we propose—based on the pattern of empirical relationships that we present—does not rely on this. Instead, our theory is that industry experience leads to better matches and less realized turnover. We also note that our suggested theory provides a straightforward explanation for why so few new ventures hire industry experience. This is because few ventures appear compelling enough for employees working in the industry experience to leave their current employer. Theory based on the application of industry-specific knowledge has

[11] To measure job-hopping, we identify individuals' employment affiliation back to 1999. We calculate job-hopping as the number of employers until joining the new establishment divided by the number of years in the labor market since 1999. This operationalization takes into account that individuals longer in the workforce are more likely to change employer. For the 1,339 focal individuals in new establishments, the variable ranges from 0.083 to 1 with a median of 0.533 (mean = 0.544, SD = 0.223).

to rely (often implicitly) on resource constraints by new ventures. However, our data show that, while constraints likely exist, it does not appear to be the overarching effect.

We note that while our analysis suggests that turnover is a more likely causal mechanism than industry-specific knowledge, this finding might not be transferable to other contexts. In several other settings, industry experience has been shown to affect firm survival. Although our insights might transfer, they might not. We cannot consider our results a test of this theory because we derive the prediction from our results. Therefore, we do not want to rule out the possibility that some other causal factor leads to this relationship. Nevertheless, we believe that our study advances work on building causal identification thorough a cumulative body of knowledge in this area (Shaver, 2020).

# Conclusion

Motivated by the fact that many studies find a correlation between new venture success and measures of employees' industry experience, we investigated the prevalence of industry experience among new venture employees. We focused on employees in occupations that we expected to have a pronounced effect based on the industry experience they bring to the new venture (i.e., high-knowledge, medium-knowledge, and managerial). However, we found that: (a) only a fraction of new venture employees come from the same industry, (b) a minority of new ventures have only one focal employee with industry experience, (c) this pattern holds for new subsidiaries of established firms, (d) there is substantial movement of these focal employees across industries when they leave the new venture, (e) industry experience is correlated with future turnover, and (f) realized turnover is a better predictor of venture survival than employees with industry experience. Our results suggest that possession of industry-specific knowledge is not the casual mechanism leading to the relationship between employee industry experience and venture success.

Although we focused on the relationship between industry-specific knowledge and venture survival, a parallel concern can be raised in other research trying to understand the role of industry-specific knowledge for new ventures. For example, some studies find that new ventures pay higher salaries to employees with industry experience compared to those without it (Honoré & Ganco, 2020; Parent, 2000). We find that employees in key positions are more likely to have industry experience than other employees, and therefore, the industry-experience wage premium may be a premium for a higher level of skills rather than industry experience.

As the body of work on strategic human capital grows, the scope of studies that link firm outcomes to human capital is expanding. Our work suggests the existence of similar patterns of results in the literature. That is, measures of human capital characteristics might reflect many different causal mechanisms. For instance, the idea of firm-specific human capital as isolating mechanism which increases the value of human capital to a firm has been increasingly challenged (Campbell, Coff, & Kryscynski, 2012; Kryscynski & Ulrich, 2015). Firm-specific human capital is often measured in terms of employee tenure in the firm (e.g., Hitt, Bierman, Shimizu, & Kochhar, 2001). In our data, tenure (i.e., retention) is correlated with industry experience, and thus, measuring firm-specific human capital based on tenure could capture other human capital characteristics such as industry experience or other attributes correlated with industry experience (see also Raffiee & Coff, 2016). Similarly, Bermiss and Murman (2015) use senior managers' functional background (i.e., job role) to proxy for possession of firm-specific knowledge. Similar to tenure, job roles may be correlated with industry mobility and other human capital characteristics.

Consistent with our efforts in this paper, an important path forward for the broader strategic human capital literature will be to assess whether the hy-

pothesized theoretical mechanisms linked to human capital are causal mechanisms. We echo prior calls to isolate individual level mechanisms (e.g., Coff & Kryscynski, 2011; Ployhart & Moliterno, 2011), and suggest that the present study provides a template for how to combine high quality data, previous findings, and theoretical insight to advance the literature.

To conclude, our analysis of comprehensive and refined data provide insights into the phenomenon of how employee industry experience relates to new venture success. Combining our findings with findings in the existing literature demonstrates empirical inconsistencies with its conclusions. We do not find employee industry-specific knowledge to be the predominant causal driver of this relationship and we propose an empirically-supported alternative mechanism. Our efforts are consistent with calls to build a cumulative body of knowledge through examining and refining well-established findings in the literature (e.g., Bettis et al., 2016).

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Chapter 3

# Appendices

# Appendix A

Agriculture, forestry and fishing
Mining and quarrying
Manufacturing
Electricity, gas, steam and air conditioning supply
Water supply, sewerage and waste management
Construction
Wholesale and retail trade
Transportation
Accommodation and food service activities
Information and communication
Financial and insurance
Real estate activities
Knowledge-based services
Travel agent, cleaning, and other operational services
Public administration, defense and compulsory social security
Education
Human health and social work
Arts, entertainment and recreation activities
Other service activities

**Table A1: List of 19 sectors**

Legal activities 69.10.00
Accounting and bookkeeping activities; tax consultancy 69.20.00
Activities of non-financial head offices 70.10.10,
Activities of financial head offices 70.10.20,
Public relation and communication activities 70.21.00,
Business and other management consultancy activities 70.22.00
Architectural activities 71.11.00,
Consulting engineering activities with construction 71.12.10,
Consulting engineering activities with production and machinery technique 71.12.20,
Mounting and delivery of ready-made production plants 71.12.30,
Geologic surveying activities and prospecting, chartered surveyors, etc. 71.12.40,
Other technical consultancy 71.12.90,
Testing and control activities in the field of food hygiene 71.20.10,
Technical testing and control 71.20.20,
Other measuring and technical analysis 71.20.90
Research and experimental development on biotechnology 72.11.00,
Other research and experimental development on natural sciences and engineering 72.19.00,
Research and experimental development on social sciences and humanities 72.20.00
Advertising agencies 73.11.10
Other advertising activities 73.11.90
Media research 73.12.00
Market research and public opinion polling 73.20.00
Industrial design and product design 74.10.10
Communications design and graphic design, 74.10.20,
Activities of interior decorators and room design 74.10.30,
Photographic activities 74.20.00,
Translation and interpretation activities 74.30.00,
Agronomy consulting 74.90.10,
Other professional, scientific and technical activities n.e.c. 74.90.90
Veterinary activities 75.00.00

## Table A2: List of industry codes that fall into the KBS

| | β | Std. Error | Odds Ratio | p |
|---|---|---|---|---|
| At least one focal employee with industry experience | 0.8889 | 0.3885 | 2.4323 | 0.022 |
| At least one focal employee with related industry experience (but none from same industry) | 0.3137 | 0.2816 | 1.3684 | 0.265 |
| New venture size (t0) | -0.4336 | 0.3155 | 0.6482 | 0.169 |
| Rural area | 0.0440 | 0.2585 | 1.0450 | 0.865 |
| Year of establishment controls | YES | YES | YES | Insig, besides 2015 |
| Constant | 0.6603 | 0.7701 | 1.9353 | 0.391 |
| Pseudo R^2 | 0.0691 | | | |
| Pseudo likelihood | -192.9773 | | | |

*n=309 new ventures. Logistic regression with robust standard errors.*
*DV = Venture survival within the first three years*

**Table A3: Venture survival within the first three years (with related experience)**

## Appendix B: Description of the relatedness measures

Industry relatedness is measured as the Euclidean Distance over the 780 occupation classifications (DISCO) using the following equation:

$$ED = \sqrt{\sum_{o=1}^{780} (EO_o - EF_o)^2}$$

where $EO_o$ is the percentage of employees in occupation o in the industry of origin, and $EF_o$ is the percentage of employees in occupation o in the focal industry. The measure can range from 0 (no difference) to 1.41 (maximum difference). For the 348,690 possible industry combinations in the Danish economy, the measure ranges from 0.05 to 1.41. In our sample, the mean is 0.284 for focal employees and 0.353 for other employees in new ventures, SD = 0.177 and SD = 0.207, respectively. Measures of industry relatedness using similar operationalizations have been used in research on human capital (Coff, 1999, 2002; Farjoun, 1994). We define employees as coming from a related sector if their previous employment was in an industry with a relatedness in the top 15 percent of the full sample of possible industry combinations (i.e., smaller than 0.298).[12]

Our operationalization of industry relatedness based on the Euclidean Distance is only one of many possible operationalizations. Neffke and Henning (2013, p. 298) point out that: "the definition of relatedness, and the methods for measuring relatedness are often surprisingly imprecise." Our measure captures the similarity (or distance) between any two industries based on their job characteristics, in line with the suggestion to "focus[…] on those resources that are most often credited with determining a firm's competitive advantage in the modern knowledge economy: the skills embedded in a firm's human

[12] We chose this cut-off because it lies mid-way between the other two relatedness measures used for the sensitivity analysis. Using sector-based relatedness measures, 18.3% of all industry combinations are deemed related; 12.3% of industry combinations are deemed as related using the labor-flow measure.

capital" (Neffke & Henning, 2013, p. 298). Industries that employ a larger share of employees in similar jobs are deemed more related than industries that include numerous very different jobs. Thus, the operationalization of industry relatedness does not rely on the hierarchy of the industry classifications whose accuracy has been questioned in terms of its ability to capture industry relatedness. Bryce and Winter (2009, p. 1572) write that:

> the fact that two four-digit industries share the same three-digit code (and on up the line) supplies no clear message about strategically significant relationships among activities. Relatedness simply cannot be reliably or directly inferred from the hierarchical structure of the SIC system (cf. Davis and Duhaime 1992, Robins and Wiersema 1995).

Using Euclidean Distance, industries from different industry sectors may also be related if they have a large share of similar jobs. Due to the detailedness of the occupation classification used for our measure, some jobs by definition will be more specific to an industry than others (e.g., electrical engineer versus general office work). This is in line with the assumption that general skills are more transferable across industries than more specific skills. While we find differences in terms of which industries are considered related compared to industry aggregation at sector level, the percentage of employees from a related industry is similar.

| Worker type | From same industry | From different industry—but same sector | From different sector | From other | Total |
|---|---|---|---|---|---|
| High-knowledge | 13.07% | 23.71% | 51.67% | 11.55% | 100.00% |
| Intermediate-knowledge | 11.18% | 16.77% | 61.49% | 10.56% | 100.00% |
| Manager | 14.29% | 22.08% | 55.84% | 7.79% | 100.00% |
| Other | 9.28% | 9.47% | 48.24% | 33.00% | 100.00% |

*n= 2161 (employees) in 309 new ventures*

**Table B1: Origin of employees in new ventures using sector-relatedness**

The results are presented in Table B1 using sector-based relatedness for comparison. The conclusions drawn from those results are consistent with the findings presented in the Findings section.

Besides sector-level relatedness, another industry relatedness measure builds on the idea that employees move to jobs that require similar skills (but which may be classified differently). Initially used to predict firm diversification (Neffke & Henning, 2013; Neffke, Henning, & Boschma, 2011), any two industries are considered to be related the higher the cross-industry labor flows between these two industries. Since we focus predominantly on employee mobility across and within industries (which defines the relatedness of industries), we consider this operationalization less appropriate for our purposes. However, for completeness and comparability, we calculate industry relatedness based on employee flows using data on the entire working population in Denmark (see Appendix D). Construction of the flow measure follows Neffke and Henning (2013, and subsequent work). Tabulation of the origin of employees broken down into occupation categories similar to Table 3 is provided in Table B2. As expected, the number of employees from related industries is higher using the flow measure compared to either of the other two relatedness measures.

| Worker type | From same industry | From related industry | From unrelated industry | From other | Total |
|---|---|---|---|---|---|
| High-knowledge | 13.07% | 48.63% | 26.75% | 11.55% | 100.00% |
| Intermediate-knowledge | 11.32% | 45.28% | 32.70% | 10.69% | 100.00% |
| Manager | 14.47% | 59.21% | 18.42% | 7.89% | 100.00% |
| Other | 13.07% | 48.63% | 26.75% | 11.55% | 100.00% |

*n= 2140 (employees) in 309 new ventures (21 observations are excluded as no relatedness measure was calculated for the respective industry combinations)*

**Table B2: Origin of employees in new ventures using labor-flow industry-relatedness measure**

| Related (but not same) industry experience | ED-measure | Labor flow measure |
|---|---|---|
| At least one high-knowledge worker with related industry experience | 22.33% | 26.86% |
| At least one intermediate-knowledge worker with related industry experience | 11.00% | 16.83% |
| At least one manager with related industry experience | 8.41% | 10.36% |
| At least one focal employee (i.e., high-knowledge, intermediate knowledge, or manager) with related industry experience | 37.54% | 39.48% |
| At least one other employee with related industry experience | 32.69% | 44.33% |
| At least one employee with related industry experience | 58.90% | 51.78% |

*n = 309 new ventures*

**Table B3: New venture related experience**

| Related industry experience (but not same industry) | ED-measure | Labor flow measure |
|---|---|---|
| At least one high-knowledge worker with related industry experience | 18.26% | 19.94% |
| At least one intermediate-knowledge worker with related industry experience | 10.11% | 12.64% |
| At least one manager with related industry experience | 4.49% | 6.18% |
| At least one focal employee (i.e., high-knowledge, intermediate knowledge, or manager) with related industry experience | 33.43% | 26.97% |
| At least one other employee with related industry experience | 27.25% | 36.24% |
| At least one employee with related industry experience | 54.21% | 39.61% |

*n = 356 new subsidiaries*

**Table B4: New subsidiary related experience**

The percentage of new ventures with related (but not the same) industry experience follows similar patterns across measures (see Tables B3 and B4 for a comparison of the labor-flow and Euclidean Distance measures). The overall conclusions based on these results using the flow measure are consistent with the results section.

The analysis in the findings section uses the relatedness measure based on Euclidean Distance as described above and used in Table 3.

## Appendix C: Occupation experience

The occupation categories (management, admin, sales and service, IT, engineering and science, social science and education, and other) are based on the 3-digit occupation codes (DISCO). Table C1 shows the grouping of the occupation codes. The grouping is independent of industry and hierarchical rank. This means that individuals who move from a lower ranked (e.g., general office work) to higher ranked positions that require similar but more advanced, expertise are considered as remaining in the same occupation category. Similarly, individuals in an engineering occupation can change to other technical or science related occupation without changing occupation category (e.g., a change of technical control work to working in life sciences). In contrast, a switch from general office work to engineering work is considered a change of occupation. Therefore, the occupation grouping captures the individual's broader expertise (e.g., technical, administrative, management) rather than knowledge gained in a specific occupation. This reduces the concern that industry experience confounds occupation experience.

**Management**

- 110: Top management in legislators, companies and organizations
- 111: Top management in legislative authorities, public companies and organizations
- 112: Top Management
- 120: Management in administration and business-oriented functions
- 121: Management in business services and administrative functions
- 122: Management of business and development-oriented functions
- 130: Management of the main activity within production and service business
- 131: Management of production in agriculture, forestry and fisheries
- 132: Management of the main activity within manufacturing, raw material extraction, construction, supply, distribution, etc.
- 133: Management of the main activity in information and communication technology
- 134: Management of the main activity within service subjects
- 140: Management of the main activity in hotel and restaurant, retail and wholesale and other service areas
- 141: Management of the main activity in hotels and restaurants
- 142: Management of the main activity in retail and wholesale
- 143: Management of the main activity in other service areas

**Admin & Finance**

- 241: Work in Finance and Economics
- 242: Work in business administration; private and public
- 330: Work in business services, finance, administration and sales
- 331: Working with finance, accounting and mathematics
- 334: Administrative secretarial work
- 335: Working with the administration and enforcement of legislation
- 411: General office work
- 412: Ordinary secretarial work
- 413: Input work
- 441: Other general office and customer service work

## Table C1: Occupations group in position categories (continuous)

**Sales & Service**

- 243: Work in sales, marketing and PR
- 332: Agent and brokerage work in sales and purchasing
- 333: Working in Business Services
- 421: Treasurer and debt collector work and related functions
- 422: Customer information work
- 522: Sales work in store
- 510: Service work

**Information Technology**

- 251: Development and analysis of software and applications
- 252: Working with databases and networks
- 351: Operations technician work and user support work in the field of information and communication technology
- 352: Technician work in audiovisual media and telecommunications

**Engineering, Science & Technology**

- 211: Work in Physics and Geology
- 212: Working with mathematical, actuarial and statistical methods and theories
- 213: Working in Life Sciences
- 214: Engineering (except in electrical engineering)
- 215: Engineering work in electrical technology
- 216: Working with architecture, infrastructure and design
- 311: Technical work in the physical sciences and engineering
- 312: Supervisor in raw material extraction, manufacturing and construction
- 313: Technical control work within process control
- 314: Technician work in life sciences
- 315: Engineer work in shipping and aviation
- 321: Technical work in the medical and pharmaceutical field
- 322: Assistant work in nursing and midwifery
- 323: Assistant work in natural medicine and alternative medicine
- 324: Assistant veterinary and veterinary work
- 325: Other technical and assistant work in the field of health
- 721: Sheet metal work, welding and related functions
- 722: Blacksmiths, toolmakers and related functions

## Table C1 (continued 1): Occupations group in position categories

- 723: Mechanic work
- 731: Precision craftsmanship
- 732: Graphic work
- 741: Installation and repair of electrical equipment
- 742: Installation and repair of electronics and telecommunications

**Social Science & Education**

- 261: Legal work
- 262: Librarian, archivist and museum inspector work
- 263: Work in Social Sciences and Religion
- 264: Author work and journalistic and linguistic work
- 265: Working with art and creative subjects
- 341: Work in Law and Social Affairs
- 343: Work in the artistic, cultural and culinary fields
- 231: Teaching and research at universities and colleges
- 232: Teaching in vocational education
- 234: Teaching and pedagogical work
- 235: Other teaching and pedagogical work

**Other (examples of position codes included)**

- 222: Nursing and midwifery work
- 226: Other health work
- 342: Working with sports and fitness
- 513: Waitress, Bar tender
- 511: Service and control work during transport and travel
- 531: Child care work and assistant teacher work
- 532: Care work in the field of health
- 711: Construction work (excl. Assistants) - basis
- 712: Construction work (excl. Assistants) - finish
- 713: Painters and work in the cleaning of buildings
- 911: Cleaning work in private homes, hotels and offices
- 912: Manual cleaning work of vehicles, windows, laundry and other
- 962: Other manual work

## Table C1 (continued 2): Occupations group in position categories

## Appendix D: Industry relatedness measure using cross-industry labor flows

To construct the industry relatedness measure, we follow Neffke and Henning (NF) (2013) and use flow of employees to measure relatedness between two industries. NF use register data provided by Statistics Sweden for the years 2004 to 2007; we use similar register data provided by Statistics Denmark for 2008 to 2016. The measure is based on the entire population and not just the study sample.

Specifically, our data include information on all employees in Denmark active in the labor market in a focal year. We excluded self-employment, employment as a spouse, secondary employment, and non-primary November employment, and individuals aged less than 17 years. We impose these restrictions because people that fall into the excluded categories may exhibit different mobility between jobs and industries compared to other employees. NF do not impose these restrictions however, they were inspired by NF's exclusions, as explained below. After imposing the restrictions, our data include information on 3,765,544 individuals working in more than 267,000 firms.

We use the four-digit industry classification (corresponding to the European NACE (Rev. 2) classification to calculate the number of employees in each industry-year. Following NF, we exclude industries with an average number of employees in the industry less than 250, which pertains to 144 industries. Our remaining sample of 449 industries is slightly larger than NF's (415 industries). Among these 449 industries, 445 are observed across all years in the period 2008-2016.[13]

[13] Initially, 145 industries did not satisfy the size criterion and 455 did satisfy it. Of the 455 industries with at least 250 employees per year on average 13 industries were not observed in every year. In addition, 17 industries that did not meet the size cut-off were not observed in every year in the period 2008 to 2016. Among these not continuously observed industries, 3 industries split up in 2013: the code 42.10 was further differentiated in 42.11, 42.12, and 42.13; 42.20 was split into 42.21 and 42.22; and 42.90 was split between 42.91 and 42.99. To

We identify all employees changing employer from one year to the next.[14] We exclude mobility events due to ownership changes (e.g., acquisitions) or employees moving out of the Danish labor market (e.g., to unemployment, (early) retirement, or abroad). On average, nearly 330,000 (328,468) employees per year (12.9%) change jobs. If we did not exclude mobility due to acquisitions, mergers, and other ownership changes, the number of employees changing jobs in a year would be around 1 percent higher (13.9%).

To reduce causality issues with respect to diversification, NF omit moves to newly founded establishments. We do this to reduce the mobility induced by firm growth in form of expansion. These excluded moves represent 22.32 percent of all moves with known destinations.

Of the 2,030,802 moves to existing establishments observed in 2009 to 2016, 80.0 percent are between 4-digit industries, and 57.2 percent are between industry sectors. These numbers are substantially higher than those reported by NF (23% change industries in the Swedish context).

To restrict the observed mobility to moves of employees with relevant human capital (e.g., employees with firm or industry specific knowledge), we follow Tate and Yang (TY) (2016) and exclude moves of employees who worked for less than two years in their former employer. This applies to 52.8% of all moves to existing establishments observed in the period 2009 to 2016 (1,072,593 of 2,030,802). Following NF, we exclude low-wage earners based on their characteristics in the year prior to the move. While NF use the median

avoid observing inter-industry mobility because of a change in industry categorization, we use the industry codes specified in 2012 (i.e., prior to splitting). Correcting for this by re-aggregating formerly joined industries, only 4 industries that employ an average of 250 employees or more per year are not observed in every year. These are: 01.16 Growing of fiber crops, 01.22 Growing of tropical and subtropical fruits, 11.4 Manufacture of other non-distilled fermented beverages, 24.34 Cold drawing of wire. The descriptions in the text and the measures are based on the 2012 classification.

[14] The following descriptive statistics are based on all employees that move to one of the 449 industries with at least 250 employees per year on average.

as the cut-off, we follow TY and use the 25th percentile which is a less restrictive cut-off enabled by our initial restrictions which exclude from the sample employees with weaker labor market ties such as secondary employment. Excluding employees with short tenure in the year prior to the move also should reduce the noise observed in the moves. Across industry-years, employees in the 25th percentile on average earn 179,455 DKK (or 26,000 USD) or less.[15] The correlation between these two restrictions (low-wage and short tenure) is .32 for the full sample and .36 for all movers. These restrictions reduce the number of moves observed from 2,030,802 to 762,232 (thus, 62.5% of moves are excluded).

The mobility among low-wage earners (20.8%) and employees with short tenure (20.5%) is significantly higher than among other types of employees (b=-.112, t=-595.295, p<.001; b=-.128, t=-782.720, p<.001; respectively); employees earning lower wages and on short tenure move more often to another sector than other employees (61.0% versus 51.8%, t=-1444.591, p <.001). Excluding these employees from the sample reduces the observed mobility to 7.64% (762,232 moves out of 9,982,184 observations).

NF argue also that managers are less likely to possess industry-specific skills, and show that managers are more likely than other employees to change industry sectors. To account for the differences between managers and other employees, they exclude managers from the analysis.

Our sample (with the above restrictions) includes 517,184 manager-year observations (5.5% of the sample). Managers move about 0.3% less than other employees (t=8.103, p< .001). These differences are smaller than those documented by NF; the number of managers changing industry and/or industry sector is not substantially larger than the numbers of other employees (76.9%

[15] Estimation includes employees with short tenure.

versus 75.7%, 50.0% versus 50.8%, respectively). In fact, the number of managers changing industry sectors is smaller than the numbers of other employees changing sectors (b = -.0077, t= -2.9414, p = .0033).

One explanation for these differences between the Swedish and Danish data may stem from overall higher inter-industry mobility. Flexible labor contracts, which make hiring and firing easier in Denmark than in other European countries, may enable the observed inter-industry mobility.[16] Although we do not find substantial differences between managers and other employees, for consistency we exclude managers from the analysis.

We calculate flows from one industry to another in the years 2009-2016 for 198,025 potential industry combinations which results in 1,584,200—mostly zero—values.

To establish a baseline, we estimate the predicted mobility across industries, in line with NF who follow Neffke, Henning and Boschma (2011). To do this, we first calculate the number of employees and average salary in an industry in each year, and industry growth from the last year to the focal year measured as numbers of employees. We calculate number of employees and industry growth for the 445 industries observable in the years 2008-2016. Following NF, we pool the variables by summing them over eight years (2008-2015 and 2009-2016).

Our data include 445 origin industries and 444 destination industries during the period 2009 to 2016. The option for an employee to move within the

[16] The high overall inter-industry mobility seems not to be driven by location inside or outside the greater Copenhagen area where most businesses are located. While employees in the greater Copenhagen area are more likely to stay in the same industry if they move (20.69% versus 19.79%), they are equally likely to stay in the same industry sector (b = - 0.00092, p = .405). If we exclude managers, these difference becomes insignificant (24.46% versus 24.27%, b = - 0.00186, p = .09997), i.e., employees are equally likely to stay in the industry but are less likely to stay in the same industry sector (48.40% versus 49.54%, b = 0.0114, p < .001). However, these differences are small.

same industry is omitted; the year 2008 is omitted because we observe no moves in that year. We can predict 198,025 (455 x 444) unique flows. Since most flows observed between industries valued zero, we follow NF and use a zero-inflated negative binominal model. The model is similar to the one used by NF. Table D1 Model 1 shows the results for employees including managers, and Model 2 shows the results excluding managers.

| | Model 1 | Model 2 |
|---|---|---|
| *Count data equation* | | |
| Growth(destination) | 0.286 | 0.270 |
| | [11.11] | [10.69] |
| Growth(origin) | -0.233 | -0.225 |
| | [-9.66] | [-9.51] |
| Log(employment(origin)) | 0.760 | 0.756 |
| | [157.86] | [159.89] |
| Log(employment(destin.)) | 0.833 | 0.828 |
| | [155.93] | [154.09] |
| Log(wage(origin)) | -0.247 | -0.193 |
| | [-17.87] | [-14.13] |
| Log(wage(destination)) | 0.654 | 0.693 |
| | [45.16] | [48.38] |
| Constant | -21.82 | -23.02 |
| | [-79.96] | [-85.09] |
| *Regime selection equation* | | |
| Employment(origin) | -0.000145 | -0.000154 |
| | [-11.25] | [-10.86] |
| Employment(destination) | -0.0000163 | -0.0000170 |
| | [-7.63] | [-7.09] |
| Constant | 0.460 | 0.468 |
| | [7.10] | [7.09] |
| *Overdispersion parameter* | | |
| Ln(alpha) | 0.863 | 0.863 |
| | [133.30] | [136.49] |
| Observations | 197,580 | 197,580 |
| Observations flow = 0 | 127,974 | 125,707 |

*t statistics in brackets*

*For industry i (origin), employment and wages are over the 2008-2015 period. For industry j (destination), employment and wages are over the 2009-2016 period. Growth is calculated over the entire period. Model 1 includes managers in the analysis, Model 2 excludes managers.*

**Table D1: Zero-inflated negative binominal regression of labor flows**

Overall, the models are similar. The coefficients of origin and destination industry size are positive which is in line with NF. Growth of the origin has a negative coefficient while growth of the destination industry has a positive coefficient indicating movement from lower growth to higher growth industries. Labor flows are less likely to originate in high-wage industries but high-wage industries receive higher cross-industry labor inflows.

The relatedness measure (SR) is calculated as the observed flow divided by the predicted flow–both pooled across years.

## Descriptive statistics and transformation of the relatedness measure (SR)

We calculated two different relatedness measures: one including managers (based on Model 1, SR) and one excluding managers (based on Model 2, SR_2). We first present the results for SR.

*SR including managers.* Most values are zero; specifically, 64.85 percent of industry combinations have no labor flows—a smaller percentage than found by NF (81.3%). Also, only 25 percent of values are greater than 0.6, 10 percent are greater than 2.346, and 1 percent of values are greater than 15.335 (mean = 1.02, SD = 5.618). For the 69,606 industry combinations with non-zero value, the mean is 2.956 (SD = 9.164, median = 1.143). Following NF and Hartog and Neffke (2017), values of SR greater than 1 reflect industry relatedness. Around one in five combinations (37,908, 19.186%) meet this criterion. Since SR is highly skewed, Hartog and Neffke (2017) propose mapping the measure on the interval [-1, 1]:

$$\widetilde{SR}_{ij} = \frac{SR_{ij} - 1}{SR_{ij} + 1}$$

Consequently, if $\widetilde{SR}_{ij}$ is greater than 0 industries *i* and *j* are related. Compared to the asymmetric measure $SR_{ij}$, the number of related industries increases when we use the transformed measure $SSR_{ij}$ (42,332, 21.425%).

Hartog and Neffke (2017) argue also that the measure should be symmetric. We therefore calculate the average relatedness of industry *i* to industry *j* and vice versa.

$$S\widetilde{SR}_{ij} = \frac{\widetilde{SR}_{ij} + \widetilde{SR}_{ji}}{2}$$

Using the symmetric, transformed measure $S\widetilde{SR}_{ij}$, fewer industries are considered to be related compared to when we use the asymmetric measure (23,450 versus 37,908 or 11.867% versus 19.186%), indicating that some industries have greater inflows of employees from an industry than outflows (or vice versa). The symmetric non-transformed measure has the same number of related industries as the asymmetric measure.

To further explore how the transformed and non-transformed symmetric measures differ, we tabulate the number of NACE level 1 industries classified as related and their relatedness. Among the industries in the same industry sector, 68.04% (3,432 of 5,044) are related according to the SSR specification, and 51.88% according to the $S\widetilde{SR}_{ij}$ specification. We assume a greater overlap between the labor flow related measure and the NACE-based measure at least at sector level. The correlation between the NACE-based measure and the mapped measure is higher than the correlation between the NACE-based and non-mapped measures ($r = .200$, $r = .184$, respectively). Thus, while the overall percentage of related industries is lower using the mapped measure (likely due to the smaller number of related industries), the correlation indicates that the mapped measure is closer to the in the literature most frequently used measures of industry relatedness based on NACE classifications.

*SR excluding managers.* For the *SR*_2 measure excluding managers, we observe a similar pattern. Most values are zero. The percentage of industry combinations with no reciprocal labor flows (63.62%) is as expected, slightly lower than when managers are included. Only 25 percent of values are greater than 0.633, 10 percent are greater than 2.364, and 1 percent of values are greater

than 14.960 (mean = 1.03, SD = 5.353). For the 71,873 industry combinations with non-zero values, the mean is 2.841 (SD = 8.582, median = 1.117). Again, about one out in five combinations (38,571, 19.52%) have a value greater than 1, reflecting industry relatedness. The transformation has no effect on percentage of related industries. However, in the case of a symmetric transformed measure the number of related industries decreases by 7 percent (12.30% versus 19.52%). This decrease is similar to the decrease observed for the measure including managers (see above). However, when managers are excluded the non-transformed measure shows that the number of related industries is not independent of its being symmetric. The number of related industries increases if the measure is symmetric but not transformed (21.60% versus 19.52%).

The strong effect of making the measure symmetric after transformation suggests that some industries have very large mono-directional in- or outflows to/from a specific industry. This effect is amplified by managers' mobility.

Again, we tabulate the number of industries classified as related and sector relatedness at the NACE 1 sector level. Among the industries in the same industry sector, 69.07 percent (3,484 of 5,044) are related in the *SSR_2* specification and 53.37 percent are related in the $\widetilde{SSR}\_2_{ij}$ specification. The correlation between the NACE-based measure and the symmetric mapped measure is higher than the correlation with the symmetric non-mapped measure ($r$ = .202, $r$ = .187, respectively). These values are almost the same as the r-values of the measures including managers. Any non-symmetric measure (transformed or not) has a lower r-value (incl. managers r = .172, excl. managers r = .175).

In the analysis, we use industry relatedness based on the measure excluding managers which is consistent with prior studies.

# Conclusion

This thesis research was motivated by the importance of human capital to firm competitive advantage and firm performance. I investigated what makes human capital valuable to firms, how human capital specificity affects employee mobility, and how firms reconfigure human capital between and within firm units. Chapter 1 provides a comprehensive model of human capital reconfiguration which includes both internal and external options. To the best of my knowledge, it is the first study that examines reconfiguration *within* firm units. The findings suggest that firms use reconfiguration of human capital between and within firm units to mitigate strategic challenges. The choice to reconfigure employees between firm units affects the human capital available to the firm's units. In the context of acquisitions, this refers to whether the human capital is acquirer-specific or target-specific. I theorize that the choice of within or between unit reconfiguration is dependent also on agency issues between merging firms (proxied by size similarity). Similar agency issues arise in the case of multi-national companies (MNCs) between headquarters and subsidiaries (e.g., Ambos, Kunisch, Leicht-Deobald, & Steinberg, 2019). While most work on resource reconfiguration focuses on multi-business firms (Dickler & Folta, 2020; Folta et al., 2016; Sakhartov &

Folta, 2014), future work could investigate how subsidiary and subsidiary-headquarter dyad characteristics affect the resource reconfiguration within the MNC. Investigations of human capital reconfiguration would also complement existing work concerned with resource reconfiguration (or allocation) in MNCs which focuses predominantly on capital resources and how the allocation of capital to subsidiaries affect headquarters' ability to create value (Dellestrand, Kappen, & Lindahl, 2020).

Chapter 2 moves the discussion from mobility of (independent) individuals to mobility of individuals embedded in teams, and examines how the configuration of human capital within firms affects who leaves (and stays in) the firm after it is acquired. The findings show the importance of the target firm characteristics, specifically the diversity of the teams in which employees are embedded. R&D workers embedded in diverse teams are less likely to leave post-acquisition. I argue that this effect is driven by the specificity of their human capital. That is, the embeddedness of human capital in diverse teams increases specificity and reduces its value in the labor market. How the organizational design and the configuration of human capital within teams affects employee mobility should be further explored. Combined with the results in chapter 1, we would expect that human capital reconfiguration accompanying acquisition will affect post-acquisition mobility. I find preliminary evidence for this in further analysis: the turnover in acquisition targets with at least one employee promoted to manager level is lower than in targets with hired or transferred managers. Moreover, the empirical exercise conducted to reduce involuntary turnover in the sample used in chapter 2 shows interesting mobility patterns: some employees (including R&D workers and managers) are transferred to the acquirer immediately on acquisition. Note that this is not due to the closure of the target. Other employees stay within the target. Whether these redeployments are beneficial and mitigate the loss of human capital needs further research. Moreover, when collection the data

used for the present study, I observed that in partial acquisitions some employees move within the target firm to non-acquired establishments prior to the acquisition. While this appears to apply to only a small fraction of employees in target firms, it raises questions about how targets reconfigure their human capital prior to acquisition.

Chapter 3 questions the importance of industry-specific knowledge for new venture success and suggests mobility as a more plausible mechanism underlying the well-established relationship between industry experience and venture survival. It calls for more careful theorizing about the mechanisms driving the effects observed in empirical analyses, and for more direct measures. It might be that other human capital characteristics reflect different causal mechanisms. For instance, while firm-specificity is commonly assumed to reduce mobility, some scholars (Campbell, Coff, et al., 2012; Morris et al., 2017) argue—and chapter 2 show—that this is not always the case. If human capital is perceived overall to be more firm-specific (i.e. if it is embedded in diverse teams), employees with longer tenure (who are expected to have more FSHC) are more likely to leave. The findings in chapters 2 and 3 raise questions about whether the diversity of new venture teams reduces mobility of employees in new ventures. If so, while founding teams often include similar demographic characteristic (Ruef, Aldrich, & Carter, 2003), diverse new ventures might be better at retaining employees, and thus, might survive for longer. There is some evidence in line with this prediction in Honoré (2020) who shows that, under certain conditions, complementary experience increases venture survival.

While my dissertation addresses questions about human capital and its theoretical and empirical implications for the strategy and entrepreneurship literatures, it also raises new questions. Overall, I hope that both the answers and the questions raised enrich debate on the importance, specificity, mobility, and reconfiguration of human capital.

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