The Micro-foundation of Innovation in the Post-acquisition Phase

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TABLE OF CONTENTS

ABSTRACT

The literature on the innovation impact of technological acquisition has focused on the deal-specific properties (e.g., knowledge and cultural fit) between an acquirer and its target; the innovation capabilities of the two parties (i.e., acquirer and target); and the managerial capabilities of the acquirer. Although the literature has provided insights into this issue, it has been limited in explaining why technological acquisition often fails to deliver the expected innovation outcomes despite a high level of complementary fit between the two parties. The literature has also not provided an answer to how the knowledge of the two parties is synthesized in the postacquisition phase.

To address these problems, I investigate inventors' innovation behaviors in the postacquisition phase. Inventors, as repositories of technological knowledge and sources of innovation capability, play a vital role in knowledge synthesis processes by collaborating with other inventors. However, inventors' interests and concerns do not always align with their organizations' strategic goals (e.g., innovation synergy). Although previous studies have emphasized the integration of the workforce of the two parties for knowledge synthesis processes, their discussions have still focused on which of the target inventors remain and how acquirers retain human capital in the postacquisition phase. This study argues that the role of the human capital of the two parties in a knowledge synthesis process in the post-acquisition phase must be better understood. As a knowledge synthesis mechanism between the two parties in the postacquisition phase, I suggest postacquisition joint inventions in which the inventors of an acquirer and those of its target collaborate and synthesize their knowledge after the acquisition

deal. The main research question of this dissertation is as follows: Which inventors (from the acquirer or the target) participate in postacquisition joint inventions, and under what conditions do they do so? The acquirer and target inventors have different stances and perceptions toward acquisition because of the asymmetric relationships between the two parties. I take different theoretical perspectives to investigate the participation behaviors of each side's inventors.

This dissertation consists of three main chapters. In the first chapter, I review the existing research on the innovation aspects of technological acquisition and studies on employees in the acquisition context. In the second chapter, I focus on the innovation behaviors of acquirer inventors. After the acquisition, the target inventors, whose knowledge is similar to the knowledge of the acquirer inventors, flow into the acquirer. Depending on the knowledge niche, the acquirer inventors face different levels of competitive crowding from the corresponding target's inventors. I explore how increased competitive crowding influences their participation in postacquisition joint inventions. In the third chapter, I focus on the innovation behaviors of target inventors. I investigate how job security threat from external and internal factors influences the target inventors' participation in postacquisition joint inventions. The analysis results show that inventors who are confident in their positions and who are best able to synthesize their knowledge with the acquisition partner's inventors are least likely to participate in postacquisition joint inventions. This dissertation contributes to the literature on the acquisition, social networks, niche and crowding, human capital, and microfoundation of innovation.

RÉSUMÉ

La documentation existante relative à l'impact de l'innovation dans l'acquisition technologique se concentre sur les propriétés propres à la transaction (par ex. l'adéquation des connaissances et de la culture) entre un acquéreur et sa cible, les capacités d'innovation des deux parties (à savoir l'acquéreur et la cible) et les compétences en gestion de l'acquéreur. Bien que cette documentation fournisse des éclairages sur le sujet, elle reste limitée dans son explication des raisons pour lesquelles dans bien des cas l'acquisition de la technologie ne permet pas de livrer les résultats d'innovation attendus, malgré un niveau de complémentarité élevé entre les deux parties. La documentation n'offre pas non plus de réponse concernant la manière dont se produit la synthèse des connaissances des deux parties dans la phase post-acquisition.

Pour aborder ces questions, la présente thèse explore les comportements d'innovation des inventeurs lors de la phase post-acquisition. Les inventeurs, en tant que dépositaires des connaissances technologiques et des sources de la capacité d'innovation, jouent un rôle vital dans les processus de synthèse des connaissances par leur collaboration avec les autres inventeurs. Toutefois, les intérêts et préoccupations des inventeurs ne concordent pas toujours avec les objectifs stratégiques de leurs entreprises (par ex. la synergie dans l'innovation). Bien que des études précédentes aient mis l'accent sur l'intégration de la main d'œuvre des deux parties dans les processus de synthèse des connaissances, les discussions se concentraient toujours sur le fait de savoir lesquels des inventeurs de la cible devraient être retenus et la façon dont les acquéreurs retenaient le capital humain dans la phase post-acquisition. Cette thèse soutient que le rôle du capital humain des deux parties d'un processus de synthèse des connaissances dans la phase

post-acquisition doit être mieux compris. Pour ce qui est du mécanisme de synthèse des connaissances entre les deux parties dans la phase post-acquisition, je suggère des inventions conjointes après l'acquisition, pour lesquelles les inventeurs d'un acquéreur et ceux de sa cible collaborent et synthétisent leurs connaissances après la transaction d'acquisition. La question de recherche principale de cette thèse est la suivante : Quels inventeurs (de l'acquéreur ou de la cible) participent aux inventions conjointes après l'acquisition et sous quelles conditions le font-ils ? Les inventeurs de l'acquéreur et de la cible ont différentes positions et perceptions par rapport à l'acquisition, en raison des relations asymétriques entre les deux parties. J'adopte différentes perspectives théoriques pour examiner les comportements participatifs des inventeurs de chaque partie.

Cette thèse comprend trois principaux chapitres. Dans le premier chapitre, je passe en revue les recherches existantes relatives aux aspects innovation de l'acquisition technologique ainsi que des études sur les employés dans le contexte de l'acquisition. Dans le deuxième chapitre, je me concentre sur les comportements d'innovation des inventeurs de l'acquéreur. Après l'acquisition, les inventeurs de la cible, dont les connaissances sont similaires à celles des inventeurs de l'acquéreur, rejoignent l'acquéreur. En fonction de la niche de connaissances, les inventeurs de l'acquéreur font face à différents niveaux d'augmentation de la concurrence interne (« crowding ») avec les inventeurs de la cible correspondante. J'explore comment cette augmentation de la concurrence influence leur participation aux inventions conjointes après l'acquisition. Dans le troisième chapitre, je me concentre sur les comportements d'innovation des inventeurs de la cible. J'examine comment les menaces à la sécurité professionnelle issues de facteurs externes et internes influencent la participation des inventeurs de la cible dans les

inventions conjointes après l'acquisition. Les résultats de l'analyse révèlent que les inventeurs qui sont confiants dans leurs postes et qui sont davantage capables de synthétiser leurs connaissances avec les inventeurs du partenaire de l'acquisition sont moins susceptibles de participer aux inventions conjointes après l'acquisition. Cette thèse contribue à alimenter la documentation relative aux acquisitions, aux réseaux sociaux, aux niches et au « crowding », au capital humain et à la micro-fondation de l'innovation.

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I dedicate my dissertation to all these people.

CONTRIBUTION TO ORIGINAL KNOWLEDGE

I intend to contribute to the acquisition literature by revealing the micro-level mechanism of knowledge synthesis between an acquirer and its target in the postacquisition phase. Specifically, my research question is which of the acquirer inventors (or the target inventors) participate in the knowledge synthesis process between an acquirer and its target after the acquisition. By focusing on postacquisition joint projects where inventors of both acquirer and target collaborate and synthesize their knowledge, I investigate who participates in postacquisition joint inventions and under what conditions they do so.

In Chapter 1, I review the literature on the innovation impact of acquisitions and studies on employees' perceptions, behaviors, and performance in the acquisition context. In Chapter 2, I empirically investigate acquirer inventors' participation behaviors in postacquisition joint inventions from the niche and status perspectives. In Chapter 3, I examine how the target inventors' perception of job security threats influences their participating behaviors in postacquisition joint inventions.

The empirical findings in Chapters 2 and 3 show that inventors who are less confident in their positions under the acquisition context are more likely to participate in postacquisition joint inventions to sustain in their organizations. These findings imply that, without inventors' participation in postacquisition joint inventions, acquirers may fail to achieve their innovation goal of their acquisitions in the expected knowledge areas despite a high level of complementary fit between the two parties. To understand the mechanism of knowledge synthesis between an

acquirer and its target, we should examine the inventors' behavioral mechanism in the postacquisition phase.

CONTRIBUTION OF AUTHORS

All of the chapters in this thesis were entirely written by Yonghwan Lee. The literature review, hypothesizing, data collection, data analysis, and findings in this dissertation are original, unpublished, and independent work by Yonghwan Lee. Dr. Corey Phelps and Dr. Kwnagjun An provided academic guidance and editorial feedback on this dissertation's theoretical and empirical aspects.

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

A central motivation behind organizations' technological acquisitions is to gain access to and control of another organization's technological knowledge and innovation capabilities (Ahuja & Katila, 2001). Technological acquisition refers to an organization's purchase of another organization for innovation purposes (Ahuja & Katila, 2001). Newly obtained technological knowledge and innovation capabilities can be valuable on their own for an acquirer, but even more so when the knowledge and capabilities of the target produce innovation outcomes with those of the acquirer (Larsson & Finkelstein, 1999; Puranam, Singh, & Chaudhuri, 2009; Puranam, Singh, & Zollo, 2006; Ranft & Lord, 2002).

The knowledge and capabilities of an acquirer and its target, however, can be difficult to synthesize (Puranam et al., 2009; Puranam & Srikanth, 2007). Technological acquisition often fails to deliver expected innovation outcomes despite a high level of complementary fit between the two parties (Rao, Yu, & Umashankar, 2016; Schweizer, 2005; Sirower, 1997). Even though predicting the innovation impact of technological acquisition is crucial for acquirers to examine innovation goal achievement, the relevant literature has underexplored how the knowledge of an acquirer and its target is synthesized in the postacquisition phase (Rao et al., 2016). To address these failures, this dissertation focuses on a postacquisition innovation process between the technical core (i.e., corporate inventors) of an acquirer and its target.

The knowledge synthesis process between an acquirer and its target requires collaboration between the human capital of these two parties, including their specialized knowledge and

capabilities. Much of the valuable technological knowledge under such conditions is tacit (Kogut & Zander, 1992; Nonaka, 1994). Innovation requires the recombination of existing technological knowledge residing in individuals (Fleming, 2001; Kogut & Zander, 1992; Nonaka, 1994; Ranft & Lord, 2000). In the acquisition context, collaboration between inventors of the two parties is required to synthesize their knowledge (Haspeslagh & Jemison, 1991; Singh & Agrawal, 2011). In support of this view, Facebook CEO Mark Zuckerberg emphasized the importance of obtaining human capital in the technological acquisition context, a phenomenon known as 'acqui-hiring.' He stated, "We buy companies to get excellent people" (Makinen, Haber, & Raymundo, 2012). His statement implies that one primary purpose of technological acquisition in knowledge-intensive industries is to obtain valuable human capital for its innovation activities, rather than simply enhancing access to innovation outcomes created before the acquisition (Chaudhuri & Tabrizi, 1999; Chen, Gao, & Ma, 2021; Makinen et al., 2012; Ranft & Lord, 2000; Younge, Tong, & Fleming, 2015). Depending on the level of cooperation between the human capital of the two parties, the innovation potential that the acquirer can achieve varies. Therefore, investigating the process of human capital integration can advance our understanding of how technological acquisition affects innovation performance in the postacquisition phase.

Despite the great innovation potential between an acquirer and its target, inventors' interests and concerns (e.g., their career development, promotion, and job security) do not always align with their organization's strategic goals (Simon, 1991). As the technological core of corporate innovation, inventors lead or resist innovation activities within their organizations (Criscuolo, Salter, & Ter Wal, 2014; Larsson & Finkelstein, 1999). Even in cases of perfect innovation potential between an acquirer and its target, no one may want to participate in the knowledge

synthesis process between an acquirer and its target if their interests do not meet their organizations' innovation goals (Larsson & Finkelstein, 1999; Ranft & Lord, 2002). Most studies on acquisition have considered inventors passive in the postacquisition context, paying less attention to their proactive role in innovation activities and their impact on innovation performance (Campbell, 2000). This proactive perspective raises two important yet unanswered questions: 1) Why does technological acquisition fail to deliver expected innovation outcomes despite a high level of organizational fits between the two parties (Rao et al., 2016; Schweizer, 2005; Sirower, 1997), and 2) under what conditions do inventors contribute to the process of synthesizing the knowledge of the two parties? By tackling these questions, we can better understand how the knowledge synthesis process occurs between the two parties.

In this dissertation, I seek to address these questions by investigating which inventors (from the acquirer or the target) participate in postacquisition joint inventions where the inventors of the two parties collaborate together in the postacquisition phase (i.e., postacquisition joint inventions). Specifically, I focus on the changes in the inventors' positions after the acquisition as a central force for participating in postacquisition joint inventions. Positions, as an umbrella construct, include the inventors' value as human resources, their status in formal and informal structures, and their relative standings as employees (Ranft & Lord, 2000). Depending on the inventors' positions within their organizations, their innovation behaviors related to creating innovation outcomes vary (Coff & Kryscynski, 2011; Paruchuri, 2010). In the technological acquisition context, the positions of an acquirer's inventors change due to the inflow of the target's inventors into the acquirer's boundary, and vice versa (Hambrick & Cannella, 1993; Paruchuri, Nerkar, & Hambrick, 2006; Prato & Ferraro, 2018; Ranft & Lord, 2000). By

investigating how such a positional change influences inventors' behaviors of participating in postacquisition joint inventions, I seek to provide implications for the process of the knowledge synthesis between the two parties in the postacquisition phase.

This dissertation consists of three chapters. In the first chapter, I conduct a literature review on the influence of technological acquisition on innovation outcomes. I suggest a framework consisting of acquisition-inherent factors (i.e., innovation purpose, knowledge fit, cultural fit, and pre-acquisition relationships); organizations' capability factors (i.e., innovation, restructuring, and human resource management capabilities); the synthesis of knowledge and capabilities of an acquirer and its target; and innovation consequences (i.e., quantitative and qualitative outcomes). I also review studies on employees in the acquisition context. Then, I discuss the direction of future research on technological acquisition.

The acquirer and target inventors have different stances and attitudes toward a technological acquisition because of the asymmetric relationships between an acquirer and its target (Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999; Ranft & Lord, 2000). I take different theoretical perspectives to investigate the innovation behaviors of each side's inventors in the postacquisition phase. In the second chapter, I focus on the positional change of acquirer inventors in their knowledge area from the niche perspective. Specifically, the research question is as follows: How does the increase in competitive crowding from the corresponding target's inventors in their knowledge niche influence their participation in postacquisition joint inventions? Depending on their knowledge backgrounds, the acquirer inventors face a varying degree of pressure from the target inventors who possess similar or the same knowledge backgrounds due to the inflow of the

target inventors into the acquirer. Such pressure creates counterbalancing forces. On the one hand, the target inventors may be substitutes with similar knowledge backgrounds (potential competitors). On the other hand, some of the inventors may complement each other by providing opportunities to collaborate and create innovation outcomes. I develop hypotheses on how those counterbalancing forces influence the acquirer inventors. I hypothesize that the acquirer inventors are more likely to participate in postacquisition joint inventions when they face a higher level of increased competitive crowding from target inventors in their knowledge niche. This competitive crowding effect may differ depending on the acquirer inventors' status in their home organization. I also test whether this mechanism works in the exact same way for the target inventors.

In the third chapter, I focus on the target inventors and examine what drives them to participate in postacquisition joint inventions. The process of technological acquisition positions the target inventors as the "acquired company's employees", which can cause them to experience job security anxiety, career development concerns, and a general sense of inferiority (Ranft & Lord, 2000). From perspective of job security threat, I attempt to reveal how the heterogeneity of job security threats influences the target inventors' behaviors related to participating in postacquisition joint inventions. I hypothesize that the target inventors who have a higher level of job security threat from external and internal factors are more likely to participate in postacquisition joint inventions than those who do not. Contrary to the conventional wisdom that it is important to retain high performers as they are crucial human capital, I expect that relatively lower performers who face a high level of job security threat will seek to help the acquirer by participating in postacquisition joint inventions.

I conducted a quantitative data analysis with inventors from acquisition deals in the U.S. high-technology industries between 2001 and 2015. As a supplement for my arguments, I interviewed people (e.g., executives, inventors, and executive-level consultants) who worked in high-technology industries and had acquisition experience. The empirical findings of this dissertation (Chapters 2 and 3) suggest that inventors who are confident in their positions in the postacquisition phase and who are best able to synthesize their knowledge with the acquisition partner's inventors are the least likely to participate in postacquisition joint inventions. Future research is needed to explore the incentive policies and conditions that cause such inventors to contribute to the knowledge synthesis process between the two parties in the postacquisition phase.

CHAPTER 1

Comprehensive Review of the Relevant Literature

Comprehensive Review of the Relevant Literature and Future Research Direction

Abstract

In this chapter, I review the literature on the innovation impact of acquisition through a conceptual framework to better understand the discussions and findings in a systematic way. This literature review consists of three main sections. I first review the organizational-level research on the innovation impact of acquisitions in the postacquisition phase and then move on to individual-level studies to understand the behavioral mechanism of employees in the acquisition context. Based on the literature review, I identify the limitations and research gaps of the literature and discuss future directions for research on innovation in the postacquisition phase.

Keywords*: M&A, Technological acquisition, Technological innovation*

INTRODUCTION

A large number of studies have advanced our understanding of the innovation impact of acquisition. The primary purpose of this chapter is to review the literature on the innovation impact of acquisition and discuss future research directions of the acquisition literature. This review chapter consists of three main sections. In the first section, I review the organizational-level research. I focus on the importance of the synthesis of the knowledge of an acquirer and its target in relation to innovation activities and performance in the postacquisition phase. The following section addresses the influence of technological acquisition on quantitative and qualitative innovation performance. Then, I review the role of deal-specific factors (i.e., dyadic factors between an acquirer and its target) of acquisition, organizational capability factors in the knowledge synthesis process, and innovation activities during the postacquisition phase. In the second section, I review the two primary streams of individual-level research: psychology-based research and human resource management research. I examine studies on the emotions and psychological perceptions of employees and on the behaviors of targets' employees (e.g., remaining and innovation activity). While reviewing both organizational- and individual-level studies, I identify the limitations and research gaps in the literature. On the basis of those limitations of the acquisition literature, I discuss future research directions for the innovation impact of acquisition in the postacquisition phase.

CONCEPTUAL FRAMEWORK

Conceptual Framework of Innovation in the Postacquisition Phase

This review employs an integrative framework to consider the innovation aspects of acquisition, as shown in Figure 1. I focus on the synthesis of the knowledge of an acquirer and its target in the postacquisition phase, as this mechanism is central to understanding the innovation impact of an acquisition. Based on this key mechanism (the synthesis of knowledge), I extend my framework to include the influence of such synthesis on the quantitative and qualitative aspects of innovation performance in the postacquisition phase.

Insert Figure 1 about Here

Not all acquisitions produce successful innovation performance (Eccles, Lanes, & Wilson, 1999; Graebner, Eisenhardt, & Roundy, 2010; Haspeslagh & Jemison, 1991; Puranam & Srikanth, 2007). Regarding the driving forces and constraints of the synthesis of knowledge in this context, I identify two principal factors that influence innovation performance in the postacquisition phase via the knowledge synthesis process: deal-specific factors (i.e., dyadic factors: acquirer-target) and organizations' capability factors (acquirer or target). An acquisition by its nature is a dyadic relationship between an acquirer and its target (Haspeslagh & Jemison, 1991). Acquisition-inherent attributes, such as innovation motivation, knowledge fit, cultural fit, and preacquisition relationships, serve as catalysts or barriers to the synthesis of knowledge in the postacquisition phase, further influencing an acquisition's quantitative and qualitative innovation performance. The other principal factor is the capability of each organization (the acquirer or its target), specifically, how an organization, particularly the acquirer, leverages its target's knowledge with its own different types of capabilities, such as managerial and innovation capabilities. These conditions can encourage or discourage both an acquirer and its target from

synthesizing their knowledge and innovation capabilities for innovation activities in the postacquisition phase.

Individual-level Research in the Acquisition Context

Although organizational-level studies have provided insights into the innovation impact of acquisition, such studies have implicitly assumed that the employees of the two parties will contribute to the knowledge and capability synthesis process in the postacquisition phase. To better understand the behavioral mechanism of employees in the acquisition context, I also review individual-level studies on the emotions, psychological perceptions, behaviors (i.e., turnover and staying), and innovation productivity of employees in the acquisition context. Employees play a crucial role in innovation activities as knowledge reservoirs and have the capability of synthesizing knowledge (Fleming, 2001; Singh & Agrawal, 2011). In this area, there are three substreams of research. One group of studies has focused on the emotions and perceptions of employees in the acquisition context (Buono & Bowditch, 2003; Marks & Mirvis, 1985; Marks, Mirvis, & Ashkenas, 2017). Another group of studies has explored the turnover and staying behaviors of target employees (Cho, Lee, & Kim, 2014; Hambrick & Cannella, 1993; Krug & Hegarty, 2001). Other research has investigated the innovation productivity effect of technological acquisition on employees in the acquisition context, with a particular focus on inventors (Empson, 2001; Paruchuri & Eisenman, 2012; Paruchuri, Nerkar, & Hambrick, 2006).

REVIEW ON DYADIC AND ORGANIZATIONAL-LEVEL STUDIES

Knowledge Synthesis as a Central Mechanism of Innovation in the Postacquisition Phase

Knowledge is a crucial resource for an organization's competitiveness (Grant, 1996; Hoskisson, Hitt, Wan, & Yiu, 1999; Kogut & Zander, 1992; Spender, 1996). How an organization creates intangible knowledge through innovation activities has been a significant concern in the innovation literature (Kogut & Zander, 1992; Spender, 1996). Such knowledge includes practical skills, know-how, and expertise that are difficult to imitate rather than factual evidence or falsifiable findings (Kogut & Zander, 1992; Spender, 1996). According to Polanyi (1966), there is a consensus that knowledge is created by combining and recombining existing knowledge (Fleming, 2001; Kogut & Zander, 1992; Nonaka, 1994). An organization with a larger knowledge base has an advantage over others in terms of improving its innovation performance by creating innovation outcomes.

To enlarge their knowledge pools and enhance their innovation capabilities, organizations implement various corporate development vehicles, such as strategic alliances (Eisenhardt & Schoonhoven, 1996; Gulati & Gargiulo, 1999; Mowery, Oxley, & Silverman, 1996), hiring employees from competitors (Singh & Agrawal, 2011; Tzabbar, Silverman, & Aharonson, 2015), and corporate venture capital investment (Benson & Ziedonis, 2009; Benson, 2010). Among these corporate development vehicles, acquisition has received increasing attention from managers and scholars (Graebner, Heimeriks, Huy, & Vaara, 2017; Vorobyov, Harding, Dassie, & Diamond, 2021). Unlike other corporate development vehicles, acquisition enables organizations to enlarge their knowledge pools and secure human capital through one-time transactions (Graebner et al., 2017; Ranft & Lord, 2000; Ranft & Lord, 2002; Ransbotham & Mitra, 2010). Among the different types of acquisitions, a technological acquisition involves one

company purchasing another to obtain technological assets such as knowledge and human capital (Ahuja & Katila, 2001). Compared with strategic alliances, technological acquisition entails a relatively low risk of moral hazard and knowledge leakage and provides full managerial control over the target (Carayannopoulos & Auster, 2010; Titus, House, & Covin, 2017). In contrast to corporate venture capital investment, organizations can utilize the mature knowledge of their targets in the short term (Titus et al., 2017; Tong & Li, 2011).

In technological acquisitions, acquirers pool their knowledge with that of their targets to achieve common innovation purposes (Dalziel, 2008; Eisenhardt & Schoonhoven, 1996; Graebner & Eisenhardt, 2004; Gulati & Gargiulo, 1999; Mowery et al., 1996). The most crucial prerequisite for innovation activities in the postacquisition phase is knowledge synthesis between an acquirer and its target (Bjorkman, Stahl, & Vaara, 2007; Cohen & Levinthal, 1990; Fleming, 2001; Lane & Lubatkin, 1998; Li & Wang, 2020; Nonaka, 1994). Knowledge synthesis refers to the innovation process conducted by an actor in gaining an understanding of the knowledge of other actors and using it to create innovation outcomes (Argote & Ingram, 2000; Inkpen & Tsang, 2005; Kogut & Zander, 1996). These actors can be individuals, groups, organizational units, or organizations (Inkpen & Tsang, 2005). Knowledge synthesis between an acquirer and its target is necessary for the acquirer to leverage the target's knowledge and innovation capability and vice versa (Graebner et al., 2010; Haspeslagh & Jemison, 1991). Through this synthesis process, an acquirer can obtain its target's knowledge, synthesize the new knowledge with its own, and create innovation outcomes.

Previous studies have revealed that the knowledge of targets is synthesized in the acquirers' ongoing innovation activities during the postacquisition phase (Puranam & Srikanth, 2007; Ranft & Lord, 2000; Ranft & Lord, 2002; Sarala, Junni, Cooper, & Tarba, 2016). From the target perspective, an acquirer's knowledge helps the target overcome technological barriers and limitations (Dalziel, 2008; Graebner et al., 2010). Bresman, Birkinshaw, and Nobel (1999) investigated the knowledge synthesis process by examining the direction of the knowledge transfer between acquirers and targets in international acquisitions. They revealed that knowledge is primarily transferred from a target to its acquirer at the very beginning of the postacquisition phase, which indicates that the knowledge synthesis process occurs primarily by the acquirer. However, the direction of the knowledge transfer between an acquirer and its target becomes reciprocal over time. Individual-level studies have shown that the knowledge of key employees is more likely to be synthesized with that of others in the postacquisition phase (Paruchuri & Eisenman, 2012).

Innovation Performance in the Postacquisition Phase

In this section, I turn to how technological acquisition influences innovation performance in the postacquisition phase. Previous studies have focused on the impact of technological acquisition on innovation performance from two primary perspectives: quantity and quality.

Innovation Quantity Previous studies on technological acquisition have revealed mixed effects (positive and negative) of technological acquisitions on an acquirer's innovation performance. On the one hand, technological acquisition has been shown to positively influence innovation

quantity (Ahuja & Katila, 2001; Al-Laham, Schweizer, & Amburgey, 2010; Berchicci, 2013; Capron, Dussauge, & Mitchell, 1998; Cloodt, Hagedoorn, & Van Kranenburg, 2006; Li & Wang, 2020) because it enables acquirers to obtain new knowledge sources and access their targets' knowledge. In this way, an acquirer and its target create a larger knowledge pool in which to combine and recombine the knowledge of the two organizations (Fleming, 2001; Kogut & Zander, 1992; Nonaka, 1994). In other words, technological acquisition expands the scale and scope of an acquirer's knowledge base, providing recombination benefits (Ahuja & Katila, 2001) and enabling the utilization of the target's knowledge for the ongoing innovation activities of the acquirer (Puranam & Srikanth, 2007; Ranft & Lord, 2000; Ranft & Lord, 2002; Sarala et al., 2016) or the target (Dalziel, 2008; Graebner et al., 2010).

On the other hand, technological acquisition negatively impacts innovation quantity. Previous studies have focused on the disruptive aspects of technological acquisition (Ahuja & Katila, 2001; Capron, 1999; Makri, Hitt, & Lane, 2010; Puranam, Singh, & Zollo, 2006; Puranam & Srikanth, 2007). There are differences in the degree of such disruption between targets and their acquirers; technological acquisition changes the workplaces, ongoing innovation activities, and organizational processes of both organizations (Haspeslagh & Jemison, 1991; Meyer & Lieb-Doczy, 2003; Puranam et al., 2006; Puranam & Srikanth, 2007; Schweizer, 2005). Newly implemented innovation activities between an acquirer and its target in the postacquisition phase increase the workloads of other business units, disrupting the innovation activities of their business units (Shaver, 2006). When the anticipated innovation potential between an acquirer and its target is overestimated during the due diligence period, the acquirer's innovation performance (quantity) declines (Rao, Yu, & Umashankar, 2016).

Innovation Quality Increased access to new knowledge sources provides acquirers and targets with more opportunities to combine and recombine their existing knowledge (Fleming, 2001; Kogut & Zander, 1992; Nonaka, 1994; Ranft & Lord, 2000; Ranft & Lord, 2002). By providing the two parties with such a large knowledge pool, technological acquisition helps acquirers create novel innovation outcomes (Beaudry & Schiffauerova, 2011; Makri et al., 2010). These innovation outcomes can become a foundation for future innovation activities (Makri et al., 2010; Park, Howard, & Gomulya, 2018) or broaden the scope of the acquirers' knowledge (Makri et al., 2010). Similarly, an acquirer's employees can produce high-quality innovation outcomes by synthesizing the knowledge of both the acquirer and its target (Li & Wang, 2020).

On the other hand, Valentini (2012) conducted his research at the innovation outcome level and revealed the negative side of technological innovation in terms of quality. He suggested the existence of three quality dimensions: originality, generality and impact. Originality indicates the extent to which an innovation outcome combines existing knowledge in a new way. Generality denotes the extent to which the focal innovation outcomes are applicable to both science and technology. Impact refers to the influence of innovation outcomes on subsequent innovation activities. While technological acquisition has a positive impact on innovation quantity, it negatively influences innovation quality in terms of originality, generality, and impact. Moreover, the author's subsequent research showed that the enlarged and diverse knowledge pool produced in this context neither deepens nor widens the knowledge base of the acquirers (Valentini & Di Guardo, 2012).

Deal-Specific Factors of Acquisitions that Impact Innovation

In terms of quantity and quality, the literature on the impact of technological acquisition on innovation performance highlights contradictory influences (positive and negative). These mixed findings originate from the dual factors involved in technological acquisitions. Some factors facilitate knowledge synthesis between an acquirer and its target, thereby resulting in increased innovation performance in terms of quantity or quality. Other factors serve as constraints and have negative influences on innovation performance.

Technological Motivation A strong motivation of an acquirer to conduct technological innovation with a target's knowledge is the driving force behind the knowledge synthesis between an acquirer and its target and the acquisition's impact on innovation performance. Even if an acquirer implements a technological acquisition for innovation purposes, technological acquisitions, by nature, have multiple purposes, such as improved distribution channels and manufacturing (Ahuja, 2000; Zhao, 2009). For example, through technological acquisitions in the pharmaceutical and biotechnology industry, an organization may acquire a target not only for its technological innovation but also for its marketing capabilities (Schweizer, 2005). Not all acquirers have the same level of motivation for technological innovation (Ahuja & Katila, 2001; Capron et al., 1998). Even if an acquisition contains a technological component and is thus regarded as a technological acquisition (Ahuja & Katila, 2001), knowledge synthesis between an acquirer and its target is less likely to occur in the postacquisition phase, when the acquirer's motivation for technological objectives is weak.

Knowledge Fit Knowledge fit between an acquirer and its target refers to the promising knowledge synthesis between the acquirer and its target (Larsson & Finkelstein, 1999; Rao et al., 2016). In terms of depth and breadth, a high level of knowledge fit generates economies of scale and scope in innovation activities during the postacquisition phase (Cloodt et al., 2006; Gerpott, 1995). A better knowledge fit can enrich an acquirer's knowledge base, help an acquirer identify technological opportunities in its own knowledge base and that of its target, and help it synthesize its target's knowledge and vice versa (Cloodt et al., 2006; Cohen & Levinthal, 1990; Graebner et al., 2010). In other words, a high level of knowledge fit enables both an acquirer and its target to synthesize their know-how, know-what, and other tacit knowledge, thereby creating innovation outcomes (Ahuja & Katila, 2001; Bjorkman et al., 2007; Bresman et al., 1999; Cassiman & Veugelers, 2006; Cloodt et al., 2006; Gulati & Puranam, 2009; Larsson & Finkelstein, 1999; Rao et al., 2016).

Previous studies have used similar constructs, such as complementarity (Bjorkman et al., 2007; Li & Wang, 2020; Makri et al., 2010; Valentini, 2012; Valentini & Di Guardo, 2012), similarity (Park et al., 2018; Rao et al., 2016), overlap (Kapoor & Lim, 2007), and relatedness (Ahuja & Katila, 2001; Cloodt et al., 2006), for knowledge fit between an acquirer and its target. However, these factors have different impacts on innovation performance in the postacquisition phase. While knowledge complementarity has a positive influence on knowledge synthesis and innovation performance (Bjorkman et al., 2007; Makri et al., 2010; Valentini, 2012; Valentini & Di Guardo, 2012), other constructs (knowledge similarity, overlap, and relatedness) have inverted U-shaped relationships with knowledge synthesis and innovation performance (Ahuja & Katila, 2001; Cloodt et al., 2006).

Although these constructs seem similar, they are not interchangeable because they have different foundations. Specifically, the concepts of knowledge complementarity and other constructs (similarity, overlap, and relatedness) have different foundations. Among these constructs, the concept of complementarity is interchangeable with the concept of knowledge fit. Knowledge fit, by definition, refers to the complementarities of knowledge that can create opportunities for synergistic innovation outcomes that cannot be created otherwise (Bjorkman et al., 2007; Cassiman & Veugelers, 2006; Fleming, 2001; Li & Wang, 2020; Valentini, 2012; Valentini & Di Guardo, 2012). Organizations with better knowledge fit and complementarity are more likely to exhibit better innovation performance (quantitively or qualitatively) in the postacquisition phase than those with less knowledge fit (Ahuja & Katila, 2001; Bjorkman et al., 2007; Valentini, 2012; Valentini & Di Guardo, 2012).

In contrast to the two concepts of knowledge fit and complementarity, knowledge similarity, overlap, and relatedness refer to the extent to which an acquirer and its target have common knowledge bases (Ahuja & Katila, 2001; Kapoor & Lim, 2007; Karim & Mitchell, 2000; Makri et al., 2010; Park et al., 2018). Previous studies have used these three constructs to indicate the knowledge commonality between an acquirer and its target, specifically, the shared common knowledge scope between these two organizations (Ahuja & Katila, 2001; Cloodt et al., 2006; Park et al., 2018). The research that has employed these three constructs has argued that a common knowledge background increases the probability that an acquirer and its target will synthesize their existing knowledge by learning and utilizing each other's knowledge (Cohen & Levinthal, 1990; Larsson & Finkelstein, 1999; Park et al., 2018).

Studies using the constructs of knowledge similarity, overlap, and relatedness have argued that a moderate level of commonality in knowledge bases is best for enriching knowledge bases and creating opportunities for knowledge synthesis and improved innovation performance (Ahuja & Katila, 2001; Cloodt et al., 2006; Karim & Mitchell, 2000; Park et al., 2018). Too much commonality between the knowledge bases of an acquirer and its target reduces the potential benefits of combining and recombining their existing knowledge due to redundancy (Ahuja & Katila, 2001; Cloodt et al., 2006). Insufficient commonality between the knowledge bases of an acquirer and its target requires a radical change in innovation processes (Cloodt et al., 2006; Cohen & Levinthal, 1990; Kogut & Zander, 1992).

In addition to providing innovation potential, the knowledge fit between an acquirer and its target helps the acquirer monitor innovation activities during the postacquisition phase (Coff, 1999; Kapoor & Lim, 2007). The innovation activities of learning and utilizing a target's knowledge in the postacquisition phase are very detailed and specific processes (Cassiman & Veugelers, 2006; Haspeslagh & Jemison, 1991; Kogut & Zander, 1996). When an acquirer understands its target's knowledge well due to common knowledge bases, it can better evaluate the target's knowledge and the processes of innovation activities that synthesize the knowledge of the two parties (Ahuja & Katila, 2001; Cohen & Levinthal, 1990; Park et al., 2018).

Cultural fit Organizational culture can be defined as the shared beliefs, values, rules, and behavioral norms within an organization (Nahavandi & Malekzadeh, 1988; Stahl & Voigt, 2008; Weber, Shenkar, & Raveh, 1996). Usually, the cultural fit between an acquirer and its target

indicates the similarity of such beliefs and values, but the term is also used with the narrow meaning of the similarity of the work routines and processes of the two organizations (Rao et al., 2016; Sarala et al., 2016; Shrivastava, 1986; Weber & Camerer, 2003). In the international business literature, the cultural fit between an acquirer and its target is usually viewed as cultural similarity at the country level (national cultural distance) rather than at the organizational level (Rao et al., 2016; Sarala & Vaara, 2010). Organizational-level studies have often used the construct of cultural fit as a proxy for cultural similarity between an acquirer and its target.

From the perspective of values and beliefs, cultural similarity between an acquirer and its target is crucial for building identities among the employees of those organizations (Ashforth & Mael, 1989; Datta, 1991; Vaara, Sarala, Stahl, & Bjorkman, 2012). Similarities in beliefs and values enable the employees of an acquirer and its target to trust each other (Stahl, Larsson, Kremershof, & Sitkin, 2011), thereby reducing social conflicts and the bias of each organization toward the other (Sarala & Vaara, 2010; Vaara, Junni, Sarala, Ehrnrooth, & Koveshnikov, 2014; Vaara et al., 2012). A great cultural distance between an acquirer and its target acts as a barrier that restricts knowledge synthesis and innovation activities in the postacquisition phase (Barkema, Bell, & Pennings, 1996; Datta, 1991; Rao et al., 2016).

From the organizational routine and process perspective, cultural similarity reduces the negative effect of interactions between an acquirer and its target during the postacquisition phase (Datta, 1991; Pablo, 1994; Pablo, Sitkin, & Jemison, 1996; Rao et al., 2016). After a technological acquisition, differences in organizational processes and routines make it challenging for the acquirer and its target to share their knowledge, collaborate to synthesize knowledge, and create

innovation outcomes (Pablo, 1994). As Rao et al. (2016) explained, each organization has its own innovation processes and routines. For example, while pharmaceutical companies tend to have bureaucratic and hierarchical processes and routines, biotechnology companies are more likely to have casual and egalitarian innovation processes. In the postacquisition phase, such differences in organizational processes make it difficult for both an acquirer and its target to collaborate, synthesize their knowledge, and create innovation outcomes.

In summary, even though the boundary between an acquirer and its target may disappear, differences in their organizational cultures may still exist within the boundaries of each organization after a technological acquisition (Buono & Bowditch, 2003; Buono, Bowditch, & Lewis, 1985). Once established, organizational cultures tend to be persistent and sometimes resist change (Weber et al., 1996). Acquirers and their targets tend to adhere to their own ways of engaging in economic exchange behaviors and are hesitant to change (Buono et al., 1985; Vaara et al., 2012). The persistence and resistance of organizational culture make it difficult for both an acquirer and its target to share their knowledge with each other. Employees must invest time and cognitive effort to understand, accept, and adopt the beliefs, values, rules, and behavioral norms of the other organization. Thus, a high level of cultural similarity between an acquirer and its target (either beliefs and values or organizational processes and routines) indicates a better cultural fit, which has a positive effect on the knowledge transfer between these organizations and innovation performance in the postacquisition phase (Rao et al., 2016; Sarala & Vaara, 2010; Stahl et al., 2011; Vaara et al., 2014; Vaara et al., 2012).

Preacquisition Relationship The preacquisition relationship is the interorganizational relationship between an acquirer and its target, which is a form of strategic alliance, before their acquisition deal. Even though acquirers evaluate their potential targets during the due diligence period, it is challenging to identify details regarding innovation potential, understand the organizational cultures of potential targets, and evaluate intangible innovation resources such as human resources and processes (Briscoe & Rogan, 2016; Haspeslagh & Jemison, 1991; Martin & Shalev, 2017; Porrini, 2004; Yang, Lin, & Peng, 2011). Such challenges make it difficult for acquirers to make decisions on the autonomy-integration dilemma (Graebner et al., 2017; Meyer & Lieb-Doczy, 2003; Puranam et al., 2006), to implement cultural integration plans and to implement innovation activities to facilitate knowledge transfer (Graebner et al., 2017; Puranam & Srikanth, 2007). A preacquisition relationship enables acquirers to better identify their targets' knowledge, understand their organizational culture, and implement innovation projects (Agarwal, Anand, Bercovitz, & Croson, 2012; Al-Laham et al., 2010; Mowery et al., 1996; Porrini, 2004). The common knowledge background developed via strategic alliances serves as a firm-specific knowledge foundation for knowledge transfer and innovation activities in the postacquisition phase (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998).

A preacquisition relationship also reduces the risk of problems caused by the cultural differences between an acquirer and its target in the postacquisition phase (Al-Laham et al., 2010). While working together, an acquirer and its target come to understand each other's innovation processes and routines (Al-Laham et al., 2010; Birkinshaw, Bresman, & Hakanson, 2000). This mutual understanding of each partner company's organizational culture reduces the misunderstandings and conflicts between an acquirer and its target and increases their trust in

knowledge transfer (Levin & Cross, 2004; Sarala et al., 2016; Stahl et al., 2011), which positively influences innovation performance in the postacquisition phase.

Impact of Organizational Capability Factors on Innovation in the Postacquisition Phase

Together with the inherent attributes of a technological acquisition deal, the capability of conducting innovation activities and managing disruptions stemming from the focal technological acquisition has a crucial impact on knowledge synthesis, innovation activities, and innovation performance in the postacquisition phase (Haspeslagh & Jemison, 1991; Pablo, 1994; Ranft & Lord, 2002). The acquisitions literature has focused primarily on the managerial and innovation capabilities of acquirers (coordination, innovation, and human resource management) because acquirers lead activities in the postacquisition phase with full control over their targets. However, the innovation capability of targets has also received attention in previous studies. In this section, I review three capabilities of acquirers (and targets) related to knowledge synthesis and innovation activities in the postacquisition phase.

Coordination Capability The coordination capability of an acquirer refers to its ability to arrange the formal structures of an organization. Because acquirers are the primary leaders of the restructuring process in the postacquisition phase, previous studies on the coordination capability of organizations have focused on acquirers' coordination capability (Berchicci, 2013; Graebner et al., 2017). By integrating, eliminating, and recombining existing formal structures, specifically, departments or divisions, an acquirer and its target change their organizational structures to promote knowledge synthesis (Clement & Puranam, 2018; Karim, 2006; Rivera,

Soderstrom, & Uzzi, 2010; Zahn, 1991), redefine the scope and types of knowledge to be synthesized between them, and regulate the aggregate efforts of their employees as a formal authority system (Allen, James, & Gamlen, 2007; Ashkenas, DeMonaco, & Francis, 1998; Barkema & Schijven, 2008; Clement & Puranam, 2018; Graebner et al., 2017; Huber & McDaniel, 1986; Karim, 2006; McEvily, Soda, & Tortoriello, 2014; Zahn, 1991).

The way in which formal structures are designed is associated with the knowledge synthesis behaviors between two different organizations (Puranam, Singh, & Chaudhuri, 2009; Puranam et al., 2006; Zaheer, Castaner, & Souder, 2013). Such changes in formal structures reshape the organizational foci of knowledge synthesis and innovation activities (Clement & Puranam, 2018; Dahlander & McFarland, 2013; McEvily et al., 2014; Rivera et al., 2010; Zahn, 1991) and reduce the transaction costs of potential partner searching and the chain of command (Cassi & Plunket, 2014; Huber & McDaniel, 1986; Zahn, 1991).

However, coordination capability does not simply mean that structural integration, which refers to the integration of the legal boundaries of an acquirer and its target (Puranam et al., 2006), is the mandatory process for innovation activities between an acquirer and its target in the postacquisition phase (Puranam et al., 2009; Puranam & Srikanth, 2007). At the individual level, structural integration may decrease the innovation performance (quantity) of a target's employees (Paruchuri et al., 2006). In contrast, the coordination capability of an acquirer entails the managerial capability to determine whether and to what extent the acquirer should structurally integrate its target after technological acquisition (Graebner et al., 2017; Pablo, 1994; Zaheer et al., 2013; Zahra, Neubaum, & Hayton, 2020). When the common ground for

knowledge synthesis between an acquirer and its target is well founded, structural integration is not necessary (Puranam et al., 2009).

Innovation Capability The innovation capability of an organization refers to its ability to create new innovation outcomes by synthesizing its existing knowledge (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998). There is a focus on both acquirers and targets in research on the effects of innovation capability on knowledge synthesis and innovation activities in the postacquisition phase (Ahuja & Katila, 2001; Beaudry & Schiffauerova, 2011).

Previous studies have focused on two aspects of the innovation capability of acquirers in relation to knowledge synthesis and innovation activities in the postacquisition phase: innovation processes and knowledge bases. First, an acquirer with a superior innovation capability is more likely to establish organizational routines and processes to combine and recombine existing knowledge (Fleming, 2001; Kogut & Zander, 1992). From the experiential learning perspective, previous studies have focused on the acquisition experiences of acquirers as an indicator of their innovation capability (Al-Laham et al., 2010; Baum, Li, & Usher, 2000; Capron & Guillen, 2009; Puranam & Srikanth, 2007). The logic of this approach is that more experience in technological acquisition helps acquirers develop their processes and routines of learning and utilizing targets' knowledge (Fiol & Lyles, 1985). Second, an acquirer with a superior innovation capability has a broad and deep knowledge base (Ahuja & Katila, 2001; Berchicci, 2013; Cloodt et al., 2006; Kogut & Zander, 1992; Lane & Lubatkin, 1998), which enables it to better learn and utilize its target's knowledge (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998). With a well-established process and a large knowledge base, an acquirer can better recognize the

technological potential of both its own knowledge and that of its target. (Ahuja & Katila, 2001; Berchicci, 2013).

The innovation capability of targets is also crucial for knowledge synthesis and innovation activities in the postacquisition phase (Ahuja & Katila, 2001; Cloodt et al., 2006). Although acquirers lead knowledge synthesis and innovation activities in the postacquisition phase, targets also participate in such activities. A target can overcome innovation hurdles and improve its innovation outcomes by learning and utilizing its acquirer's knowledge (Dalziel, 2008; Graebner et al., 2010). Previous studies have paid attention to two aspects of targets' innovation capability: knowledge bases and human capital (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991; Ranft & Lord, 2000; Valentini & Di Guardo, 2012). First, when a target has a large knowledge base, it can provide more opportunities for combining and recombining its own knowledge with that of its acquirer (Ahuja & Katila, 2001; Cloodt et al., 2006; Haspeslagh & Jemison, 1991; Valentini, 2012). Second, the human capital of a target is considered part of its crucial innovation capability (Beaudry & Schiffauerova, 2011; Chen, Gao, & Ma, 2021; Makinen, Haber, & Raymundo, 2012). A target's key employees enhance its innovation productivity in the postacquisition phase by sharing their knowledge and combining the knowledge of the focal acquirer and the target (Chen et al., 2021; Ranft & Lord, 2000; Ranft & Lord, 2002).

Human Resource Management Capability An acquirer's capability of managing its target's human resources is significantly associated with knowledge synthesis and innovation activities in the postacquisition phase (Buono & Bowditch, 2003; Castro-Casal, Neira-Fontela, & Alvarez-Perez, 2013; Younge, Tong, & Fleming, 2015). The literature on technological acquisition has

emphasized two aspects of human resource management: human capital retention and psychological management. First, retaining the human capital of a target is considered important for knowledge synthesis and innovation activities in the postacquisition phase (Coff, 2002; Hambrick & Cannella, 1993; Wulf & Singh, 2011; Younge et al., 2015). Even though a target's knowledge resides in its organizational processes and routines (Fiol & Lyles, 1985), the target's employees serve as a reservoir of knowledge (Nonaka, 1994; Ranft & Lord, 2000). Knowledge is synthesized only through interactions among employees (Singh & Agrawal, 2011; Tzabbar et al., 2015). Among a target's employees, key employees are considered more important than other employees due to their innovation capability and access to other employees (Wulf & Singh, 2011).

Second, managing the anxiety of targets' employees is another key component of human resource management in the postacquisition phase (Melkonian, Monin, & Noorderhaven, 2011; Sarala et al., 2016). Targets' employees often feel negative emotions in relation to acquisitions or acquirers, such as job security anxiety (Schweiger & Denisi, 1991b), inferiority (Ranft & Lord, 2000), and fear of exploitation (Empson, 2001). Such negative feelings and emotions discourage targets' employees from sharing their knowledge with acquirers (Ellis, Reus, & Lamont, 2009; Empson, 2001; Melkonian et al., 2011; Sarala et al., 2016). By providing an incentive scheme for its target's employees with satisfiable rewards, an acquirer can reduce the negative aspects of acquisition-related emotions and increase these employees' willingness to create innovation outcomes with the acquisition partner's employees (Ellis et al., 2009; Ellis, Reus, Lamont, & Ranft, 2011; Melkonian et al., 2011; Sarala et al., 2016).

The Influence of Deal-specific and Firm-level Factors on Perception and Emotion

The psychological perceptions and emotions of employees can vary depending on deal-specific and organization-level factors (Bauer, King, & Matzler, 2016; Cartwright & Cooper, 1993; Marmenout, 2010; Nahavandi & Malekzadeh, 1988).

Organizational culture Organizational culture refers to shared beliefs and behavioral norms among the employees of an organization (Nahavandi & Malekzadeh, 1988; Stahl & Voigt, 2008). Cultural differences between an acquirer and its target influence the psychological perceptions and emotions of employees in the postacquisition phase (Cartwright & Cooper, 1993; Marmenout, 2010; Savovic, 2017). Acquisitions lead to changes in how employees work in their organizations because acquirers tend to build a common cultural foundation between the two parties (i.e., the acquirer and its target) (Haspeslagh & Jemison, 1991; Nahavandi & Malekzadeh, 1988). Employees tend to adhere to their previous behavioral patterns (Buono et al., 1985; Marmenout, 2010).

On the one hand, when the organizational cultures of the two parties differ, employees should invest time and effort in understanding the other party's organizational culture, as they are more likely to experience conflict with the other party's employees (Savovic, 2017; Vaara et al., 2012). Target employees are more likely to experience the acculturation process after the acquisition (Elsass & Veiga, 1994; Nahavandi & Malekzadeh, 1988), which causes feelings of loss and anxiety (Marmenout, 2010; Seo & Hill, 2005). On the other hand, in an acquisition between organizations with similar cultural backgrounds, employees of both parties experience a

lower level of negative emotions such as loss and anxiety (Drori, Wrzesniewski, & Ellis, 2011; Larsson & Lubatkin, 2001; Marmenout, 2010; Savovic, 2017; Seo & Hill, 2005).

Postacquisition integration Postacquisition integration is related to employees' perceptions and emotions (Bauer et al., 2016; King, Bauer, Weng, Schriber, & Tarba, 2020; Marmenout, 2010; Schweizer & Patzelt, 2012). After the acquisition, an acquirer attempts to minimize the period of organizational disruptions in the postacquisition integration process (Bauer et al., 2016; Haspeslagh & Jemison, 1991; Homburg & Bucerius, 2006). By doing so, acquirers establish a foundation for value creation in order to achieve the acquisition goal as quickly as possible (Haspeslagh & Jemison, 1991). However, postacquisition integration speed is related to the target employees' perceptions and emotions. King et al. (2020) explored how the speed of task integration influences the resistance of target employees in the postacquisition phase. Target employees tend to have a negative attitude toward new routines and processes implemented and enforced by their acquirer (Haspeslagh & Jemison, 1991; King et al., 2020; Savovic & Babic, 2021). When task integration is implemented at a high speed, target employees are more likely to resist the changes (King et al., 2020) and take action in response to the speed of change (Schweizer & Patzelt, 2012).

In addition to the speed of postacquisition integration, the degree of integration is associated with the perceptions and emotions of employees, particularly the target employees (Marmenout, 2010; Schweiger & Goulet, 2005). After an acquisition, acquirers determine the level of integration needed between the two parties (i.e., acquirer and target) (Larsson & Finkelstein, 1999; Pablo, 1994). Marmenout (2010) found that the level of postacquisition integration is also associated

with employees' perceptions and emotions. Depending on the level of postacquisition integration, the degree of organizational changes experienced by target employees varies. When acquirers implement a higher level of postacquisition integration, target employees face greater uncertainty and perceive a higher level of anxiety and feeling of loss (Marmenout, 2010; Schweiger & Goulet, 2005).

Managerial capability The managerial capability of the acquirer is related to target employees' perceptions and emotions after an acquisition (King et al., 2020; Savovic & Babic, 2021). Previous studies have focused on managers' roles and capabilities (King et al., 2020; Savovic & Babic, 2021; Schweizer & Patzelt, 2012). Managers articulate a strategic vision of the integrated entity and endorse employees' participation in vision achievement (Savovic & Babic, 2021). How managers provide a vision and establish a common foundation between the two parties influences target employees' perceptions and emotions (King et al., 2020; Savovic & Babic, 2021; Schweizer & Patzelt, 2012). In the integration process, those managers play a role as a catalyst for the target employees' adaptation to and acceptance of the new culture and tasks (King et al., 2020).

REVIEW ON INDIVIDUAL-LEVEL STUDIES

Psychological Perception and Emotion

One stream of research has explored the psychological aspects of target employees in the acquisition context (Buono & Bowditch, 2003; Buono et al., 1985; Marks & Mirvis, 1985; Marks

et al., 2017; Seo & Hill, 2005). Acquisitions lead to different types of changes in workplaces, work conditions, organizational cultures, values, norms, etc. (Cartwright & Cooper, 1993). Such changes, in turn, influence target employees' psychological perceptions of acquisition situations, thus affecting their emotions (Cartwright & Cooper, 1993; Moeen, 2017; Teerikangas, 2012). Individual-level studies have focused on target employees' different types of psychological perceptions of changes in the acquisition process and their emotions, such as those related to anxiety and threats (Fugate, Kinicki, & Scheck, 2002; Fugate, Prussia, & Kinicki, 2012; Marks & Mirvis, 2001).

Some studies have explored how target employees' perceptions and emotions change throughout the different stages of the acquisition process (Fugate et al., 2002; Schweiger & Denisi, 1991b). Although various studies have suggested different sets of acquisition stages (Fugate et al., 2002; Haspeslagh & Jemison, 1991), one plausible list is 1) the deal announcement stage, 2) the change stage, and 3) the post-change stage. Throughout the acquisition process, target employees feel different types of emotions, such as anxiety, threats, and loss, due to the turmoil and changing nature of acquisitions (Cartwright & Cooper, 1993; Seo & Hill, 2005). The causes and intensity of such emotions vary depending on the stage. In the earlier stages, these emotions are more likely to arise from uncertainty regarding the future (i.e., a lack of information). In the later stages, these emotions tend to be based on target employees' perceptions of the situations they face in the acquisition context (i.e., based on information about different types of changes).

Emotions from Uncertainty (A Lack of Information about Changes) In the initial stage (i.e., right after the deal announcement stage), target employees feel different types of negative

emotions such as anxiety, threats, and loss (Cartwright & Cooper, 1993; Fugate et al., 2002; Seo & Hill, 2005). The uncertainty that arises at the time of an acquisition announcement induces such emotions (Cartwright & Cooper, 1993; Ivancevich, Schweiger, & Power, 1987; Seo & Hill, 2005). Acquisitions are one of the primary events that cause organizational changes in culture, employment, organizational structures, policies and other workplace elements (Haspeslagh & Jemison, 1991; Ivancevich et al., 1987). In most cases, information on future acquisition deals is limited to executive-level managers and those who are involved (Haspeslagh & Jemison, 1991; Ivancevich et al., 1987). Most target employees may have little control over an acquisition situation before and after the acquisition deal announcement (Cartwright & Cooper, 1993; Ivancevich et al., 1987). This lack of information and limited control over the situation impose uncertainties on target employees regarding their future, particularly in relation to their career development, jobs, status, workplace changes, rewards (i.e., promotion and salaries), cultures and identities (Ivancevich et al., 1987; Lazarus & Folkman, 1984). A lack of information about what will happen and what consequences target employees will face in the future makes target employees appraise acquisition events as a threat and feel anxiety, threats, and loss (Edwards, Lipponen, Edwards, & Hakonen, 2017; Lazarus & Folkman, 1984; Schweiger & Denisi, 1991b). An elongated information-lacking period intensifies their negative emotions (Ivancevich et al., 1987).

The emotions related to anxiety, threats, and loss that arise during the initial stage (i.e., immediately after the deal announcement and before the change stage) are alleviated as acquirers and their targets provide target employees with information about the acquisition deal and any changes (Ivancevich et al., 1987; Lazarus & Folkman, 1984; Marks & Mirvis, 2001; Schweiger

& Denisi, 1991b). Schweiger and Denisi (1991b) suggested that communication between executive-level managers and target employees gives target employees knowledge about their future (e.g., career, jobs, workplaces) and how their organizations will change (e.g., organizational culture and identities). By dispelling rumors among employees via preview sessions, acquirers and their targets can alleviate target employees' negative emotions (Ivancevich et al., 1987). At the end of the initial stage, uncertainties due to a lack of information are, at least partially, solved, and sources of negative emotions seem to be managed by acquirers or targets (Fried, Tiegs, Naughton, & Ashforth, 1996; Gutknecht & Keys, 1993). However, in the later stages, other sources of negative emotions affect target employees.

Emotions from Perceptions of Change During the change stage, there are two sources of anxiety, threat, and loss impacting target employees. One source is target employees' perceptions of changes in their personal value (i.e., value as human resources) (Rentsch & Schneider, 1991; Schweiger, Ivancevich, & Power, 1987). The other source is target employees' perceptions of changes in the shared values (i.e., organizational culture and identity) they believe in or adhere to (Cartwright & Cooper, 1993; Elsass & Veiga, 1994; Nahavandi & Malekzadeh, 1988).

In the acquisition process, target employees perceive changes in their personal value (Hambrick & Cannella, 1993; Rentsch & Schneider, 1991; Schweiger et al., 1987). Target employees' status, power, and prestige within their organizations are influenced by acquisition events (Schweiger et al., 1987; Seo & Hill, 2005). The position of a target employee changes from an independent company's employee to an 'acquired' company's employee (Haspeslagh & Jemison, 1991; Ranft & Lord, 2000). Acquirers evaluate target employees' personal value (Ranft

& Lord, 2000; Ranft & Lord, 2002). In this process, target employees are relatively likely to perceive the positional hierarchy between an acquirer and its target. Target employees are likely to perceive positional loss and feel inferior (Ranft & Lord, 2000), particularly when the organizational size of the acquirer is larger than that of its target (Rentsch & Schneider, 1991). As the acquired company's employees, target employees are relatively likely to experience a loss of self-esteem (Lazarus & Folkman, 1984). When their jobs are duplicated with those of employees from the acquirer, a target's employees are more likely to perceive reduced value as human capital and role conflict (Hambrick & Cannella, 1993; Ivancevich et al., 1987; Schweiger et al., 1987). Due to such positional loss or decreased relative standing, target employees feel anxiety and perceive threats (Ivancevich et al., 1987; Newman & Krzystofiak, 1993; Schweiger et al., 1987).

In the post-acquisition integration process, acquirers are relatively likely to influence target employees (Blake & Mouton, 1985; Haspeslagh & Jemison, 1991; Paruchuri et al., 2006). Target employees are likely to experience changes in work relationships with their colleagues and supervisors, workplace changes such as restructuring, and changes in other work environments such as relocation (Buono et al., 1985; Ivancevich et al., 1987; Paruchuri et al., 2006). Such changes subsequently influence target employees' expectations of their future career paths, performance, job satisfaction, and commitment to the combined organization (Buono et al., 1985; Hackman & Oldham, 1975; Seo & Hill, 2005). Target employees tend to feel anxiety, threats, and loss, as they perceive that their value as human capital is reduced in the integrated organization (Buono et al., 1985; Newman & Krzystofiak, 1993; Schweiger & Walsh, 1990). When target employees perceive that they are not treated as fairly as acquirer employees (e.g., in

terms of resource allocation, promotion opportunities, and salary), these negative emotions become stronger (Cartwright & Cooper, 2012; Cobb, Wooten, & Folger, 1995; Edwards et al., 2017). Previous studies have emphasized the roles of leadership, communication with target employees, and fairness in managing such negative emotions (Cartwright & Cooper, 2012; Gutknecht & Keys, 1993; Marks & Mirvis, 1992; Seo & Hill, 2005).

Target employees also tend to feel anxiety, threats, and loss from changes in the shared values (i.e., organizational culture and identity) they believe in or pursue (Cartwright & Cooper, 1993; Elsass & Veiga, 1994; Nahavandi & Malekzadeh, 1988). Organizational culture refers to the beliefs, rules, organizational identity, communication style, and behavioral norms shared among the employees within an organization (Haspeslagh & Jemison, 1991; Nahavandi & Malekzadeh, 1988; Stahl & Voigt, 2008). Organizations have different organizational cultures (Nahavandi & Malekzadeh, 1988). In the acquisition context, employees face two different organizational cultures, namely, those of the acquirer and its target, which can cause cultural clashes (Cartwright & Cooper, 1993).

In some acquisitions, attempts are made to develop new organizational cultures and identities (Gaertner, Dovidio, Mann, Murrell, & Pomare, 1990; Terry & O'Brien, 2001). However, in most cases, because of the asymmetric relationship between an acquirer and its target, the acquirer's organizational culture is more likely to be enforced within the target and among the target employees, particularly when the target is structurally integrated (Elsass & Veiga, 1994; Marks & Mirvis, 1992; Nahavandi & Malekzadeh, 1988; Seo & Hill, 2005). In such an acculturation process, target employees face changes in their organizational culture and identities, experience

stress due to damaged pride, psychologically resist cultural changes, and even feel threatened due to the elimination of their shared beliefs, norms, and rules (Brooks, Rosson, & Gassmann, 2005; Drori et al., 2011; Elsass & Veiga, 1994; Nahavandi & Malekzadeh, 1988; Schweiger & Goulet, 2005). Such negative emotions are more intense when the cultural difference between the acquirer and its target is great than when it is small (Cartwright & Cooper, 1993).

The literature has also suggested ways in which to alleviate the increased levels of target employees' feelings of anxiety, threat, and loss (Brooks et al., 2005; Buono & Bowditch, 2003; Buono et al., 1985). Buono and Bowditch (2003) suggested that an attempt to develop a new vision and common goals is one way to alleviate the negative emotions of target employees. By doing so, the employees of an acquirer and its target can share common values and an identity as one integrated organization (Buono & Bowditch, 2003; Gaertner, Mann, Murrell, & Dovidio, 1989; Gutknecht & Keys, 1993)

Emotions from Disruptions and Adaptation (Accommodating Change) Between the second stage (i.e., changing stage) and the final stage (i.e., post-change stage), the negative emotions of target employees are alleviated (Fugate et al., 2002; Schweiger & Denisi, 1991b). There are two main drivers of this transition. The first is the turnover of some target employees, and the second is target employees' adaptation (Buono & Bowditch, 2003). Some target employees decide to leave their organization (i.e., target) due to their negative emotions and perceptions of organizational changes (Astrachan, 2004; Edwards et al., 2017; Fugate et al., 2012). Moreover, some target employees may be terminated by the acquirer (Aghasi, Colombo, & Rossi-Lamastra, 2021; Chao, Kaetzler, Lalani, & Lynch, 2020). Either way, those who feel strong negative

emotions due to changes (i.e., disruptions) in the acquisition context and those who resist such changes leave the target.

The other reason stems from the remaining target employees. They start to cope with their emotions by adapting themselves to the changes arising from the acquisition process and accepting psychological support from their organizations, such as counseling (Matteson & Ivancevich, 1990), and other people they are close with, such as coworkers, spouses and friends (Fugate et al., 2002; Scheck & Kinicki, 2000). Some target employees may proactively try to find opportunities to recover their self-esteem and value as human capital by attempting to find something they can do in their organization (Lazarus & Folkman, 1984). They also try to accept and adapt themselves to the new vision, identity, and culture with the support of their acquirer (Buono & Bowditch, 2003; Gutknecht & Keys, 1993). Even though such target employees still experience negative emotions and negative perceptions of value changes in the post-change stage (Fugate et al., 2002), the intensity of such negative emotions and perceptions in the post-change stage is lower than that in the previous two stages (Aghasi et al., 2021; Fugate et al., 2002; Schweiger & Denisi, 1991b). However, the survivors or remaining employees of targets also feel anxiety and threats related to being exploited by their acquirers after they learn these employees' know-how in the near future (Empson, 2001).

Post-acquisition Behaviors

Employee Departure & Remaining in the Post-acquisition Phase

Another stream of individual-level research in the acquisition context has focused on the departure and remaining behaviors of the targets' human capital in the post-acquisition phase.

One substream of research has focused on qualifications of who among targets' human capital can stay in the post-acquisition phase (Hambrick & Cannella, 1993; Ranft & Lord, 2000; Steigenberger & Mirc, 2020). The theoretical foundation of this research stream is the resource-based view of the firm (Barney, 1991; Barney, 1986). From the viewpoint of acquirers, the literature discusses the qualifications of employees who are valuable human capital for acquirers. From the psychological perspective, the other substream focuses on who among a target's employees will stay in their current company in the post-acquisition phase (Cho et al., 2014; Krug & Hegarty, 2001; Krug, Wright, & Kroll, 2014; Walsh, 1988). Many psychology-based studies have focused on target employees' emotions and behaviors related to staying in their current organizations (i.e., target companies) from the perspective of employees. To maintain the employment of a target's human capital, two requisite conditions must be fulfilled: the acquirer's willingness to retain its target's human capital and the target employees' willingness to stay in their current organization. Even if acquirers want to retain target employees, these employees can leave their organization in the post-acquisition phase. Similarly, some acquirers do not retain their target employees even if they want to stay in their current organization after the acquisition. The following sections review both streams of research sequentially.

Qualifications of human capital From the perspective of the resource-based view of the firm, some literature on human capital has discussed the qualifications of a target's employees and executives for its acquirer (Aghasi et al., 2021; Hambrick & Cannella, 1993). Previous studies have emphasized three aspects of a target's human capital: 1) firm-specific knowledge, 2) leadership and 3) valuable capability as human resources. First, a target's employees have firm-specific knowledge (Aghasi et al., 2021; Bargeron, Schlingemann, Stulz, & Zutter, 2017; Bergh,

2001; Buchholtz, Ribbens, & Houle, 2003; Wulf & Singh, 2011). Target employees know their organizations' structures, cultures, processes, routines, and history of development, as well as their own collective capabilities (Aghasi et al., 2021; Buchholtz et al., 2003). They also have constructed relationships with their suppliers, customers, and other stakeholders (Bergh, 2001; Krishnan, Miller, & Judge, 1997). In particular, a target's CEO and executives possess tacit and firm-specific knowledge and relationships and have a deep understanding of the target (Bargeron et al., 2017; Buchholtz et al., 2003; Wulf & Singh, 2011). Regarding CEOs, a target's founding CEO may be more valuable than a professional CEO when the target is a young organization because the founding CEO designed the organizational structure, shaped the organizational culture, and developed the target's technology (Aghasi et al., 2021). To acquirers that have little knowledge about their targets' industries (i.e., unrelated acquisition), the targets' human capital is valuable (Buchholtz et al., 2003). Such firm-specific knowledge of target employees is considered akin to a valuable, rare, inimitable, and nonsubstitutable (VRIN) resource to acquirers (Barney, 1991; Barney, 1986; Bergh, 2001). For acquirers, retaining target employees and executives is crucial to achieving the goal of acquisition in the post-acquisition phase (Buchholtz et al., 2003).

Second, the leadership of a target's CEO and executives plays a crucial role in task implementation after its acquisition (Aghasi et al., 2021). A target experiences organizational changes throughout the acquisition process and works towards the success of the acquisition (Haspeslagh & Jemison, 1991). This process disrupts the target's routines and processes. To mitigate this negative effect, acquirers require that leaders play the role of a communication channel between the acquirers and their targets with authority, perform tasks with target

employees, and motivate and coordinate target employees in their contribution to the achievement of acquisition goals (Aghasi et al., 2021; Bergh, 2001; Jemison & Sitkin, 1986). As previous leaders, a target's CEO and executives can help its acquirer achieve acquisition goals (Aghasi et al., 2021; Bergh, 2001). As a communication channel between an acquirer and its target, target CEOs and executives share acquisition-related information such as task timelines, changes in organizational policies (i.e., promotion and salary table changes), socialization programs to prevent work instability, and integration processes (Graebner, 2004; Haspeslagh & Jemison, 1991).

Finally, employees who possess valuable and unique capabilities are worth retaining (Chao et al., 2020; Ranft & Lord, 2000; Ranft & Lord, 2002; Younge et al., 2015). Employees have capabilities related to completing strategic tasks, creating innovative outcomes, or making feasible performances (Ranft & Lord, 2000). As a knowledge reservoir, employees possess know-how (Fleming, 2001) and an established search chain for who has what knowledge and skills within their organizations (Singh, Hansen, & Podolny, 2010). Together with their firm-specific knowledge, target employees' capabilities and social capital can help their acquirers leverage and utilize target resources, capabilities, and social capital to achieve their acquisition goals (Ranft & Lord, 2000; Younge et al., 2015). In summary, target employees, CEOs, and executives have firm-specific knowledge and leadership abilities to perform tasks to achieve acquisition goals and capabilities related to creating innovation outcomes and enhancing performance.

From the perspective of acquirers, however, not all of a target's human capital is worth retaining or necessary. Previous studies have suggested two contingencies in this context: redundancies among human capital from the organizational efficiency perspective (Aghasi et al., 2021) and the value of human capital from the organizational life cycle perspective (Bergh, 2001). First, when there are redundancies among target employees, acquirers should eliminate such redundancies to manage their organizations efficiently by reducing costs (Bergh, 2001; Krug et al., 2014; Meyer & Lieb-Doczy, 2003). In the acquisition context, the employees of an acquirer and its target are relatively likely to have similar jobs, knowledge, and specialties (Ashkenas et al., 1998; Marks et al., 2017; Meyer & Lieb-Doczy, 2003). Although target employees have firm-specific knowledge, not all target employees are valuable for acquirers to retain. Second, target employees' value (particularly target CEOs' value) can differ depending on the target's organizational development stage. From the organizational life cycle perspective, previous studies have suggested that the transition from a founding CEOs to a professional CEO may be necessary depending on the developmental stage of a target (Wasserman, 2008). In the post-acquisition phase, acquirers may need to replace founding CEOs with professional CEOs depending on their targets' developmental stage (Boeker & Karichalil, 2002; Boeker & Wiltbank, 2005).

Psychological Factors of Human Capital Two substreams of literature adopt different approaches to the employment of target employees during the post-acquisition phase. The literature that adheres to the resource-based view of the firm explores who is a target's valuable human capital in the post-acquisition phase and is worth to be retained by acquirers. On the other hand, psychology-based studies have discussed what factors influence target employees'

decisions related to staying in their current organizations after an acquisition. While the former studies represent acquirers' stances and focus on how to reshape the behaviors of target employees, the latter stream of literature explores the factors that affect target employees' behaviors from the psychological viewpoint of employees.

Studies on qualifications of targets' employees have focused on how incentives can be provided to target employees to retain them in the post-acquisition phase (Aghasi et al., 2021; Ahammad, Glaister, Weber, & Tarba, 2012; Fich, Rice, & Tran, 2016; Wulf & Singh, 2011). These studies have emphasized the function of human resource management in the post-acquisition phase. If acquirers provide financial compensation for the firm-specific knowledge and capabilities of target employees, acquirers are likely to retain target employees with a high level of willingness to contribute to their acquisition goal achievement (Aghasi et al., 2021; Ahammad et al., 2012; Fich et al., 2016; Ranft & Lord, 2000; Wulf & Singh, 2011). Promotion is another way to retain target employees (Dalziel, 2008; Degbey, Rodgers, Kromah, & Weber, 2021; Ranft & Lord, 2000).

The literature on which target employees will stay in their current organizations has explored relevant factors from a psychological perspective (Hambrick & Cannella, 1993; Krishnan et al., 1997; Krug et al., 2014; Seo & Hill, 2005). Acquisitions lead to organizational changes, and employees experience and recognize such changes during the acquisition process (Haspeslagh & Jemison, 1991). Previous studies have focused on two different types of psychological perceptions target employees have in the post-acquisition phase: 1) perceptions based on changes in target employees' practical value as human resources and 2) those based on changes in

abstract values target employees uphold. Both types of perceptions are not purely rational or emotional (Seo & Hill, 2005). These perceptions reflect self-calculations about the situation target employees face in the post-acquisition phase and are related to the emotional feelings (e.g., anxiety, threats, and emotional instability) they experience in the acquisition context (Seo & Hill, 2005).

One psychological perception of target employees is based on their practical value changes as human capital changes. In the post-acquisition phase, target employees experience changes in their status within their organizations (Hambrick & Cannella, 1993; Paruchuri et al., 2006) and in their uniqueness as human resources due to employee duplication (Bergh, 2001; Krug et al., 2014; Ranft & Lord, 2000). Target employees calculate their value as human capital from the perspective of their acquirers even though their calculations are not perfectly rational (March & Simon, 1958; Simon, 1955). This greater loss leads them to leave their organizations after an acquisition deal because of their feelings of inferiority (Ahammad et al., 2012; Hambrick & Cannella, 1993) or depression (Astrachan, 2004). Such feelings of loss and depression also indicate their prospective weakening power over resources in the united organizations, which enhances their performance (Marmenout, 2010). Both positional loss and feelings of inferiority cause target employees to leave their organizations in the post-acquisition phase (Astrachan, 2004).

On the other hand, the perceived opportunity to pursue better performance within their organizations leads target employees to stay in their organizations (Krishnan et al., 1997). Target employees are more likely to stay in their current organizations when they recognize

complementarity from acquirer employees and have confidence to pursue better career development within their organizations than when they do not. This is because they can enhance their value as human resources in their current organizations. Opportunities outside of their organizations, such as restrictions on job mobility between companies (e.g., noncompete agreements), also influence their behaviors of staying in their current organizations (Younge et al., 2015). In summary, how target employees perceive changes in their value as human capital within their organizations and identify opportunities to enhance or appeal their capabilities are associated with their staying behaviors.

The other psychological perception held by target employees is based on their abstract value changes in the post-acquisition phase. Different organizations have different organizational cultures (Haspeslagh & Jemison, 1991; Nahavandi & Malekzadeh, 1988; Stahl & Voigt, 2008). Employees in different organizations have different shared identities, beliefs, rules, and behavioral norms (Nahavandi & Malekzadeh, 1988; Stahl & Voigt, 2008). How two organizations (i.e., acquirer and target) can be integrated in terms of organizational culture is a crucial issue facing acquirers aiming to achieve better performance in the post-acquisition phase (Larsson & Lubatkin, 2001; Savovic, 2017). In the acquisition context, these abstract values can be changed over the course of the acquisition process, particularly in the post-acquisition integration process (Buono & Bowditch, 2003; Drori et al., 2011; Larsson & Lubatkin, 2001; Nahavandi & Malekzadeh, 1988).

Target employees recognize changes in their identities, beliefs, rules and norms in the acquisition context and feel different emotions stemming from such changes (Cho et al., 2014; Marmenout,

2010; Steigenberger & Mirc, 2020). Target employees' loss of organizational identity makes them feel negative emotions because their organizational identity is related to their commitment to their organizations (Ashforth & Mael, 1989; Cho et al., 2014; Schweiger et al., 1987). In the acquisition context, such employees should develop a new organizational identity pertaining to their working behaviors as employees of an integrated organization(Cho et al., 2014). During such a development process, some target employees are not satisfied with their new organizational identity, which leads to the turnover of these target employees (Ashforth & Mael, 1989; Degbey et al., 2021; Drori et al., 2011; Graebner et al., 2017; Liu et al., 2021). Some target employees face difficulty in feeling that they belong to their current organizations (Ashforth & Mael, 1989; Steigenberger & Mirc, 2020).

Similarly, changes in an organization's political ideology in the post-acquisition phase are associated with target employees' feelings toward and commitment to the newly integrated organization (Chow, Louca, Petrou, & Procopiou, In-process). When target employees cannot align themselves with the new organization's political ideology, they are relatively likely to leave their current organizations (Chow et al., In-process). When the organizational cultures of an acquirer and its target are relatively different, the target's employees are likely to perceive a greater degree of abstract value changes, to resist such changes and to leave their current organizations (i.e., targets) than when this difference is smaller (King et al., 2020; Marmenout, 2010). From the human resource management perspective, Liu et al. (2021) argue that an acquirer's capability and attempts to provide perceptions of justice and fairness in the integration process for target employees reduce their negative feelings toward changes in abstract values and increase the likelihood that they will remain in their current organizations.

Collaborative Behavior and Adaptation

Collaborative Behavior Individual-level studies have also shown that a moderate level of knowledge overlap between an employee and his or her organization is optimal for knowledge synthesis and innovation performance (Kapoor & Lim, 2007; Makri et al., 2010). An acquirer's employees (knowledge workers) absorb their target's knowledge when they share their knowledge backgrounds, but too much overlap eliminates the incentive to learn the target's knowledge and synthesize it with that of the acquirer and vice versa.

Innovation Productivity Individual-level studies have focused on the innovation productivity (quantity) of the employees of acquirers and their targets (Eisenman & Paruchuri, 2019; Empson, 2001; Kapoor & Lim, 2007; Li & Wang, 2020; Paruchuri & Eisenman, 2012; Paruchuri et al., 2006). An acquirer's employees are more likely to show an increase in innovation performance (quantity) if they access the corresponding target's knowledge (Li & Wang, 2020). Technological acquisition increases the attention given by a target's employees to the corresponding acquirer's knowledge and provides these employees with an expanded knowledge source (Eisenman & Paruchuri, 2019). However, the innovation performance (quantity) of a target's employees is lower than that of the employees of organizations that have not been acquired by another organization (Kapoor & Lim, 2007; Paruchuri et al., 2006). This decline in the innovation performance of target employees lasts over time (Kapoor & Lim, 2007). Among target employees, those whose knowledge is not within the scope of their acquirer's knowledge core are likely to suffer a greater degree of productivity loss than those whose knowledge is consistent with their acquirer's knowledge core (Li & Wang, 2020; Paruchuri et al., 2006).

Similarly, when acquirers have a relatively large knowledge base and the capability to absorb their targets' knowledge, this decline is attenuated (Hussinger, 2012).

LIMITATIONS AND FUTURE RESEARCH DIRECTION

Limitations of Previous Research and Future Research Directions

Through my review of the research on the innovation impact of technological acquisition, I identify a few limitations of existing studies, research gaps, and opportunities for future research directions.

First, future research should focus on the integration of the human capital of both an acquirer and its target in the postacquisition phase. Inherently, technological acquisition enhances an acquirer to gain access to and control of another organization's technological knowledge and innovation capability (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991). However, simply enlarging the knowledge pool and gaining access to the target's innovation outcomes created before an acquisition are not sufficient conditions for an acquirer to leverage its target's knowledge and innovation capability (Seo & Hill, 2005; Singh & Agrawal, 2011). Particularly in knowledge-intensive industries, technological knowledge is tacit and resides in human capital (Kogut & Zander, 1992; Nonaka, 1994). Knowledge is transferred, utilized, and synthesized exclusively through collaboration between employees (Singh & Agrawal, 2011). Through these processes, employees create innovation outcomes (Fleming, 2001; Singh & Agrawal, 2011).

The importance of human capital in innovation activities is associated with the rise of 'acquihiring' in high-technology industries, where human capital is crucial as a knowledge repository and a source of innovation capability (Chen et al., 2021; Makinen et al., 2012; Ranft & Lord, 2000). Even though an acquirer obtains the proprietary right to intellectual properties and preexisting innovation outcomes, it is challenging for an acquirer to achieve its innovation goals of technological acquisition without its target's human capital (Makinen et al., 2012; Younge et al., 2015). Reducing the risk of buying an 'empty shell' is a key topic for both acquisition practitioners (Chaudhuri & Tabrizi, 1999; Makinen et al., 2012) and scholars (Hambrick & Cannella, 1993; Younge et al., 2015). The term 'empty shell' refers to an acquisition in which the acquirer fails to retain the target's human capital (Coff, 2002). However, simple retention does not necessarily translate into a contribution to innovation activities during the postacquisition phase. The discussions of previous studies have focused on the retention of human capital or the staying of employees, primarily on the target side (Aghasi et al., 2021; Hambrick & Cannella, 1993; Krishnan et al., 1997). From the human capital integration perspective, the discussion should further our understanding of how the employees of both the acquirer and its target work together, synthesize their knowledge, and create innovation outcomes together. Previous studies have focused primarily on target employees' retention and remaining (Aghasi et al., 2021; Seo & Hill, 2005; Stahl & Voigt, 2008). I argue that future research should address acquirer employees' behaviors and contributions to innovation activities in the postacquisition phase because knowledge synthesis between an acquirer and its target occurs through the collaboration of employees on both sides.

Second, future research should address the knowledge synthesis process in the postacquisition phase by focusing on inventors' innovation behaviors. A promising innovation fit between an acquirer and its target at the organizational level does not always lead to the expected outcomes after the acquisition (Eccles et al., 1999; Rao et al., 2016; Schweizer, 2005). An organization is not a single entity (Alchian & Demsetz, 1972; Barnard, 1938; Simon, 1991); rather, it consists of employees and the complex interactions between them within its boundaries. Employees' interests and concerns (e.g., their career development, promotion, financial rewards, and job security) are not always the same as their organizations' strategic goals, such as creating innovation outcomes with the acquisition partner's employees (Simon, 1991). As agents, employees initiate, participate in, and resist creating innovation outcomes with others (Criscuolo, Salter, & Ter Wal, 2014; Larsson & Finkelstein, 1999). Regardless of how good the complementarity is between an acquirer and its target, it is the interactions, collaborations, and cooperation among the employees that eventually realize the innovation potential between the organizations.

By investigating the process of how an acquirer's employees synthesize their knowledge with that of the target and vice versa, we can find answers to two questions: 1) Why does technological acquisition fail to deliver the expected innovation synergy despite a high level of complementarity fit between two parties (Rao et al., 2016; Schweizer, 2005; Sirower, 1997)? 2) Under what conditions do inventors contribute to postacquisition innovation between an acquirer and its target? Previous studies have explored the influence of complementarity fit between an acquirer and its target (Ahuja & Katila, 2001; Makri et al., 2010; Park et al., 2018). One underlying assumption of those studies has been that the knowledge of the two parties is

synthesized in knowledge areas that are considered complementary. However, those studies have not provided any detailed evidence that the knowledge of the two parties is actually synthesized in that area of complementarity. They have discussed only the likelihood that innovation synergy exists in those complementary areas. However, unanticipated innovation outcomes are created by synthesizing the knowledge of the two parties (Rao et al., 2016). We do not know the mechanism of such outcomes. Furthermore, because employees have technological knowledge (Fleming, 2001; Kogut & Zander, 1992), we can understand the knowledge areas in which the employees of the two parties work together and create innovation outcomes.

Third, how employees proactively respond to the acquisition event and contribute to the knowledge and capability synthesis process is another topic that should be investigated. Despite the agency of employees, previous studies have focused on externalities that render inventors passive in the acquisition context (Paruchuri et al., 2006; Younge et al., 2015). Inventors may suffer from productivity loss (Paruchuri et al., 2006), experience feelings of inferiority and anxiety (Empson, 2001; Schweiger & Denisi, 1991a), or leave their organization (Younge et al., 2015). Such negative and passive externalities provide insight into the challenges and risks inherent in acquisition. However, employees can also be proactive in responding to organizational changes and may attempt to find and seize opportunities for their career development (Campbell, 2000). From the human capital integration perspective, exploring how employees work together and the conditions in which they do can help us better understand the innovation impact of technological acquisitions. Thus, future research should address employees' proactive behaviors in the acquisition context. For example, who among an acquirer's employees will synthesize their knowledge with that of the corresponding target's employees in the

postacquisition phase, and under what conditions will they do so? Are the behaviors of acquirers' employees and of targets' employees driven by the same mechanism? If the mechanisms differ, which factors inherent in the acquisition context drive this difference? Finding answers to these questions will reveal the mechanism of how innovation outcomes are created as a result of human capital integration.

Fourth, an innovation performance measure that reflects human-side integration must be developed in future studies. Previous studies have focused on the quantity and quality aspects of aggregated innovation outcomes to investigate the innovation impact of technological acquisition (Ahuja & Katila, 2001; Paruchuri et al., 2006). The quantity and quality of innovation outcomes are good indicators of the innovation impact of technological acquisition. However, those aspects have a limitation in reflecting human-side integration. The aggregated quantity of innovation outcomes may or may not contain innovation outcomes created by the employees of the two parties. Thus, aggregated innovation outcomes overevaluate the innovation impact of technological acquisition from the human capital perspective. Despite the increase in overall innovation outcomes, an acquirer may have no innovation outcome created by human capital integration. An acquirer may achieve its innovation purpose with innovation outcomes reflecting the knowledge synthesis between the two parties even though overall innovation outcomes are reduced after the acquisition. Thus, to explore the innovation impact of acquisition from the human-side integration perspective, the focus on innovation performance should shift from overall innovation outcomes (i.e., quantity and quality) to innovation outcomes reflecting collaboration between the employees of the two parties.

Finally, future research should investigate the subsequent influence of collaboration between the employees of acquirers and those of their targets. The unique pattern of collaboration among an organization's employees (intraorganizational collaboration network) is associated with innovation activities within that organization (Allen, 1966; Guler & Nerkar, 2012; Reagans & McEvily, 2003). In the context of a technological acquisition, the two intraorganizational collaboration networks of the focal acquirer and its target begin to exist within one organizational boundary after the acquisition deal is complete. Structural changes in these intraorganizational collaboration networks are related to the innovation activities within each organization because they provide a channel for searching for the knowledge of other employees (Allen, 1966; Borgatti & Foster, 2003; Paruchuri & Awate, 2017) and learning opportunities (Carnabuci & Operti, 2013). Collaboration between the employees of an acquirer and those of its target reshapes the structure of the corresponding intraorganizational collaboration networks, thus influencing subsequent innovation activities. However, we have a limited understanding of how such changes influence innovation consequences (quantitively or qualitatively). From a social network evolution perspective, we know little about how two social networks that previously existed separately become interrelated through the collapse of the organizational boundary between an acquirer and its target due to an acquisition event.

In summary, previous research on technological acquisition has provided insight into the influence of such acquisition on innovation outcomes. However, these studies have limitations in that they have overlooked human-side integration, underexplored the microlevel processes of innovation in the postacquisition phase, and lacked evolutionary perspectives on these ongoing processes.

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BRIDGING TEXT: THEORETICAL APPROACH

I explore how the positional changes of inventors who undergo acquisition affect their participation behaviors in postacquisition joint inventions. In Chapter 2, I take the niche perspective to investigate how the increase in niche crowding influences the participation behaviors of acquirer inventors in postacquisition joint inventions. In Chapter 3, I shift my attention toward target inventors to understand how perceived job-security threats may motivate and discourage target inventors from pursuing participation behaviors in postacquisition joint inventions.

As employees of both organizations (i.e., acquirer and target), inventors face changes and uncertainties in the technological acquisition context (Haspeslagh & Jemison, 1991). However, due to the asymmetric relationship between an acquirer and its target, inventors have different stances and attitudes toward technological acquisition (Hambrick & Cannella, 1993; Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999; Ranft & Lord, 2000). Previous studies have shown that acquirer employees are more likely to feel superior to target employees and have a domineering attitude toward target employees (Jemison & Sitkin, 1986; Ranft & Lord, 2000). Additionally, target employees are more likely to feel inferior, conquered, and dominated (Ranft & Lord, 2000).

Such different feelings and attitudes are associated with employees' varying concerns in the postacquisition period. Unlike the target employees, employees on the acquirer side are less likely to perceive job-security threats and a sense of loss. Acquirer employees may have

concerns about their knowledge conflict with the target employee due to job overlaps, which may cause competition among employees (Sears & Hoetker, 2014). Such an overlap has counterbalancing forces. On the one hand, those target employees may be perceived as potential competitors. On the other hand, they are also future collaborators with whom to achieve innovation outcomes. Although technological acquisition provides an opportunity for an acquirer (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991), not all acquirer inventors have the same level of perceived opportunities, and some of them may perceive the acquisition in terms of increased competition. My conversation with experienced inventors (i.e., acquirer inventors) reinforces this counterbalancing idea. Surprisingly, how such opposite forces influence the innovation behaviors of acquirers' employees has been underexplored.

Due to the opposite stance, acquisitions are a more disruptive event for target employees. Empirical evidence shows that target employees have greater concerns about their job security and experience career anxiety (Hambrick & Cannella, 1993; Ranft & Lord, 2000). My conversations with target employees generally support this view. Although previous studies have focused on how such negative emotions and stances influence the retention of target employees, how those feelings and positional changes influence staying employees in terms of their contribution to innovation activities has rarely been investigated.

From the niche perspective, I explore the acquirer inventors' participation behaviors in postacquisition joint inventions in Chapter 2.

CHAPTER 2

Acquirer Inventor Side: The Perspectives of Niche and Status

Which Acquirer Inventors Participate in Inventions with Target Inventors? The Perspectives of Niche and Status

Abstract

Although previous studies have provided insights into the innovation impact of technological acquisitions, the questions of how the knowledge of an acquirer and its target is synthesized and why acquisitions often fail to produce expected innovation outcomes remain unanswered. When acquirer inventors do not participate in this process, acquirers cannot innovate because only inventors are capable of synthesizing their knowledge with that of the target. However, our understanding of acquirer inventors' behavioral mechanism is limited. As a knowledge synthesis mechanism between an acquirer and its target, I suggest postacquisition joint inventions, through which the inventors of the two parties collaborate and synthesize their knowledge. From the niche and social network perspectives, I investigate which acquirer inventors participate in such inventions and under what conditions they do so. I hypothesize that acquirer inventors facing a higher (vs. lower) level of competitive crowding from the corresponding target's inventors in their knowledge niches are more likely to participate in postacquisition joint inventions. I also hypothesize that high-status (vs. low-status) inventors in their home organizations are less sensitive to increased competitive crowding from target inventors due to the former's advantageous, established positions. I use a sample of 135,159 inventors from 173 acquirers corresponding to 261 technological acquisition deals in U.S. high-technology industries. Based on empirical evidence that supports my hypotheses, this research contributes to the literature on M&As, social network evolution, and the niche perspective in the organizational ecology field.

Keywords*: M&As, Technological acquisition, Innovation, Corporate inventors, Niche, Competitive crowding, Status*

INTRODUCTION

The literature on technological acquisition indicates that synthesizing the knowledge of an acquirer and its target is a prerequisite for an acquirer to leverage its target's knowledge in the postacquisition phase (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991; Makri, Hitt, & Lane, 2010; Puranam & Srikanth, 2007; Ranft & Lord, 2002). In exploring the innovation impact of technological acquisitions, previous studies have focused on deal-specific factors such as cultural fit (Bauer & Matzler, 2014; Pablo, 1994) and knowledge fit (Gulati & Puranam, 2009; Sears & Hoetker, 2014), capability factors of an acquirer and its target such as innovation and coordination capability (Argote & Miron-Spektor, 2011; Haleblian & Finkelstein, 1999; Zollo & Singh, 2004), and postacquisition integration (Barkema & Schijven, 2008; Puranam, Singh, & Chaudhuri, 2009; Puranam & Srikanth, 2007). However, those studies have assumed the likelihood of knowledge synthesis without suggesting its mechanisms. The literature has also not explained why technological acquisitions often fail to produce the expected outcomes and how knowledge of the two parties can be synthesized (Rao, Yu, & Umashankar, 2016; Sirower, 1997). To address these problems, this research explores how the knowledge of the two parties is synthesized in the postacquisition phase.

Because knowledge is sticky and resides in inventors (Nonaka, 1994; Ranft & Lord, 2000), the knowledge of the two parties can be synthesized exclusively through collaboration among inventors (Carnabuci & Operti, 2013; Singh & Agrawal, 2011). However, their interests are not always aligned with their organizations' strategic directions (Feldman, 2020; Simon, 1991). As inventors are self-interested agents (Criscuolo, Salter, & Ter Wal, 2014; Guler & Nerkar, 2012;

Liu, Srivastava, & Stuart, 2016), they engage actively and selectively in innovation activities. Without acquirer inventors' participation in the knowledge synthesis process in which an acquirer and its target engage, the acquirer cannot leverage its target's knowledge and will thus fail to achieve innovative goals. Despite the importance of such an acquirer inventor's role, previous studies have paid little attention to the acquirer inventors' participation in this knowledge synthesis process between an acquirer and its target. Specifically, I focus on the participation of acquirer inventors in postacquisition joint inventions in which the inventors of the two parties collaborate and synthesize their knowledge after the acquisition. This research investigates which acquirer inventors participate in postacquisition joint inventions and the conditions under which they do.

I consider the niche and crowding literature as theoretical foundations for this study. From the niche perspective, inventors compete with one another as employees within an organization for performance, promotions, financial rewards, and other positions in their organization (Liu et al., 2016). An inventor's specialized knowledge can be applied to his or her resource and capability spaces as an appeal to his or her organization (Freeman & Hannan, 1983; Liu et al., 2016; Stuart, 1998). From this viewpoint, I define the knowledge niche as the position of an inventor in a knowledge space. In the technological acquisition context, depending on their knowledge niches, acquirer inventors face various levels of increased competitive crowding due to the inflows of the corresponding target's inventors into the acquirer's boundary. This change in the competitive crowding in their knowledge niche may influence inventors' innovation behaviors in terms of securing or obtaining advantageous positions that they wish to sustain in their organizations

(Baum & Mezias, 1992; Baum & Singh, 1994; Hannan & Freeman, 1977; McPherson, 1983; Podolny, Stuart, & Hannan, 1996).

This research argues that this change in competitive crowding is a force that drives acquirer inventors to participate in the knowledge synthesis process between an acquirer and its target. When acquirer inventors face a high level of increased competitive crowding from target inventors, the former should act to secure advantageous, unique positions among their competition, i.e., among both target and acquirer inventors. At least in the short term, participation in the knowledge synthesis process enables acquirer inventors to learn the target's knowledge, gain more opportunities to construct their social capital in the target's knowledge community and develop their capability of hybridizing the knowledge of the two parties. Furthermore, I argue that such an influence is contingent on the network positions of acquirer inventors in their home organization. High-status inventors are more likely to be insensitive to increased competitive crowding because of their sufficient social capital, increased access to others, and information overload problems.

I test my hypotheses with a set of 135,159 inventors from 173 acquirers corresponding to 261 technological acquisition deals between 2001 and 2015 in U.S. high-technology industries. I analyze the data and obtain empirical evidence supporting my arguments. To strengthen my argument and reflect reality, I use a qualitative method, interviewing professionals working in high-technology companies.

This research makes theoretical contributions to the literature on mergers and acquisitions (M&A), social network evolution, and organizational ecology. First, I reveal the microlevel mechanism underlying the knowledge synthesis process between an acquirer and its target. The increased competitive crowding that acquirer inventors face during the postacquisition period and their positions within the acquirers are driving forces that induce them to contribute to the knowledge synthesis process between the acquirer and its target. Second, this research contributes to the literature on the evolution of social networks by providing insights into how two networks (i.e., inventor collaboration networks) that previously existed separately within different boundaries become interrelated after the boundary between the two networks collapses. Third, in contrast to previous studies that have focused on only one boundary (e.g., market, region, or industry), I address how an actor's niche can be changed as a result of a boundary collapse between two entities. By doing so, I further expand the scope of the niche and crowding perspectives in the context of intraorganizational studies. Finally, I derive an implication for managers. Managers should investigate the competitive pressure inventors face and identify which inventors contribute to the knowledge synthesis process between an acquirer and its target in the postacquisition phase.

THEORY AND HYPOTHESES

Knowledge Synthesis Process in the Postacquisition Phase

Organizations with large and diverse knowledge bases occupy advantageous positions for better innovation performance (Ahuja & Katila, 2001), as knowledge is created by synthesizing and

recombining existing knowledge and capabilities (Fleming, 2001; Kogut & Zander, 1992; Nonaka, 1994). Technological acquisition enables organizations to enlarge their knowledge pools and secure human capital by conducting one-time transactions (Ahuja & Katila, 2001; Graebner, Heimeriks, Huy, & Vaara, 2017; Makri et al., 2010; Puranam, Singh, & Zollo, 2003; Ranft & Lord, 2000; Ranft & Lord, 2002; Ransbotham & Mitra, 2010), which increasingly direct managers' attention to technological acquisition as a crucial corporate development vehicle (Haspeslagh & Jemison, 1991; Macmillan & Prakash, 2018). Despite these advantages, a fundamental question in the technological acquisition literature has concerned why many technological acquisitions end in failure, despite careful evaluations of the potential between acquirers and targets during the due diligence period (Eccles, Lanes, & Wilson, 1999; Graebner, Eisenhardt, & Roundy, 2010; Puranam & Srikanth, 2007).

Previous studies have found that synthesizing the knowledge and capability of an acquirer and its target is necessary for the acquirer to leverage its target's knowledge and capability (Capron, 1999; Carnabuci & Operti, 2013; Haspeslagh & Jemison, 1991; Puranam & Srikanth, 2007; Ranft & Lord, 2002). One stream in this research has argued that differences between an acquirer and its target, such as those related to cultures and routines, are obstacles to the synthesizing of the two parties' knowledge (Bauer & Matzler, 2014; Greenwood, Hinings, & Brown, 1994; Pablo, 1994; Weber, Shenkar, & Raveh, 1996). Some scholars have focused on resource and knowledge fit (Puranam et al., 2009; Sears & Hoetker, 2014). Another group has argued that an acquirer's acquisition experiences crucially impact the knowledge synthesis process between the two parties (Argote & Miron-Spektor, 2011; Haleblian & Finkelstein, 1999; Hayward, 2002; Singh & Zollo, 1999; Zollo & Singh, 2004). Other studies have insisted that the restructuring

process is essential in leveraging a target's innovation capability and knowledge (Barkema & Schijven, 2008; Graebner et al., 2017; Puranam et al., 2009; Puranam, Singh, & Zollo, 2006; Puranam & Srikanth, 2007). Although previous studies focusing on organizational-level factors have provided insights, those studies have assumed the likelihood of the knowledge synthesis process without providing evidence or an explanation for its specific process.

This research argues that investigating the microlevel mechanism of the knowledge synthesis process of the two parties is essential for two reasons. First, knowledge synthesis occurs primarily through inventors (Singh & Agrawal, 2011). Although knowledge can be accumulated through processes or routines (Fiol & Lyles, 1985), the inventors who comprise the lower echelon of an organization are regarded as the organization's main knowledge repositories (Nonaka, 1994; Ranft & Lord, 2000). Previous research has shown that knowledge is combined and recombined exclusively through collaborations among inventors (Singh & Agrawal, 2011; Tzabbar, Silverman, & Aharonson, 2015). Second, as self-interested agents, inventors have great autonomy with respect to refusing, sabotaging, or participating in innovation activities within their organizations (Carnabuci & Operti, 2013; Criscuolo et al., 2014). Innovation potential exists between acquirers and targets from an upper-level manager's comprehensive approach. The interests of acquirer inventors are not always aligned with those of the acquirers. Inventors' interests influence their behaviors in terms of setting and implementing detailed innovation plans for innovation performance (Allen & Cohen, 1969; Feldman, 2020; Paruchuri & Awate, 2017; Singh, Kryscynski, Li, & Gopal, 2016). For acquirers, synthesizing the knowledge of targets with their own is possible only through interactions between the inventors of the two parties.

Understanding acquirer inventors' behaviors in the postacquisition period is vital in relation to revealing the process of knowledge synthesis between the two parties.

Postacquisition Joint Inventions

To investigate the microlevel mechanism used in the knowledge synthesis process between an acquirer and its target in the postacquisition phase, this study focuses on acquirer inventors' participation in postacquisition joint inventions. In the postacquisition period, the acquirer and target inventors of the two parties can collaborate in the form of a postacquisition joint invention. A postacquisition joint invention refers to an innovation task conducted by a group with which the inventors of an acquirer and its target collaborate and share their knowledge to create inventions after the technological acquisition deal is finalized. Regardless of structural integration, which refers to the physical and legal combination of an acquirer and a target as one organization (Puranam et al., 2009; Puranam et al., 2006), a postacquisition joint invention is a unique form of collaboration among inventors. One executive-level manager (acquisitions expert) described the nature of postacquisition joint inventions as follows:

> We have to set up like a temporary organizational structure. …We use basically the same structure whether it is integrated or separated. … It is set up like a program (common projects). We want to use the technology that's inside a target company. … [We] need to mix people from the acquired company to be able to understand how we [are] going to migrate the new technology because they know more about the technology. … That's essentially how it works. … It's meant to be very efficient in terms of aligning people.

By participating in postacquisition joint inventions, the inventors of the two parties can collaborate. On the other hand, acquirer inventors must devote time and effort to participate in postacquisition joint inventions due to the nature of learning (Cohen & Levinthal, 1990; March, 1991; Nonaka, 1994) and organizational differences such as those related to cultures, processes, and jargon (Pablo, 1994; Ranft & Lord, 2000). Because inventors' concerns involve their career development and progression in their organizations, participating in postacquisition joint inventions is a concern for acquirer inventors in the postacquisition period. How these career and attainment concerns are related to the pros and cons of participating in postacquisition joint inventions reveals the mechanism by which knowledge is synthesized by the two parties after technological acquisition.

Knowledge Niche and Competitive Crowding

This study considers the niche perspective as a theoretical foundation from which to investigate acquirer inventors' behaviors within organizations. A niche refers to a region of a resource space and capabilities in which a social actor can grow, survive, and promote its offerings to audiences (Freeman & Hannan, 1983; Hannan, Carroll, & Polos, 2003; Hannan & Freeman, 1977). Inventors have their own knowledge specialties and occupy positions in innovation activities within their organizations (Fleming, 2001; Nerkar & Paruchuri, 2005; Paruchuri & Awate, 2017). For example, the knowledge of Jim Keller, an inventor who worked at AMD (Advanced Micro Devices) Inc. and Apple Inc., is specialized in the design of the x86 architecture of the microprocessor chip. This x86-based specialty represents Keller's position in the knowledge space. His specialty in designing microprocessor chips and related innovation activities

constitute what he can contribute to his organization. From this viewpoint, this research defines an inventor's knowledge niche as his or her position in the knowledge space and the innovation activities he or she participates in within his or her organization.

When one inventor's knowledge niche overlaps with those of other inventors, both substitution and competition pressures increase (Baum & Haveman, 1997; Liu et al., 2016; Podolny et al., 1996). Such a high level of pressure indicates a high level of competitive crowding in a specific knowledge niche (Liu et al., 2016; Podolny et al., 1996). Inventors who share the same knowledge niche compete for scarce resources such as promotions, financial benefits, and survival within their organizations (Barnett & Miner, 1992; Liu et al., 2016; Stewman & Konda, 1983). Inventors' competition within their organizations is associated with their knowledge niches. A high level of competitive crowding fundamentally implies an increase in competitive intensity among the inventors in the same knowledge niche (Baum & Mezias, 1992; Baum & Singh, 1994; Hannan & Freeman, 1977; McPherson, 1983; Podolny et al., 1996). Inventors seek ways not only to attain advantageous positions but also to survive in their organizations (Liu et al., 2016). On the other hand, such high pressure levels can also serve as an opportunity for some inventors to remain in their organizations because the overlapping knowledge niche between inventors increases the possibility of knowledge complementarity, which in turn enables them to engage in innovation activities (Baum & Mezias, 1992; Baum & Singh, 1994; Podolny et al., 1996; Stuart, 1998).

Competitive Crowding from Target Inventors

After a technological acquisition, inventors flow from the target into the acquirer (Coff, 2002; Larsson & Finkelstein, 1999). Like the acquirer inventors, the target inventors have their own knowledge niches. The knowledge niche of acquirer inventors and that of the target inventors either completely overlap, partially overlap, or does not overlap at all. Many acquirer inventors face target inventors who share their knowledge niche (Lee, Mauer, & Xu, 2018; Yu, Umashankar, & Rao, 2016). In the technological acquisition context, the overlap of inventors' niches acts as a dual force on acquirer inventors. On the one hand, when two inventors' niches overlap, these individuals are likely to compete in the same knowledge niche for productivity, promotions, financial rewards, and other career-related positions within an organization (Baum & Singh, 1994; Liu et al., 2016; McPherson, 1983). Depending on his or her knowledge niche, each acquirer inventor faces various levels of increased competitive crowding from target inventors. Although the extent of this competition is different for each inventor, such increased competition in the postacquisition period is unavoidable for acquirer inventors.

On the other hand, at least immediately after a technological acquisition, the two parties' inventors in the same knowledge niche can complement each other. Even within the same industry or knowledge sector, different organizations have different knowledge bases, which implies that inventors in different organizations possess different knowledge bases despite the sharing of knowledge niches and that they function as repositories of their organizations' knowledge (Makri et al., 2010; Puranam et al., 2009; Ranft & Lord, 2000; Stuart, 1998). Although both acquirers and targets have similar knowledge, an acquirer selects the target that potentially complements its own knowledge during the due diligence period (Haspeslagh & Jemison, 1991; Makri et al., 2010; Stuart, 1998; Yu et al., 2016). A high (vs. low) level of

increased competitive crowding from target inventors can indicate that acquirer inventors will benefit from an increased number of collaborators with whom to create inventions in the postacquisition period. One of my interviewees stated such a counterbalancing aspect:

> Both companies' employees [acquirer and target] are concerned about their jobs. …. They [jobs] are duplicated [with the target employees] or not.... If their [acquirer employees] work areas are overlapped, they are very competitive for their jobs. Some try not to mix [not to work together with the target employees]. But, for someone, it can be good for them [if they work together].

Participating in postacquisition joint inventions provides several advantages and opportunities for acquirer inventors in the postacquisition period. First, acquirer inventors can increase their opportunities to learn their target's knowledge. Because inventors on both sides have different knowledge bases, despite sharing similar knowledge backgrounds (Makri et al., 2010; Puranam et al., 2009; Ranft & Lord, 2000; Stuart, 1998), they can complement each other's knowledge within the same knowledge niche. Furthermore, a common knowledge base acts as an absorptive capacity and helps acquirer inventors to learn and internalize the target's knowledge quickly and with relatively less effort than they would with others with whom they do not share any niche (Cohen & Levinthal, 1990). When facing a higher (vs. lower) level of increased competitive crowding from target inventors, acquirer inventors have a greater (vs. smaller) pool of potential collaborators. Thus, greater opportunities are available to acquirer inventors when they face a higher level of increased competitive crowding from target inventors.

Second, greater competitive crowding from target inventors provides acquirer inventors with an opportunity to have social capital in the target's knowledge community. The high level of competitive crowding pressure from the target inventors whose knowledge niches overlap with those of acquirer inventors implies that those target inventors are part of a large knowledge community. By participating in postacquisition joint inventions, acquirer inventors can establish their social capital in the target's knowledge communities.

Third, by participating in postacquisition joint inventions, acquirer inventors can develop their ability to hybridize the knowledge of an acquirer and its target. Thus, acquirer inventors gain opportunities to differentiate and secure advantageous positions for future competition with inventors on both sides. Acquirer inventors face greater competitive crowding from target inventors, as they face a greater number of intraorganizational competitors in the long term. This situation pressures acquirer inventors to seize opportunities to work with target inventors in postacquisition joint inventions to differentiate themselves. Hence, this paper argues that acquirer inventors, who face an increasing level of competitive crowding from target inventors in their knowledge niches, have more opportunities or are under greater pressure to learn the target's knowledge, construct social capital in the target's knowledge community, and develop their capability of hybridizing the knowledge of both parties by participating in postacquisition joint inventions. In so doing, they can demonstrate their unique human capital to their organizations in the postacquisition phase.

H1: Higher levels of increased competitive crowding from target inventors in the knowledge niche of an acquirer inventor make it more likely that he or she will participate in postacquisition joint inventions.

Status in the Home Organization

Even if acquirer inventors face the same level of increased competitive crowding from target inventors in their knowledge niches, their participation in postacquisition joint inventions may vary depending on the positions that acquirer inventors occupy in their home organizations (Podolny & Stuart, 1995).

At a given level of increased competitive crowding from target inventors, collaborations with those target inventors still provide a good opportunity for high-status acquirer inventors in technological acquisition contexts. A high status serves as an innovation capability signal to others (Allen, 1966; Allen & Cohen, 1969; Paruchuri, 2010; Paruchuri & Eisenman, 2012). High-status acquirer inventors are more likely to be noticed as competitive collaborators by the corresponding target's inventors due to their higher visibility and superior performance (Paruchuri, 2010; Singh et al., 2016). However, high-status acquirer inventors are more likely to face information overload problems (Oldroyd & Morris, 2012; Paruchuri, 2010). High-status inventors can facilitate information sharing within their organizations (Reinholt, Pedersen, & Foss, 2011). They can respond to requests from other inventors to provide knowledge and information, for example about who has what knowledge (Paruchuri, 2010). As human beings, inventors have their own cognitive limitations in terms of processing information.

High-status (vs. low-status) acquirer inventors are more likely to be insensitive to increased competitive crowding from target inventors due to their advantageous and prestigious positions within their organizations. High-status inventors already possess extensive access to knowledge and other inventors because high-status inventors have social capital within their organizations (Coleman, 1988; Paruchuri & Awate, 2017; Reinholt et al., 2011; Singh et al., 2016; Singh, Hansen, & Podolny, 2010). High-status inventors are confident that they will perform well with their existing partners and thus do not necessarily feel the need to collaborate with target inventors. Such high-status inventors are more likely to become involved in path-dependent innovation activities by maintaining the status quo regarding other acquirer inventors (Nerkar & Paruchuri, 2005).

On the other hand, low-status acquirer inventors have relatively little access to other inventors and are not perceived as competitive collaborators by other inventors. In relation to enhancing their position and innovation performance, they have an incentive to differentiate themselves and put forth their unique values (i.e., by hybridizing the knowledge of two parties) in their organizations in light of future innovation activities. Even if an acquirer requires low-status inventors to participate in postacquisition joint inventions, those low-status inventors have little power to resist.

At different levels of competitive crowding from target inventors, low-status acquirer inventors may not be perceived as competitive collaborators by target inventors. However, because high-status (vs. low-status) acquirer inventors have decreased motivation and make fewer concessions, opportunities arise for low-status acquirer inventors. This research argues that,

under a given level of increased competitive crowding from target inventors, low-status (vs. high-status) acquirer inventors are more sensitive to competitive crowding from target inventors and are more willing to participate in postacquisition joint inventions.

H2: The positive relationship between the increased level of competitive crowding from target inventors and the likelihood that acquirer inventors will participate in postacquisition joint inventions is weaker for high-status acquirer inventors.

DATA AND METHODS

Research Context and Sample

I tested my hypotheses using 135,159 inventor-acquirer observations from 173 acquirers who had completed 261 technological acquisition deals in U.S. high-technology industries between 2001 and 2015. I determined the scope of high-technology firms as follows. High-technology industries include the semiconductor, materials, electronics, telecommunications, aerospace, and biopharmaceutical sectors. Acquisition deals in high-technology industries fit well with the purpose of this research. The primary acquisition goals of companies in high-technology industries involve innovation and R&D-intensive activities (Ahuja & Katila, 2001; Puranam et al., 2009; Sears & Hoetker, 2014). I set the observation period because the United States Patent and Trademark Office (USPTO) started to disclose patent application records after the American Inventors Protection Act (AIPA) of 1999 (Chondrakis, Serrano, & Ziedonis, 2021).

I obtained data regarding acquisitions in high-technology industries from the Securities Data Company (SDC) Platinum database. I extracted information on the acquisition deals, i.e., effective dates, acquisition types (i.e., hostile vs friendly), postacquisition percentage of shares, acquirers' and targets' addresses, and standard industry codes (SICs). I manually searched for missing information on acquisition deals using the Wharton Research Data Services (WRDS) and Bloomberg databases. I used the USPTO's patent data. The sources used for my patent dataset included PatentView and the Coleman Fung Institute of the University of California, Berkeley. These databases provide U.S. patent data from the 1970s to 2020. The patent databases contain various types of disambiguated information about individual patents, such as patent numbers, assignees, inventors' names, and approval dates. Although not all the innovation activities of a company are recorded within the patent application documents, the USPTO gathers almost all the existing patent filing records, as well as the names of the corresponding inventors and assignees. Interviews with inventors have shown that the inventors' names on patent records reflect actual collaborations among inventors (Carnabuci & Operti, 2013; Fleming, King, & Juda, 2007).

From the SDC Platinum database, I initially obtained over 60,000 equity transaction records corresponding to companies in high-technology industries between 2001 and 2015. Based on a few criteria, the acquisition cases that did not fit my purpose were discarded. I considered acquisitions in which the acquirers owned more than 50% of their targets after deal closure and had full managerial control over their targets to pursue technological innovations together (Bettinazzi, Miller, Amore, & Corbetta, 2020; Capron & Shen, 2007; Chen, Kale, & Hoskisson, 2018). I screened out acquisition cases in which an acquirer held a minor share investment in

another company and cases in which an additional purchase of a target's shares was made after full management over the target was obtained (i.e., buyback or share repurchase). The number of acquisition deals was thus reduced to 56,227. Of these initial acquisition cases, I included only those acquisitions that took place between publicly traded companies in the U.S. Public companies have well-established organizational processes, routines, and cultures and a large number of inventors, which results in competitive pressures among inventors in their specialty groups. My selection method minimized the effect of the cost to inventors of participating in joint inventions when they have to adapt to unfamiliar organizational cultures, processes, and routines. After these criteria were applied, 487 acquisition deals remained in the sample.

I further excluded acquisitions that had nontechnological purposes from the 487 acquisition deals. Using acquirer 10-K reports, DEFM14A and PREM14A from the U.S. Securities and Exchange Commission (SEC) and media coverage from the LexisNexis and FACTIVA databases, I identified the technological purpose of each acquisition deal based on phrases such as "Becton, Dickinson & Co's acquisition of CareFusion allows us to align our highly complementary technologies" and "we actively work with Sun on joint SOA-based architectural and vertical solutions." The number of acquisition deals included in the sample was thus reduced to 276. Finally, after matching the companies' names in the acquisition data with assignees' names in the patent data, I screened out the acquisition cases in which the acquirers or targets did not have any patent record (Hernandez & Shaver, 2019). The goal of this research is to investigate inventors' participation in postacquisition joint inventions. At least one inventor can be investigated among all acquirers and their corresponding target. Through this selection process, I included in the sample 261 acquisition deals, which corresponded to 173 acquirers and

261 targets. Among the 173 acquirers, 47 acquirers were part of multiple acquisition contracts, which were part of the sample.

By matching the companies' names in the acquisition data with the assignees' names in the patent data, I collected all the patent records for each company appearing in the patent database, including patent numbers, assignees, and application dates. I also collected the names of the inventors involved in each patent, the patents' references (citation information) and citation dates and the patents' class information. Even though PatentView and the patent data of the Coleman Fung Institute of the University of California, Berkeley provided disambiguated data, limitations remained. I checked for historical name changes and subsidiaries using WRDS, FACTIVA, 10-K reports, Bloomberg, and Google search. I manually matched the names of each acquirer and target in the SDC Platinum database with those of the corresponding assignee in the patent data, including for subsidiaries (Cheyre, Klepper, & Veloso, 2015; Di Lorenzo & Almeida, 2017). Through this process, I constructed a merged dataset that included the company's name, the patent, the patent application date and the inventor for each acquisition deal. In this dataset, I included inventors who created at least two patents for the corresponding acquirer, one within the five years prior to the acquisition date and the other within the five years after the acquisition date. The existence of two such patents strongly implied that the focal inventor had been continuously working for the acquirer before and after the acquisition deal (Paruchuri, Nerkar, & Hambrick, 2006).

I included only observations that pertained to patent applications that fell within five years before or after the acquisition's effective date. I used a five-year window as my study period, as the

purpose of this research is to investigate the behaviors of acquirer inventors immediately after technological acquisitions. During this period, common cultures and organizational systems have not yet been formed, and the absorptive capacity of inventors is the most crucial factor in relation to learning a target's knowledge via collaboration. It usually takes five years for an acquirer and its target to form a common culture and establish integrated work processes and routines (Makri et al., 2010). In addition, the average duration required to create a patent is between three and five years (Corredoira & Rosenkopf, 2010). Innovation projects initiated immediately after an acquisition in the form of a joint invention are likely to be filed with the USPTO office during the five years after the acquisition's effective date. Finally, the value of a target's knowledge from the perspective of its acquirer inventors depreciates over time in high-technology industries (Carnabuci & Operti, 2013; Corredoira & Rosenkopf, 2010; Katila & Ahuja, 2002). Five years after an acquisition's effective date, the knowledge of the target inventors may not be novel or useful to the acquirer inventors.

I combined each acquisition's acquirer–inventor set, resulting in a pooled dataset. The final observational units take the form of acquirer–inventor sets. The analytical level is the inventor level. The final sample size is 135,159.

Qualitative Approach

For this research, I conducted interviews. First, I interviewed engineers working in high-technology industries. Seven engineers were acquirer employees (among them, two were high-status engineers). Three were target employees. While interviewing them, I listened to their stories about how they felt, what they thought, and how they behaved in the technological

acquisition context. Second, I interviewed two executive-level managers. One was working as a manager in the human resource department in a high-technology industry and had acquisition experience. The other was an executive-level consultant working in an internationally known strategic consulting company and had much technological acquisition experience. I listened to their acquisition experiences about how an acquirer managed and coordinated the target employees throughout the acquisition and postacquisition processes. Particularly, the human resource manager shared her experiences with human resource coordination from the viewpoint of an acquirer and stories about how engineers on both sides experience changes in their jobs.

Insert Figure 2 about Here

Dependent Variable

Postacquisition joint inventions. Based on the patent application dates, I counted the number of patent application records containing the name of each inventor from the focal acquirer with at least one inventor from the corresponding target during the five years subsequent to the effective date of the focal acquisition. In line with the definition of postacquisition joint inventions, I examined patent application records containing both the names of inventors from the focal acquirer and those of inventors from the corresponding target as postacquisition joint inventions (Figure 2). In high-technology industries, inventors participate in innovation activities to create inventions, and companies file patent applications with the USPTO to protect their new technological knowledge as intellectual property (Ahuja & Katila, 2001; Almeida & Kogut, 1999; Fleming, 2001; Podolny et al., 1996). Inventors' names on patent application records reflect actual collaborations among inventors (Carnabuci & Operti, 2013; Fleming et al., 2007). I used patent application records rather than grant records because the former mark the invention

regardless of whether an intellectual property right is granted to the focal patent application by the USPTO as a successful innovation outcome (Balachandran & Hernandez, 2018; Paruchuri, 2010).

Independent Variables

Competitive crowding from target inventors. I measured the level of competitive crowding that an inventor from the focal acquirer faces from the corresponding target's inventors by calculating the log of the sum of the niche overlap between the focal acquirer inventor and all inventors of the corresponding target (Figure 3).

Insert Figure 3 about Here

The patent references of one inventor's patents can represent his or her knowledge space (i.e., knowledge niche). I consider references of inventors made only within the most recent five-year period to reflect their current innovation activities (Carnabuci & Operti, 2013; Corredoira & Rosenkopf, 2010; Fleming et al., 2007; Katila & Ahuja, 2002). The niche overlap between two inventors can be calculated as the ratio of the number of patent references an inventor shares with another inventor to his or her number of unique references (Baum & Mezias, 1992; Baum & Singh, 1994; McPherson, 1983; Podolny et al., 1996). The level of competitive crowding an inventor faces can be computed as the sum of the reference overlaps between the focal acquirer inventor and all inventors of the corresponding target. I eliminated any duplicate references of focal acquirer inventors and target inventors. Because the value of this sum is skewed, I took its log. The formula is below:

$$Competitive\ Crowding\ of\ an\ Acquirer's\ Inventor_i = \ln\left(1 + \sum_j^n \frac{The\ Number\ of\ Common\ References\ between\ Inventor_i\ and\ Inventor_j}{The\ Number\ of\ Unique\ References\ of\ Inventor_i}\right)$$

n: Number of the corresponding target's inventors

A greater value of competitive crowding from target inventors implies that the focal inventor faces a greater number of target inventors who share his or her patent references after the focal acquisition.

Status in the home organization. I measured the status of the focal acquirer inventor using Bonacich centrality (Bonacich, 1987). Bonacich centrality fits well with the concept of status in individual-level studies, as it reflects a person's influence over others (Ibarra, 1993; Nerkar & Paruchuri, 2005). I constructed inventor collaboration networks for each acquirer based on the patent applications filed with the USPTO during the five years prior to the effective date of the focal acquisition (Nerkar & Paruchuri, 2005; Paruchuri, 2010). I selected a five-year window when constructing these inventor collaboration networks because the relationships among inventors depreciate (Carnabuci & Operti, 2013; Corredoira & Rosenkopf, 2010; Katila & Ahuja, 2002). I measured an inventor's status within his or her company's inventor collaboration network at the time of the focal acquisition deal. The following formula was used to measure the Bonacich centrality of the inventors of each acquirer (Bonacich, 1987):

$$c(\alpha, \beta) = \sum_{k=0}^{\infty} \beta^k R^{k+1} \mathbf{1}$$

To consider the direct and indirect connections among the inventors by weighting them based on their centrality, I set the values of α and β as one- and three-quarters, respectively (Bonacich, 1987; Nerkar & Paruchuri, 2005; Paruchuri, 2010; Wasserman & Faust, 1994). Greater Bonacich centrality values of inventors indicate that these inventors have greater influence or status.

Control Variables

In this study, I conducted individual-level research to investigate the participation of inventors in postacquisition joint inventions. However, inventors belong to and are under the influence of their organizations. Furthermore, organizations' acquisition deals have different purposes, which may affect inventors' behaviors. Thus, I included control variables at the inventor, organization, and acquisition deal levels.

Control Variables: Inventor Level

Competitive crowding from acquirer inventors. Using an approach similar to my calculation of the level of increased competitive crowding from target inventors, I measured the level of competitive crowding that an acquirer inventor faces from other acquirer inventors within his or her organization (i.e., acquirer inventors).

Previous innovation performance (logged). The innovation capability of an acquirer inventor may be associated with his or her participatory behavior in postacquisition joint inventions. I controlled for this innovation capability effect by controlling for the inventors' previous performance. I calculated each inventor's performance as the log of the number of patents he or she created during the five years prior to the effective date of his or her company's acquisition.

Tenure (logged). The tenure of an acquirer inventor was estimated using his or her patent records. By tracking all the patent records of the focal inventor, I obtained the application date of his or her first patent under the name of his or her current company (i.e., acquirer). The tenure of

an acquirer inventor as of the focal year was calculated by subtracting his or her first patent application date from the acquisition's effective date; this value was then logged because the distribution of the inventor's tenures was skewed.

Knowledge familiarity (to the acquirer/target). Each inventor's familiarity level with the corresponding acquirer's knowledge was measured as the ratio of the number of the acquirer's patents cited by the focal inventor to the total number of patents cited by him or her during the five years prior to the acquisition's effective date. The focal inventor's familiarity with the corresponding target's knowledge was calculated by replacing the number of the acquirer's patents cited by the focal inventor in the aforementioned calculation with the number of the corresponding target's patents cited by him or her.

Knowledge scope (logged). The knowledge scope of an acquirer inventor indicates his or her range of diverse knowledge types. I counted the unique main classes of all the patents that each inventor created during the five years prior to the focal acquisition's effective date. The distribution of this variable was skewed, so I took its log.

Unique collaborators. I counted the number of unique inventors the focal acquirer inventor collaborated with for the previous five years from the acquisition's effective date.

Ratio of unique collaborators. The openness of each inventor to new relationships with inventors with whom he or she has never worked before was controlled in this research. I measured each inventor's openness to new relationships by considering his or her relationships with previous

collaborators. I calculated the ratio of the number of the focal inventor's unique collaborators to the total number of his or her collaborators (duplicate) during the five years prior to the acquisition's effective date.

Gender. The gender of each acquirer inventor was obtained from the PatentView database. This database provides information about the inventors' gender (Toole et al., 2020). Based on the ethnic and migratory backgrounds of the examined inventors, their gender information was estimated using their names and IBM's Global Name Recognition algorithm (Breschi, Lissoni, & Miguelez, 2017; Breschi, Lissoni, & Tarasconi, 2017; Whittington, 2018). I used this gender variable as an instrumental variable in my data analysis.

Control Variables: Organization and Acquisition Deal Level

Geographic distance. Geographic distance was measured as the log of the kilometers between an acquirer and its target based on the corresponding headquarters' locations. I first obtained the addresses of the headquarters of each acquirer and its target, converted these addresses into a longitude and latitude format via Google Map API's service, and calculated the distance (in thousands of kilometers) between these addresses using the WGS84 ellipsoid standard, which is the most popular global ellipsoid method and has a radius of 6,378,137 meters and a flattening ratio of 1/298.257223563.

Technological distance. The technological distance between an acquirer and its target was measured by calculating the cosine value of the inner product between the patent's main class vectors (of the acquirer and its target). I extracted all the patents of each acquirer from the five

years prior to the focal acquisition's effective date and constructed the main class vector (counting the number of patents in each main class). I did the same for the target. I measured the technological distance between each acquirer and its target as follows:

$$\text{Technological distance} = 1 - \cos\theta = 1 - \frac{\vec{A} \cdot \vec{T}}{|\vec{A}| \cdot |\vec{T}|}$$

where $\vec{A}$ denotes the patent class vector of the acquirer's firm, and $\vec{T}$ denotes the patent class vector of the target firm. When the cosine value is smaller, the acquirer and target technologies are further apart.

Industrial distance. Industrial distance indicates the extent to which each acquirer and its target belong to different industries. I calculated the industrial distance between each acquirer and its target using their SIC codes. If all four digits of the two SIC codes (acquirer and target codes) were different, the distance was denoted as 4. The value was reduced by one if the first digits were the same. If only the last (fourth) digit was different, the distance was coded as 1.

Preacquisition alliance. If an acquirer and its target formed a strategic alliance during the five years prior to their acquisition deal, I coded the corresponding dummy as 1; otherwise, I coded it as 0. A preacquisition alliance between two companies may reduce the knowledge gap between them and enable both the acquirer and the target to understand each other's systems and processes (Martin & Shalev, 2017; Porrini, 2004; Zaheer, Hernandez, & Banerjee, 2010). I restricted this window to five years because such a strategic alliance experience with a specific partner depreciates over time and may no longer be valid after five years (Yang, Lin, & Peng, 2011).

Acquisition experience (Acquirer). From an organizational learning perspective, organizations develop their capabilities to conduct tasks and execute strategies through repeated experiences (Argote & Miron-Spektor, 2011; Levitt & March, 1988). Thus, I controlled for each acquirer's technological acquisition experiences by counting the number of technological acquisitions that acquirer conducted before the focal acquisition date (Puranam et al., 2006; Puranam & Srikanth, 2007). When evaluating the focal acquirer's acquisition history using the SDC database, I considered only acquisition cases in which the targets were high-technology companies and the total share of the target owned by the acquirer was more than 50 percent. Given that this study involves understanding the mechanism underlying inventions in the course of technological acquisitions, only relevant acquisition experiences were considered. Therefore, I attempted to distinguish between acquisitions with full control over targets and shared investments in other companies.

Acquisition attitude (Hostile). Using the SDC Platinum database, I coded each acquisition deal as 1 if it was hostile and 0 otherwise.

Structural integration. Structural integration can influence both acquirer and target inventors after an acquisition by accelerating or disrupting their innovation activities (Puranam & Srikanth, 2007; Schweizer, 2005). Thus, I measured structural integration with a binary variable. If an acquirer structurally integrated its target during the five years after the focal acquisition's effective date, this variable was coded as 1; otherwise, it was coded as 0. Based on the focal acquirer's 10-K reports and the related media coverage during the five years after the focal acquisition's effective date, I determined whether each target was structurally integrated

(Puranam et al., 2006; Puranam & Srikanth, 2007). If I found phrases involving structural integration, I regarded the focal acquirer's target as structurally integrated into the acquirer. An example of such phrases is "integrate our and CuraGen's business without causing delays in research and development", which was pronounced with regards to the acquisition contract between Celldex Therapeutics and CuraGen. If a target's name disappeared in the subsidiary section of its acquirer's 10-K reports without a reselling event, I viewed that target as structurally integrated.

Relative size of the knowledge base. This variable was calculated as the ratio of the total number of an acquirer's patents to that of its target's patents (Ahuja & Katila, 2001). I considered patents created during the five years prior to the focal acquisition's effective date (Ahuja & Katila, 2001; Carnabuci & Operti, 2013; Corredoira & Rosenkopf, 2010; Katila & Ahuja, 2002).

Analytical Approach

I tested my hypotheses using a negative binomial regression model. I counted the number of postacquisition joint inventions in the postacquisition period (number of patents) to construct the dependent variable. This dependent variable is a countable and nonnegative integer. I considered nonlinear estimators rather than an ordinary least square (OLS) model because OLS models assume that dependent variables range from negative to positive infinity (Cameron & Trivedi, 2005; Greene, 2011). Thus, an OLS model does not fit well with the discreteness of my dependent variable. Among nonlinear estimators, the Poisson regression model is a potential model for dependent variables that are countable and nonnegative integers (Cameron & Trivedi, 2013; Greene, 2007). One strong assumption of the Poisson model is that the conditional mean

and variance of the dependent variable are equal (Cameron & Trivedi, 2013; Greene, 2011). However, my dependent variable does not meet this condition due to its overdispersed nature stemming from the zeros within it (Cameron & Trivedi, 2013).

For this overdispersion case, negative binomial, zero-inflated negative binomial, and zero-inflated Poisson models are potentially usable regression models. From the potential nonlinear estimators, I selected the negative binomial model rather than the Poisson model or another zero-inflated model. Simply having many zeros in the dependent variable does not lead to zero-inflated models in the analyses (Allison, 2012; Cameron & Trivedi, 1990; Greene, 2007). If the proportion of zeros in my dependent variable is within the probability of zero with the mean from the Poisson distribution, then the zeros are not inflated, and the use of a zero-inflated model does not have a solid empirical foundation (Allison, 2012; Cameron & Trivedi, 1990; Greene, 2007). Even if the proportion of zeros in the dependent variable is greater than the probability of zero with the mean from the Poisson distribution, the negative binomial model does not lose the foundation if the two values are close (Allison, 2012; Cameron & Trivedi, 1990). Thus, I can conclude that a zero-inflated model is not necessary. The negative binomial model, which is an expansion of the Poisson model, fits this overdispersion case well, even though it contains many zeros (Cameron & Trivedi, 1990; Cameron & Trivedi, 2013). I analyzed my sample using a negative binomial regression model with two fixed effects. One is a calendar-year fixed effect for the closure date of each acquisition deal. The other is an industry fixed effect based on the two-digit SIC code of an acquirer's industry. The standard errors were clustered at the inventor's level to account for the nonindependence of the observations, as the same inventor could be included in the sample multiple times if his or her acquirer made multiple acquisitions.

One concern regarding this study involves the sample selection in relation to an unobserved heterogeneity problem. This research sample consisted of acquirer inventors who created at least one patent within five years before their companies' acquisition deal dates and another within five years afterward (i.e., known survivors). Those known survivors can participate in postacquisition joint inventions. My sample was not random; thus, unobserved heterogeneity or sample selection bias was present. These issues raise an endogeneity concern in relation to my sample. To address this concern, I employed a two-stage regression model (Heckman, 1979). In the first stage, I estimated the examined inventors' survival in a postacquisition period with a probit model, which implied that each inventor's postacquisition patent applications were considered (i.e., selection model) (Raffiee, 2017). I used the predicted probability of the patenting activity of each acquirer inventor and calculated an inverse Mills ratio (Cameron & Trivedi, 2005; Greene, 2011). I included this inverse Mills ratio in my second-stage model. Moreover, I included each inventor's gender as an instrument variable in the first-stage model and excluded it in the second-stage model. Empirically, men and women inventors showed different patenting trends within their organizations and different mobility tendencies from their current companies to others when their educational levels and career history were controlled (Campbell, Ganco, Franco, & Agarwal, 2012; Kim & Marschke, 2005; Whittington & Smith-Doerr, 2008). However, no difference was found between the men and women inventors in terms of the competitive pressures or opportunities stemming from the number of other inventors in their knowledge niches. Thus, I used inventor gender as an instrumental variable in the first stage.

RESULTS

Insert Table 1 about Here

Main Analysis

The descriptive statistics of and correlations among the variables corresponding to the 135,159 inventor–acquirer observations are presented in Table 1 (descriptive statistics and correlations). The correlation table shows mostly low variable correlations, but some of the variable pairs exhibited a high correlation (above 0.5). I conducted a variance inflation factor (VIF) test to check for multicollinearity among the variables. Table 2 (VIF) shows that the VIF values of all the variables were very low; indeed, these values were less than 2.5 (i.e., the conservative threshold point for multicollinearity), and the mean VIF value was 1.31, which was far less than the generally accepted threshold point of 10 (Vittinghoff, Glidden, Shiboski, & McCulloch, 2012). The maximum VIF value of the variables was 1.91, which was less than even the conservative threshold point of 2.5 (Johnston, Jones, & Manley, 2018). Thus, multicollinearity was not a problem in this study.

Insert Table 2 about Here

The results of the first-stage probit model regarding the acquirer inventors are presented in Model 1 of Table 3. All the inventors who were regarded as acquirer employees were included in this model (those who had patent application records from the five years prior to an acquisition's effective date). Among those inventors, those who had patent application records five years after the acquisition date were considered to be survivors (Paruchuri et al., 2006). The dependent variable of the first stage denotes whether the focal inventor survived in the postacquisition

period (known survivors are coded as 1, and nonsurvivors are coded as 0). In the model, the gender of each acquirer inventor was employed as an instrumental variable. Based on the probit regression results, I calculated an inverse Mills ratio for the second-stage analysis (Certo, Busenbark, Woo, & Semadeni, 2016; Greene, 2011; Heckman, 1979).

Insert Table 3 about Here

In the second stage, I used the negative binomial regression model. The results of the negative binomial regression model are presented in Models 2–4 of Table 3. The log alphas of all three models were significant ($p<0.001$), which indicates that the negative binomial model fits better than the Poisson models across all the models due to the overdispersion issue. Model 2 includes all the control variables and the inverse Mills ratio obtained from the first-stage regression with the year and industry fixed effects. In Model 3, I tested the first hypothesis, namely, that the competitive crowding from target inventors faced by an acquirer inventor would be positively related to his or her participation in postacquisition joint inventions. Model 3 provides support for the first hypothesis ($\beta = 1.117$; $p < 0.01$). Model 4 tests the moderating effect of an inventor's status on the relationship between increased competitive crowding from target inventors and the inventor's likelihood of participating in postacquisition joint inventions after the acquisition deal. The results supported the second hypothesis with the negative and significant coefficient of the interaction variable ($\beta = -0.189$; $p < 0.05$).

Supplementary Analysis

I conducted supplementary tests to confirm my results with various analyses. First, I tested my negative binomial models with varying approaches to standard error clustering, such as clustering at the acquirer-inventor and acquirer levels. The analysis results were the same across

the different models shown in Table 4. Across the models, I used the probit regression model at the first stage and the negative binomial model at the second stage. In Model 1, I employed standard error clustering at the acquirer-inventor level for both the first- and second-stage analyses. In Model 2, I used standard error clustering at the acquirer level for both stages. Across the models, all the hypotheses were supported. The signs of the coefficients were consistent, and the p values were low (significant).

Insert Table 4 about Here

Second, as alternative models, I tested my hypotheses with zero-inflated negative binomial and ordinary least square (OLS) regression models, employing the main sample set used in Table 3. I used the same dependent, independent, and control variables. The analysis results are presented in Table 5. In these models, I included the inverse Mills ratio obtained from the analysis shown in Table 3. The results in Table 5 show that both the zero-inflated negative binomial model and the OLS model led to the conclusion drawn in Table 3.

Insert Table 5 about Here

Third, I conducted sensitivity tests regarding high-status inventors. I set a high-status criterion, namely, the top 10%, 15%, and 20% of the acquirer inventors in terms of Bonacich centrality. Table 6 (status sensitivity) shows that the results were the same across the models. Hence, all the hypotheses were consistently supported across different high-status criteria.

Insert Table 6 about Here

DISCUSSION AND CONCLUSION

This research investigates which acquirer inventors participate in the knowledge synthesis process between the acquirer and its target in the postacquisition phase. I explore this research question by focusing on the participation of acquirer inventors in postacquisition joint inventions. After a technological acquisition deal is closed, common innovation activities are carried out by an acquirer and its target, regardless of whether these entities are structurally integrated. A postacquisition joint invention offers a unique way for acquirer inventors to synthesize their knowledge with that of target inventors through collaboration because that knowledge is sticky (Nonaka, 1994; Ranft & Lord, 2000; Singh & Agrawal, 2011). This collaborative innovation activity is a fundamental mechanism underlying the knowledge synthesis process that takes place between acquirers and targets in the postacquisition phase. By focusing on acquirer inventors, I develop hypotheses using the niche and status perspectives as theoretical foundations.

The results reveal how the dynamics of the postacquisition competitive crowding faced by individual inventors influence the behaviors of acquirer inventors. Those acquirer inventors face a force stemming from increased competitive crowding from the corresponding target's inventors in their knowledge niche, and these target's inventors are their substitutes for future competitors. At least immediately after a technological acquisition deal is closed, some of the target inventors have knowledge that is complementary (rather than redundant) to that of the acquirer inventors because they each have various types of knowledge (Makri et al., 2010; Puranam et al., 2009; Ranft & Lord, 2000; Stuart, 1998). When acquirer inventors face a an

increasingly high level of competitive crowding from the corresponding target's inventors, acquirer inventors (vs. target inventors) are under greater pressure to differentiate themselves. Those inventors need to learn the target's knowledge (Haspeslagh & Jemison, 1991; Nonaka, 1994; Ranft & Lord, 2000; Yu et al., 2016), construct social capital in the knowledge communities of target inventors (Baum & Haveman, 1997; Podolny et al., 1996; Singh et al., 2010), and develop their capability of hybridizing the knowledge of the two parties. By doing so, they can appeal to their organization using their value as human capital and align their interests with their organizations' strategic goals.

This mechanism is contingent on the status of acquirer inventors in their home organizations. Low-status acquirer inventors are more sensitive to increased competitive crowding in their knowledge niche, and they participate in postacquisition joint inventions to acquire a unique position for future competition with other acquirer and target inventors. Even though opportunities to participate in such inventions are more available to high-status (vs. low-status) acquirer inventors, the latter are less likely to participate due to their established social capital in their home organizations (Singh et al., 2010) and to information overload problems stemming from their cognitive limitations (Oldroyd & Morris, 2012; Paruchuri, 2010). High-status acquirer inventors are less sensitive to increased competition from target inventors. Hence, due to competitive crowding from target inventors, opportunities to participate in postacquisition joint inventions arise for low-status acquirer inventors.

Through those findings, this study contributes to the technological acquisition literature by investigating the microlevel mechanism underlying the knowledge synthesis process between an

acquirer and its target in the postacquisition period. The knowledge synthesis process that occurs between an acquirer and its target is driven by the level of acquirer inventors' confidence in their positions within their knowledge space and intraorganizational networks. This study argues that an organization's strategic direction is not always supported by its employees, despite a high level of organizational fit between an acquirer and its target (Bauer & Matzler, 2014; Greenwood et al., 1994; Pablo, 1994; Weber et al., 1996), its technological compatibility (Makri et al., 2010; Puranam et al., 2009), the organization's acquisition experiences (Argote & Miron-Spektor, 2011; Haleblian & Finkelstein, 1999; Hayward, 2002; Singh & Zollo, 1999; Zollo & Singh, 2004), or the subsequent postacquisition integration (Barkema & Schijven, 2008; Graebner et al., 2017; Puranam et al., 2009; Puranam et al., 2006; Puranam & Srikanth, 2007). As self-interested agents, inventors act to address changes in the competitive crowding they face in their knowledge niches during postacquisition periods and maintain or increase their unique value as human capital within their organizations. Depending on their status in their home organizations, inventors are less sensitive to increased competitive crowding. Acquirer inventors who are less confident in their positions in the postacquisition period help acquirers achieve innovation goals by participating in the knowledge synthesis process in which an acquirer and its target engage.

This research indirectly provides insight into how two social networks evolve after the boundary between them collapses. Previous studies on social network evolution have focused on changes within one social network, overlooking changes in the boundaries between multiple social networks. Inventors within an organization and their collaborative relationships comprise a collaboration network (Carnabuci & Operti, 2013; Paruchuri & Awate, 2017; Singh et al., 2016). Through technological acquisition, two collaboration networks of inventors that existed

separately within two organizational boundaries (i.e., acquirer or target) come to exist within the same organizational boundary. How these two networks evolve has remained unexplored. This research suggests that the two social networks of an acquirer and its target can be connected via collaborations that unite inventors from both sides. The self-differentiation behaviors of acquirer inventors regarding learning the target's knowledge, establishing the acquirer inventor's unique social capital in the target's community, and developing the acquirer inventor's capability of hybridizing the knowledge of the two parties after the acquisition are driving forces that allow individuals to connect these two social networks. From the perspective of individual-level social network studies, this research shows how inventors can establish their network positions by participating in postacquisition joint inventions.

This paper contributes to the literature on niche and crowding in the field of organizational ecology. Previous studies have addressed the niche and crowding perspectives within a single boundary, such as within the limits of one organization (Liu et al., 2016), one market (Podolny et al., 1996; Stuart, 1998), or one region (Baum & Mezias, 1992; Baum & Singh, 1994). This research reveals how competitive crowding within a target and a home organization influences the behaviors of the home organization's actors after the boundary between the two organizations has collapsed. Competitive crowding with a target organization imposes two types of pressure: competitive and cooperative pressure. At least in the short term, competitive crowding acts as a substitute and cooperative pressure in a boundary-collapsing context. On the other hand, competitive crowding increases the substitute pressure. This study also contributes to the niche and crowding literature by expanding the scope of these perspectives to individual-level studies. The niche and crowding perspectives have been popular topics in organization- and

interorganization-level studies that explain organizations' behaviors and survival in competitive contexts. Although Liu et al. (2016) attempted to apply the niche and crowding perspectives to intraorganizational research, applications of these theoretical foundations to individual-level studies have been limited. By focusing on the behaviors of inventors in the acquisition context, this research has shown that an actor's niche can change as a consequence of boundary collapse between different entities. This study applies the niche and crowding arguments to the knowledge synthesis mechanisms found in the technological acquisition literature.

This research has managerial implications. Managers should select targets that can generate behavioral pressure on acquirer employees and make them contribute to value creation after an acquisition. Organization-level factors such as cultural fit, resource and capability complementarity, and postacquisition integration are essential in M&A processes. However, based on previous research findings, I argue that managers should consider competitive crowding among target inventors in their knowledge niches when they evaluate their targets. Managers should also consider the internal organizational environments, determine who will respond to increased competitive crowding from the corresponding target's inventors, and ascertain whether their actions align with their M&A purposes.

Limitations and Future Study

Despite its theoretical and managerial implications, this research also has limitations that pave the way for future research. First, this research focuses on acquirers. I investigate the participation of acquirer inventors in postacquisition joint inventions. In an acquisition context, both acquirer and target inventors may have different stances and incentives in relation to

postacquisition joint inventions. Table 7 (Target Inv) presents empirical results that are similar to those shown in Table 3 (Acquirer Inv), where I apply the same logic to target inventors. However, who participates (and under what conditions) in postacquisition joint inventions must be determined from a target inventor's perspective.

Another concern regards whether acquirer inventors collaborate with target inventors with whom they share a knowledge niche. This research has focused on the behavioral motivation of acquirer inventors (i.e., one side's motivation), which can be considered a necessary condition for postacquisition joint inventions that require inventors on both sides. Future research must address the partner selection mechanism among the inventors of the two parties. Second, this paper assumes that postacquisition joint inventions are homogenous in terms of risk and invention purpose. We also do not know whether such collaborations are contingent on other factors, such as the seeking of explorative inventions. Some postacquisition joint inventions that are explorative are riskier than others. Future research can consider the nature of individual postacquisition joint inventions and inventors' behaviors toward them. These questions are worth addressing in subsequent studies.

In addition, some generalization issues stem from the boundary conditions of this study. I conduct this research by focusing on inventors included in patent data rather than on employees in general. As knowledge workers, inventors play a crucial role in an organization's innovation activities. However, they cannot represent all employees. Although this paper has implications for the microlevel mechanism underlying knowledge synthesis among inventors, it provides a limited understanding of how employees interact. Subsequent studies are necessary to address

these issues. This research sets the boundary condition for technological acquisitions among public companies. We still have limited understanding of inventors' innovation behaviors in acquisitions between public and private companies and in those between private companies. Future studies must investigate the behaviors of inventors in different acquisition contexts. Finally, this research considers inventors' behaviors only immediately after the acquisition. We still have a limited understanding of inventors' innovation activities over time. By investigating inventors' participation in postacquisition joint inventions, we can better understand the evolution of the two social networks over time and identify their different evolutionary paths.

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BRIDGING TEXT: FROM ACQUIRER INVENTORS TO TARGET INVENTORS

In Chapter 2, I investigate the acquirer inventors' participation behaviors in postacquisition joint inventions. From the niche perspective, the increasing competitive crowding in the acquirer inventors' knowledge niche is a driving force for them to participate in postacquisition joint inventions. However, depending on their status within their home organizations, the sensitivity to such increased competitive crowding varies.

In the previous bridging text, I explain why I use different theoretical foundations to investigate the behaviors of both acquirer and target inventors. The asymmetric relationship between an acquirer and its target in the acquisition context leads the inventors on both sides of the acquisition to have different stances, attitudes, concerns, and emotions (Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999; Ranft & Lord, 2000). Compared to the acquirer inventors, the target inventors are more likely to feel job security threats and career anxiety (Hambrick & Cannella, 1993; Ranft & Lord, 2000). However, such a decision was based on the argument in the literature and my conversations with the interviewees. There was no empirical evidence showing whether the same mechanism works for both acquirer and target inventors.

Insert Table 7 about Here

For a better understanding, I test hypotheses regarding the target inventors applying the same theoretical foundation (i.e., niche and status) and method that I use for the acquirer inventors. I construct the sample of the target inventors. The results are presented in Table 7. The results of the first-stage probit model are shown in Model 1. Known survivors are included in the second-

stage analysis (i.e., negative binomial regression model). The results of the second-stage analysis are shown in Model 2, 3, and 4 in Table 7. The results show that my main argument regarding the behaviors of the focal acquirer's inventors can be applied to those of the corresponding target's inventors. Increased competitive crowding from acquirer inventors in the same niche of knowledge influences the participation behaviors of the target inventors in postacquisition joint inventions. However, the moderating effect of high status with respect to the target inventors is not significant. The fundamental mechanism (competitive crowding) seems to be the same for the inventors of both the acquirer and the target. However, we cannot argue that the exact same mechanism works for the inventors of both acquirers and targets in a postacquisition period.

In Chapter 3, I investigate the target inventors' behaviors of participating in postacquisition joint inventions from the job security threat perspective.

CHAPTER 3

Target Inventor Side: The Perspective of Job Security Threats

Job Security Threats and Target Inventors' Innovation Activities with Acquirer Inventors in the Postacquisition Phase

Abstract

The technological acquisition literature emphasizes the importance of retaining a target's human capital, particularly key employees, to leverage the target's innovation capability. However, few studies examine the actual behaviors of retained human capital in the postacquisition period. Focusing on the engagement of a target's retained inventors in innovation activities with the inventors of its acquirer, I investigate the factors that drive retained inventors to synthesize their knowledge with acquirer knowledge in the postacquisition period. From the perspective of job security threats, I hypothesize that a target's retained inventors are more likely to synthesize their knowledge with acquirer knowledge when labor market conditions are less favorable for inventors, when the innovation performance of the acquirer is better than that of the target, and when the standing of the target's retained inventors is inferior to that of the acquirer's inventors. While not all target inventors experience job security threats in the acquisition context, retained inventors who perceive a greater threat to their job security under such conditions are more likely to seek opportunities to establish their unique value as human capital and to maintain employment in their current organizations (i.e., acquirer and target) than those who perceive a weaker threat. I test my hypotheses using 4,722 retained inventors of targets of technological acquisitions in U.S. high-technology industries between 2001 and 2015. With empirical evidence, this research contributes to the technological acquisition and human capital literature by revealing the knowledge synthesis process between an acquirer and its target and by emphasizing the value of a target's relatively low performers in the postacquisition period.

Keywords*: M&A, Technological acquisition, Innovation, Organization inventors, Job security threat, Relative standing*

INTRODUCTION

One concern in the technological acquisition literature is how acquirers can best use the target's knowledge and innovation capabilities in the postacquisition period (Argote & Ingram, 2000; Haspeslagh & Jemison, 1991; Puranam & Srikanth, 2007; Sears & Hoetker, 2014). Previous studies have emphasized the retention of human capital, particularly key inventors, to leverage the target's knowledge (Barney, 1991; Coff, 2002; Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999; Wulf & Singh, 2011). Even though an acquirer obtains proprietary rights over its target's intellectual property, the inventors of its target are considered the main repository of knowledge (Buono & Bowditch, 2003; Nonaka, 1994; Singh & Agrawal, 2011). However, unlike physical and financial capital, inventors as human capital can quit their jobs and leave their organizations (Chao, Kaetzler, Lalani, & Lynch, 2020; Younge, Tong, & Fleming, 2015). Such an outflow of the target's inventors can result in acquirers taking over an empty shell (Coff, 2002; Larsson & Finkelstein, 1999; Younge et al., 2015).

The emphasis on retaining the target's inventors, particularly key inventors, raises at least two questions: whether the retained inventors actually help acquirers learn and use the target's knowledge and whether the retained key inventors are more crucial for acquirers than nonkey inventors. This paper argues that the participation of the target's retained inventors in the knowledge synthesis process between an acquirer and its target matters; it is not the mere retention of these retained inventors. Despite the importance of such participation, little research has investigated the factors that drive the target's retained inventors to synthesize their knowledge with the acquirer's knowledge and contribute to the acquirer's innovation activities. I

further insist that nonkey inventors can be more helpful to the acquirer than key inventors in the acquisition context because key inventors can find alternatives outside their organizations at any time.

For this study, I investigate the participation of the target's retained inventors in the knowledge synthesis process between an acquirer and its target in the postacquisition phase. As one process, I suggest postacquisition joint inventions, which refer to a collective work in which the inventors of the acquirer and target come together to synthesize their knowledge. After the technological acquisition deal is closed, acquirers carry out postacquisition joint inventions as a form of knowledge synthesis process between inventors of the two parties and a process of hybridizing the knowledge of the two parties (i.e., an acquirer and its target) (Haspeslagh & Jemison, 1991; Puranam & Srikanth, 2007). The participation of the target's retained inventors in postacquisition joint inventions implies that those inventors synthesize their knowledge with that of the acquirer inventors and contribute to the acquirer's value creation after the acquisition. In exchange for this contribution, the target's retained inventors learn the acquirer's knowledge, construct their social capital in the acquirer, and develop their capability of hybridizing the acquirer's and target's knowledge.

This research draws from the perspective of job security threat to develop hypotheses concerning the factors that drive the target's retained inventors to participate in postacquisition joint inventions. The threat to job security provides an excellent theoretical foundation. Target inventors perceive job security threats throughout the technological acquisition process (Cartwright & Cooper, 1993; Fugate, Kinicki, & Scheck, 2002; Hırsch, 1987; Larsson &

Finkelstein, 1999). Not all target inventors experience job security threats. Their job security is one of their key concerns, even if the acquirer retains them (Empson, 2001; Seo & Hill, 2005). The increasing within-organization competition among inventors of the acquirer and target makes the target's retained inventors vulnerable to job security threats (Cartwright & Cooper, 1993; Teerikangas, 2012). The target's retained inventors feel different levels of job security threat depending on their relative position and alternative jobs they may have. Different levels of job security threat can influence their behaviors and decisions in the postacquisition period (Marks, Mirvis, & Ashkenas, 2017).

For hypothesis development, this paper considers the sources of job security threat at three different levels: the labor market condition (i.e., high unemployment rate), the relative performance between the acquirer and target (i.e., deal-specific factor), and the standings of the target's retained inventors relative to those of the acquirer's inventors (i.e., individual-level factor). I argue that unfavorable labor market conditions for the target's inventors increase the job security threat and compel the target's retained inventors to participate in postacquisition joint inventions to keep their jobs in their current organizations. This research also argues that the target's retained inventors are more likely to participate in postacquisition joint inventions when the target's innovation performance is lower than that of the acquirer. Under this condition, they are more likely to feel inferior to the acquirer's inventors and attempt to meet the acquirer's criteria for innovation performance. When their innovation performance is lower than that of the acquirer inventors, the target's retained inventors are more likely to engage in self-differentiation to remain in their organization. I predict that the lower the relative standing of each inventor is, the more likely he or she is to participate in postacquisition joint inventions.

The research context comprises acquisition deals in U.S. high-technology industries between 2001 and 2015. I construct my sample of 4,722 inventors of targets from 188 acquisition deals. Because the purpose of this study is to examine the participation of the target's inventors in postacquisition joint inventions, I only include technological purpose acquisitions, excluding nontechnological purpose acquisitions, such as those for a financial purpose. The results of the empirical analysis support all my arguments.

This study contributes to the technological acquisition literature. I argue that merely retaining the target's inventors does not necessarily mean that the acquirer can synthesize the target's knowledge for its innovation activities. I reveal the mechanism of how different sources of job security threat drive the target's inventors to synthesize their knowledge with the acquirer's knowledge in the postacquisition phase. Another contribution is provided to the human capital literature. Previous studies have focused on the negative aspects of job security threats (Cartwright & Cooper, 1993; Freeman & Cameron, 1993; Matteson & Ivancevich, 1990). Managing or reducing the anxiety related to job security has been one of their primary concerns (Ivancevich, Schweiger, & Power, 1987; Scheck & Kinicki, 2000; Teerikangas, 2012). This study argues that the job security threat that employees feel can be helpful to an organization, at least in the technological acquisition context. I make another contribution to the literature on key employees. During the technological acquisition process, one of the key concerns is how to manage the target's human capital. Managers attempt to identify the key employees to retain and the nonkey employees to discharge after technological acquisition. This study argues that low performers can be helpful for acquirers to synthesize their knowledge with the target's

knowledge. Last, I present a managerial implication. Managers should hold job security threats over the target's retained inventors' heads to make these inventors, particularly relatively low performers, contribute to the knowledge synthesis process between an acquirer and its target.

THEORY AND HYPOTHESES

Technological Acquisition & Human Capital

Technological acquisition refers to one organization purchasing another organization to obtain knowledge and innovation capabilities to improve its innovation performance (Ahuja & Katila, 2001; Sears & Hoetker, 2014). How acquirers can use their target's knowledge after an acquisition deal has been a crucial concern in the technological acquisition literature (Argote & Ingram, 2000; Capron, 1999; Haspeslagh & Jemison, 1991; Puranam, Singh, & Chaudhuri, 2009; Puranam & Srikanth, 2007). Previous studies have emphasized the importance of a target's human capital for an acquirer to learn and use a target's knowledge and innovation capabilities (Barney, 1991; Barney, 1986; Coff, 2002; Ellis, Reus, Lamont, & Ranft, 2011; Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999; Wulf & Singh, 2011). Obtaining proprietary rights over a target's intellectual property (i.e., patents) and knowledge pools is one purpose of a technological acquisition (Haspeslagh & Jemison, 1991). However, human capital, as a repository of an organization's knowledge, plays a significant role in innovation processes after a technological acquisition deal (Buono & Bowditch, 2003; Chao et al., 2020; Nonaka, 1994; Ranft & Lord, 2000; Singh & Agrawal, 2011). A target's human capital is required for an acquirer to use the knowledge obtained from the target and create new knowledge based on the

obtained knowledge (Coff, 2002; Larsson & Finkelstein, 1999; Park, Howard, & Gomulya, 2018; Ranft & Lord, 2000; Singh & Agrawal, 2011).

Despite its importance, a target's human capital also creates uncertainty for acquirers in the technological acquisition process. Human capital has a unique property that distinguishes it from physical and financial capital. Employees are free to leave their organizations (i.e., targets) at any time during the technological acquisition process, from the acquisition announcement stage to the postdeal stage (Buchholtz, Ribbens, & Houle, 2003; Walsh, 1988; Younge et al., 2015). Because new knowledge is created through the innovation process of combining and recombining the existing knowledge residing in human capital (Fleming, 2001; Grant, 1996; Nonaka, 1994), acquirers should depend on a target's employees to learn and use the target's knowledge. Retaining a target's human capital has been considered a crucial source of uncertainty for successful technological acquisitions (Coff, 1999, 2002; Graebner, 2004; Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999; Younge et al., 2015).

To manage such uncertainty, acquirers employ different tactics at different stages of the technological acquisition process. In the process of selecting potential targets, acquirers consider the risk of turnover among a target's employees from different aspects, such as noncompete agreements (Younge et al., 2015), organizational ideology fit (Chow, Louca, Petrou, & Procopiou, In-process), and organizational identification (Steigenberger & Mirc, 2020). Considering these factors, acquirers select potential targets whose employees are less likely than others to leave their organizations after the technological acquisition deal. By doing so, acquirers attempt to reduce the risk of taking over an empty shell. Other studies have focused on how

acquirers actively retain the human capital of their targets during the technological acquisition process (Buono & Bowditch, 2003; Coff & Kryscynski, 2011; Coff, 1999). Acquirers set technological acquisition plans to retain the target's employees (Cording, Christmann, & King, 2008; Zollo & Singh, 2004) by granting autonomy to the target (Ashkenas, DeMonaco, & Francis, 1998; Pablo, 1994), setting incentive schemes in the forms of salaries and promotions (Coff & Kryscynski, 2011), and explaining the future by holding preview sessions for the target's employees (Schweiger & Denisi, 1991; Shrivastava, 1986).

Although these studies provide acquirers with various solutions and tactics to retain a target's human capital, hardly any study has attempted to extend the research scope to investigate the actual behaviors of the retained human capital. One underlying assumption in previous studies is that retaining the target's human capital implies learning and utilizing it for the acquirer's innovation activities. However, retaining the target's human capital does not necessarily mean that retained employees will contribute to the acquirer's innovation activities. In the postacquisition period, not all target employees will have the same incentive to share their knowledge with acquirers or become involved in innovation activities led by acquirers (Aalbers, Dolfsma, & Koppius, 2013). Acquirers can use the target's knowledge for their innovation activities only when they can learn it from the target's employees (Singh & Agrawal, 2011). Without the knowledge sharing of the target's inventors, acquirers cannot utilize the target's knowledge for their own innovation activities.

Another stream of literature has focused on which employees to retain among a target's human capital and has emphasized the retention of a target's key employees, such as executives (Ellis et

al., 2011; Graebner, 2004; Hambrick & Cannella, 1993; Ranft & Lord, 2000; Wulf & Singh, 2011; Zollo & Singh, 2004), high performers, and key inventors (Ernst & Vitt, 2000; Jemison & Sitkin, 1986; Park et al., 2018; Ranft & Lord, 2000; Younge et al., 2015). These key employees lead the target's innovation activities until the day of the technological acquisition; thus, they are the target's knowledge core and have better access to the target's overall knowledge communities (Chao et al., 2020; Hambrick & Cannella, 1993; Paruchuri, Nerkar, & Hambrick, 2006; Wulf & Singh, 2011). From the acquirer's view, these key employees seem to be the most important ones to retain for the acquirer's future innovation.

However, this research argues that the most valuable and attractive human capital is not always helpful for acquirers. Although key employees possess attractive aspects to retain, they also have more power than other employees when resisting contributing to the acquirer's innovation activities in the postacquisition period, based on their superior innovation capabilities and attractiveness in the labor market (Carnabuci & Operti, 2013; Criscuolo, Salter, & Ter Wal, 2014; Larsson & Finkelstein, 1999). Despite the importance of the actual behaviors of retained human capital, the mechanism driving a target's retained human capital to share their knowledge with acquirers and become involved in innovation activities with acquirers has been underexplored.

For this research, I investigate the participation of a target's retained inventors in the knowledge synthesis process between an acquirer and its target. As a synthesis process, I suggest postacquisition joint invention, which is a collective work in which the inventors of both an acquirer and a target synthesize their knowledge after a technological acquisition deal. Because a

target's inventors possess the target's technological knowledge (Singh & Agrawal, 2011), this research focuses on the behaviors of target inventors, who represent essential human capital in the technological acquisition context. In postacquisition joint inventions, acquirers can learn a target's knowledge from the target's inventors and use it for their own innovation activities. By participating in postacquisition joint inventions, the target's inventors can synthesize their knowledge with the acquirer's knowledge, learn the acquirer's knowledge, and develop their capabilities of hybridizing the acquirer's and the target's knowledge. On the other hand, this participation in postacquisition joint inventions also requires inventors' time and effort. This paper argues that retained inventors' perception of job security threat influences their participation behaviors in postacquisition joint inventions.

Perceived Threat to Job Security

From the moment when a technological acquisition between an acquirer and a target is announced, many of the target's inventors start to feel a considerable level of anxiety and uncertainty about their future (Fugate et al., 2002; Haspeslagh & Jemison, 1991; Hırsch, 1987; Larsson & Finkelstein, 1999). One key concern is related to their job security because their jobs are not guaranteed in the acquisition context (Cartwright & Cooper, 1993; Fugate et al., 2002; Larsson & Finkelstein, 1999; Seo & Hill, 2005). In the process of technological acquisition, a downsizing process (such as layoffs and job cuts) is expected (Haspeslagh & Jemison, 1991). Previous studies have shown that approximately 10~30 percent of a target's workforce is reduced in a postacquisition period (Fugate et al., 2002; Marks et al., 2017). Even if acquirers retain inventors, not all retained inventors can avoid unfavorable situations over many years (Buchholtz et al., 2003; Krug & Hegarty, 1997; Walsh, 1988; Younge et al., 2015). Although not

all target inventors perceive the same level of job security threats, job security is the target inventors' key concern.

In the postacquisition period, the primary source of job security threat for the target's retained inventors is the increased competition among the inventors in both the acquirer and the target (Fugate et al., 2002; Larsson & Finkelstein, 1999; Marks et al., 2017; Seo & Hill, 2005; Teerikangas, 2012). Although they cooperate in their performance, inventors compete for attainments such as innovation performance, promotions, and salary (Kilduff, Elfenbein, & Staw, 2010; Liu, Srivastava, & Stuart, 2016; Pfeffer & Cohen, 1984). In some technological acquisitions, the target's inventors are retained by the acquirer. In other cases, they can remain without being subject to a downsizing process. Regardless of how they are retained, the target's retained inventors must compete with both the target's other retained inventors and the acquirer's inventors (Liu et al., 2016; Teerikangas, 2012).

The target's retained inventors may feel that the competition among the inventors of both the acquirer and the target is more challenging for the target's inventors than it is for the acquirer's inventors because the latter occupy leading positions relative to the target's inventors and are familiar with the acquirer's culture and processes (Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999). Paruchuri et al. (2006) show that the productivity of a target's inventors declines after a technological acquisition, particularly when the target is structurally integrated into the acquirer. Even though the target's inventors are retained or remain postacquisition, they still face at least three different actions with respect to the increased competition: performing tasks they had been doing, looking for alternative jobs in other organizations, and actively

seeking opportunities in their current organizations (Marks et al., 2017). This research argues that a target's inventors may take different actions in response to the increased competition and threats to job security based on the situations and positions in which they find themselves.

Labor Market Conditions (Unemployment Rate)

The labor market is where the supply and demand of human capital are exchanged (Makarius & Stevens, 2019; Molloy & Barney, 2015). Employees, including inventors, are the supply side, and organizations are the demand side. When the supply of human capital is greater than its demand (unemployment rate is high), the labor market is competitive for job seekers (i.e., those who wish to move from one organization to another). On the other hand, when demand and supply are reversed, job seekers have more job opportunities in the labor market. The labor market continues to fluctuate with changes in the supply of and demand for human capital (Molloy & Barney, 2015). The literature has shown that changes in the labor market influence employees' behaviors, such as moving from one company to another (Barnett & Miner, 1992; Hausknecht & Trevor, 2011; Makarius & Stevens, 2019; Younge et al., 2015).

The labor market conditions at the time of a technological acquisition may influence the behaviors of target inventors such that they will be more likely to participate in postacquisition joint inventions. In response to increased competition from their disadvantageous position, the target's inventors may attempt to accurately evaluate their alternatives outside their current organization based on information about the labor market (Barnett, Baron, & Stuart, 2000; Baron & Bielby, 1980; Stewman & Konda, 1983). When a target's retained inventors are under favorable labor market conditions for the supply side (i.e., the unemployment rate is low) at the

time of a technological acquisition, they have more alternatives outside their organization than when the conditions are reversed. It is easier for the target's retained inventors to find better jobs for their career development and prospects in other organizations. Alternatives outside their organization are attractive to them (Coff & Kryscynski, 2011) and alleviate the threats to job security caused by increased within-organization competition among the inventors of both the acquirer and the target or by reducing the target's employees as a restructuring process. The target's retained inventors may have less motivation to remain in their current organization because they are more likely to experience performance decline in the postacquisition phase (Paruchuri et al., 2006), which is unfavorable to their career development or survival in their organization.

On the other hand, when the labor market is not favorable to the supply side (i.e., the unemployment rate is high), employees have fewer opportunities outside their current organization. Having fewer alternatives in the labor market drives the target's retained inventors to compete with the inventors in both the acquirer and the target to stay in their current organization (Younge et al., 2015). The target's retained inventors are more likely to feel a more significant job security threat in their current organization, and they are more likely to seek opportunities inside their current organization (Marks et al., 2017). Involvement in postacquisition joint inventions is one opportunity for the target's retained inventors because they can learn the acquirer's knowledge, construct relational capital in the acquirer, and develop their capabilities of hybridizing the knowledge of the two parties. By doing so, they can create unique value for the acquirer. In this sense, this research argues that labor market conditions influence the participation of the target's retained inventors in postacquisition joint inventions.

The fewer job opportunities the target's retained inventors have due to a high unemployment rate in the labor market, the more likely they are to participate in postacquisition joint inventions.

Hypothesis 1: The more unfavorable the labor market is for a target's retained inventors, the more likely they are to participate in postacquisition joint inventions.

Relative Performance between an Acquirer and a Target

From the social comparison perspective, an individual, as a member of a group, compares his or her group to referent groups (Festinger, 1954; Very, Lubatkin, Calori, & Veiga, 1997). Such social comparison influences his or her perceptions and behaviors (Festinger, 1954). This research argues that depending on a target's relative position to an acquirer, the target inventors' perceived job security threat varies (Festinger, 1954; Frank, 1985; Hambrick & Cannella, 1993; Kacperczyk, Beckman, & Moliterno, 2015). There is an imbalance between the innovation performance of an acquirer and a target before a technological acquisition deal is closed (Haspeslagh & Jemison, 1991; Very et al., 1997). The target inventors believe that their acquirers evaluate them as a group (i.e., the target) (Festinger, 1954). An acquirer's managerial control of its target leads the target's retained inventors to recognize that their performance evaluation criteria will be changed to meet the acquirer's standards (Larsson & Finkelstein, 1999; Larsson & Lubatkin, 2001). When the target's innovation performance is higher than that of the acquirer, the target's retained inventors will most likely feel a lower job security threat than when its performance is lower. They will believe that the acquirer perceives them to be a group (i.e., target), while the target inventors will also feel that the acquirer considers their group to hold a superior position relative to that of the acquirer inventors. They will also expect to perform better

than the acquirer's inventors, which lowers the job security threat that the target's inventors experience. In such a case, the target's retained inventors will have less incentive to actively seek opportunities on the acquirer's side by investing time and effort. They are more thus likely to resist participating in postacquisition joint inventions and to maintain their current performance.

In contrast, when an acquirer's innovation performance is higher than that of a target, the target's retained inventors are likely to feel a higher level of competitive pressure and perceive a higher degree of job security threat. In the long run, the innovation performance evaluation will be modified to meet the acquirer's standards, which are higher than the target's innovation performance standards. Retained inventors will be forced to meet these higher performance criteria (Larsson & Finkelstein, 1999). In such a disadvantageous position, the target's retained inventors will be motivated to create value for the acquirer. Participating in postacquisition joint inventions is one way for them to become valuable to the acquirer. Although they must share their knowledge with the acquirer's inventors, they also learn the acquirer's knowledge, develop the capability to hybridize the acquirer's and the target's knowledge, and use this capability to remain in their organization. By doing so, the target's retained inventors can put themselves in an advantageous position when competing among inventors, which will make them more likely to remain in their current organization. This research argues that the threat to their job security due to the relative performance between the acquirer and the target is associated with the participation of the target's retained inventors in postacquisition joint inventions.

Hypothesis 2. The greater the superiority of an acquirer's innovation performance over that of a target in the preacquisition period, the more likely the target's retained inventors are to participate in postacquisition joint inventions.

Relative Standing of Target Inventors

Individuals compare themselves to others within their reference groups (Festinger, 1954; Frank, 1985; Kacperczyk et al., 2015; Oldham, Kulik, Stepina, & Ambrose, 1986; Stark & Hyll, 2011). In the technological acquisition context, acquirers have managerial power over their targets and alter their organizational cultures and evaluation criteria accordingly (Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999; Ranft & Lord, 2002). Usually, a target's retained inventors obtain information on their performance evaluation from an acquirer's perspective during personal meetings with the acquirer's human resources team. Such changes and information about themselves lead the target's retained inventors to change their reference group for their innovation performance from the target's inventors to the acquirer's inventors (Frank, 1985; Hambrick & Cannella, 1993; Haspeslagh & Jemison, 1991; Kacperczyk et al., 2015). With such information and expectations on their innovation performance, the target's retained inventors will respond to the increased level of competition among the inventors in both the acquirer and the target. Depending on their relative standing with the acquirer's inventors, the target's retained inventors will feel different levels of job security threat and will take different actions in response to the increased level of competition among inventors in the postacquisition period (Frank, 1985).

The better innovation performance of a target's retained inventors compared to that of an acquirer's inventors is a source of behavioral confidence for the former (Fugate et al., 2002; Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999; Wulf & Singh, 2011). When the target's retained inventors perceive themselves to be superior to the acquirer's inventors, they know that they are attractive and valuable human capital for the acquirer (Park et al., 2018; Ranft & Lord, 2000). Even in the labor market, they can signal to other organizations that they are competitive human capital rather than losers dismissed in the technological acquisition process (Molloy & Barney, 2015). This advantageous position leads them to express their opinions and resist changes enforced by acquirers (Hambrick & Cannella, 1993; Larsson & Finkelstein, 1999).

Participating in postacquisition joint inventions provides relatively high performers opportunities to learn an acquirer's knowledge, develop their capabilities of hybridizing the acquirer's and the target's knowledge, and create value for the acquirer. Despite these advantages, the disadvantage of participating in postacquisition joint inventions is more prominent for the target's relatively high performers. In most cases, as postacquisition joint inventions are led by the acquirer, the target's high performers will have less initiative to participate (Puranam, Singh, & Zollo, 2006; Puranam & Srikanth, 2007). Rather than synthesizing their knowledge with the acquirer's knowledge, which requires time and effort, it is better for the target's high performers to maintain their current innovation performance. Their position as a perceived better performer (in relation to the acquirer's performance criteria) alleviates their job security threat and makes them less likely to participate in postacquisition joint inventions. They are confident in their positions in the postacquisition phase.

When the target's retained inventors perceive their innovation performance to be lower than that of the acquirer's inventors, they may exhibit an opposite attitude toward participating in postacquisition joint inventions. Together with their disadvantageous position as the target's employees (Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999; Paruchuri et al., 2006), their relatively low innovation performance makes it difficult for them to remain in their current organization. Moreover, in the labor market, their lower performance may send a negative signal to other organizations. The high threat to their job security may drive low performers to participate in postacquisition joint inventions. Even though this participation costs time and effort, they can make themselves valuable to the acquirer by synthesizing their knowledge with the acquirer's inventors, learning the acquirer's knowledge, and developing their capabilities of hybridizing the acquirer's and target's knowledge. By constructing relational capital in the acquirer via collaboration with the acquirer's inventors, they can obtain an advantageous position in the competition among the inventors in both the acquirer and the target. This paper argues that the target's retained inventors are more likely to participate in postacquisition joint inventions when their innovation performance is lower than that of the acquirer's inventors due to the higher level of job security threat.

Hypothesis 3. The lower the standing of a target's retained inventors is relative to that of an acquirer's inventors, the more likely the former are to participate in postacquisition joint inventions.

DATA AND METHOD

Research Context and Sample

The research context comprises technological acquisitions between companies in U.S. high-technology industries during the observation period 2001–2015. I selected this observation period to avoid the bubble period in the late 1990s (Cai & Sevilir, 2012) and to set the period after the American Inventors Protection Act (AIPA) of 1999 (Chondrakis, Serrano, & Ziedonis, 2021). Via the AIPA, the United States Patent and Trademark Office (USPTO) started to disclose patent application records. From 188 targets of 188 acquisitions in this period, I obtained 4,722 retained inventors. I screened the acquisition cases using a few sample criteria. First, using data from the Security Data Company (SDC) Platinum database, I included acquisition cases where an acquirer had more than a 50 percent share of its target. With more than 50 percent of the target's share, an acquirer exercised managerial control over the target by placing it as a subsidiary or integrating it into the acquirer (Bettinazzi, Miller, Amore, & Corbetta, 2020; Capron & Shen, 2007; Chen, Kale, & Hoskisson, 2018). Minor share acquisition was regarded as a share investment or a partnership without complete managerial control over the target. With more than 50 percent of shares owned by an acquirer, the purchase of additional shares was regarded as a buyback or a share repurchase.

Second, I included acquisitions between publicly traded companies in the U.S. Compared to private companies, public companies have more well-established organizational processes, cultures, identities, and even ideologies (Capron & Shen, 2007; Chow et al., In-process; Haspeslagh & Jemison, 1991). The level of resistance of a target's inventors to a technological acquisition may differ depending on whether the target is a public or private company. The job

security threat faced by targets' inventors may differ between private and public companies in high-technology industries because employees in private companies may become aware that their companies will be acquired in the future (Blevins & Ragozzino, 2018; Ozmel, Reuer, & Gulati, 2013). At this stage, 467 acquisition deals remained in the sample.

Third, I selected acquisitions whose purpose is technological innovation (Ahuja & Katila, 2001; Sears & Hoetker, 2014). The goal of this research is to investigate the mechanism driving a target inventors' engagement in projects with an acquirer's inventors. I selected acquisitions in which collaboration among employees is the most crucial for value creation. I obtained news articles about a focal acquisition deal from FACTIVA, LexisNexis, Google search, and 10-K reports from the Electronic Data Gathering, Analysis, and Retrieval Service (EDGAR) database of the U.S. Securities and Exchange Commission (SEC). Acquisition cases with statements or phrases such as "by combining our powerful technologies" and "the combination will be a catalyst in the development of next" are included in the sample. Among them, companies possessing at least one patent application record were included in the sample (Hernandez & Shaver, 2019). Because this research investigates the inventors' innovation activities after the acquisition, I excluded acquisition cases where either the acquirer or its target does not have at least one inventor. Applying these criteria, I retained 276 acquisition deals.

I obtained patent application data from the USPTO, the PatentView database (Toole et al., 2020), and the Coleman Fung Institute of the University of California – Berkeley (Balsmeieri et al., 2018). I matched the company names shown in the SDC Platinum database and assignee names in the patent database by taking into account name changes and company identifiers such as

CUSIP from COMPUSTAT of Wharton Research Data Services (WRDS). I listed the inventors of each company (i.e., acquirer and target) in a focal acquisition deal from the SDC Platinum database, arranged their patents by year of application, and identified their affiliation sequences over time for the previous five years from the acquisition's effective date (Di Lorenzo & Almeida, 2017; Singh & Agrawal, 2011). I regarded inventors whose affiliation clearly belonged to the target at the time of the acquisition as the target's inventors (Singh & Agrawal, 2011; Song, Almeida, & Wu, 2003). I did the same for the matched acquirer in a focal acquisition deal. Among the target's inventors, those who filed at least one patent application during the five-year period after the acquisition's effective date were considered the target's retained inventors. With those criteria applied, the final sample had 4,722 retained inventors of 188 targets from 188 acquisition deals.

Insert Figure 2 about Here

Dependent Variable

Postacquisition Joint Inventions. The unit of analysis is the individual level. I counted a focal inventor's patent application records with a few criteria: 1) patent applications that contained the name of the focal target's inventor, 2) those that also contained the name of at least one of the acquirer's inventors in the matched acquisition deal, and 3) those that were created during the five-year period following the acquisition's effective date (see Figure 2). Patent applications are considered inventions, not successful innovation outcomes (Balachandran & Hernandez, 2018; Paruchuri et al., 2006). Among them, only successful projects receive intellectual property rights from the USPTO (Balachandran & Hernandez, 2018). I set the observation window as five years

following the acquisition's effective date (Carnabuci & Operti, 2013; Corredoira & Rosenkopf, 2010; Fleming, King, & Juda, 2007; Makri, Hitt, & Lane, 2010). On average, it takes three to five years to create one patent and apply to the USPTO (Makri et al., 2010; Paruchuri et al., 2006). Over time, a retained inventor's perceived threat to job security changes (Fugate et al., 2002). The purpose of this study is to observe the responses of retained inventors to increased competition at the time of an acquisition. For these reasons, the five-year window was appropriate (Ahuja & Katila, 2001; Carnabuci & Operti, 2013; Makri et al., 2010; Paruchuri et al., 2006).

Independent Variables

Unemployment rate. I measured labor market conditions using the U.S. unemployment rate in the year of the acquisition to which a focal retained inventor belonged as an inventor in the target. Unemployment rates reflect job opportunities in the labor market (Manning & Petrongolo, 2017; Nakajima, Tamura, & Hanaki, 2010; Simon & Warner, 1992). A high unemployment rate indicates fierce competition for jobs in the labor market (Makarius & Stevens, 2019). On the other hand, when the unemployment rate is lower, job seekers have more job opportunities (Hausknecht & Trevor, 2011; Makarius & Stevens, 2019; Manning & Petrongolo, 2017). Hence, I used the unemployment rate as an indicator of the job security threat perceived by the focal retained inventors of targets.

Relative innovation performance (Firm level). I calculated the relative innovation performance between the acquirer and its target by subtracting the target's innovation performance from that of the acquirer. In detail, I counted the number of patent applications that 1) were filed during the

five-year period preceding the acquisition's effective date and 2) were under the name of the target to which a focal retained inventor belongs as the target's inventor. In the same way, I counted the number of patent applications of an acquirer with which a focal inventor's company is matched as the acquisition partner. I subtracted the number of the target's patent applications from that of the acquirer's patent applications. Then, I divided the obtained number by one thousand.

Relative standing (Inventor level). I measured the relative innovation performance of a focal retained inventor (target's inventor), which was obtained from the acquirer inventors' innovation performance distribution. I extracted the innovation performance of the acquirer's inventors for the five years preceding the effective date of the acquisition to which the retained target inventor belonged. I obtained the average and standard deviation of their innovation performance. I calculated the location value of the focal retained inventor's innovation performance in the distribution formulated with the average and standard deviation. The formula was as follows:

$$Relative\ Innovation\ Performance_i = \frac{(Innovation\ Performance_i - Average\ of\ the\ Acquirer's\ Innovation\ Performance_i}{Standard\ Deviation\ of\ the\ Acquirer's\ Innovation\ Performance_i}$$

Control Variables

This research is an individual-level study focusing on the behaviors of targets' retained inventors in the postacquisition period. Although inventors behave at their own will as agents (Guler & Nerkar, 2012; Liu et al., 2016), they are constrained by their organizations and acquisitions. To control for influences at different levels, I included inventor-level, organization-level, and acquisition-level variables in the analysis.

Control Variables (Inventor Level)

Previous innovation performance (logged). I controlled for the performance effect of a target's retained inventors. I counted the number of patent applications containing the name of a target's focal retained inventor created for the five years preceding an acquisition's effective date. Because the distribution of the counts is skewed, I took the log of each value.

Tenure (logged). I estimated the tenure of a target's retained inventors in their organization (i.e., the target). I extracted all patent applications containing the name of a focal retained inventor and identified the first application date of his or her first patent application record under the target's name. The date from the time of the focal acquisition to the date of his or her first patent application date was calculated in years. Suppose that the focal inventor moved from another company to the target. In that case, I took the midpoint between the first patent application date in the target and the last patent application date in his or her previous company (Almeida, Dokko, & Rosenkopf, 2003; Dokko & Rosenkopf, 2010; Singh & Agrawal, 2011).

Knowledge familiarity (to the acquirer/to the target). Each retained investor is familiar with the knowledge of his or her current organization (target) or acquisition partner organization (acquirer). To control for the influence of such knowledge familiarity on the behaviors of targets' retained inventors, I included knowledge familiarity variables. First, I counted the number of the acquirer's patents that the focal retained inventor cited for the five years preceding the acquisition's effective date. Second, I counted the number of patents that the focal retained inventor cited for the same period. Finally, I measured the knowledge familiarity of the acquirer by calculating the ratio of the acquirer's number of patent citations to the total number of patent

citations. Similarly, I obtained the knowledge familiarity of the target by replacing the number of the acquirer's cited patents with that of the target.

Knowledge scope (logged). I measured the knowledge scope of a focal inventor by counting the unique number of main classes on the patent application records containing the focal inventor's name. As with other variables, only patent applications of the focal inventor over the past five years from the acquisition's effective date were considered.

Unique collaborators. I measure this variable by counting the number of target inventors the focal target inventor collaborate with for the past five years from the acquisition's effective date.

Ratio of unique collaborators. The extent to which a focal inventor can form a new relationship with unfamiliar inventors may influence his or her behaviors in terms of collaborating with the acquirer's inventors. I measured this variable by calculating the ratio of the unique number of collaborators for the five years preceding the acquisition's effective date to the total number of collaborators for the same period. The value was between zero and one.

Control Variables: Organization and Acquisition Levels

Geographical distance. The geographical distance between an acquirer and its target is associated with communication and collaborations among inventors in different locations (Chakrabarti & Mitchell, 2013). Based on the headquarters addresses of the acquirer and the target, I obtained their longitudes and latitudes and calculated the distance between them in

kilometers by using the WGS84 ellipsoid standard (the radius is 6,378,137 meters, and the flattening is 1/298.257223563). I converted the value into the log format due to the skewness.

Technological distance. I measured the technological distance between the acquirer and the target by using the cosine value of the inner product method. For the calculation, I extracted the recent five years of patent applications of the target to which the focal retained inventor belongs and those of the acquirer. I obtained all main class information of the extracted patents. I constructed the vector space of the acquirer's main classes and that of the target's main classes. Finally, I calculated the cosine value of the two vector spaces. The value was between zero and one. The formula is below:

$$\text{Technological distance} = 1 - \cos\theta = 1 - \frac{\vec{A} \cdot \vec{T}}{|\vec{A}| \cdot |\overrightarrow{T}|}$$

$$\vec{A}: Acquirer's\ vector\ space\ of\ patent\ main\ classes$$

$$\vec{T}: Target's\ vector\ space\ of patent\ main\ classes$$

Industrial distance. The industrial distance between the acquirer and the target was measured by using SIC codes. I calculated this value by adding the value of one for each difference from the fourth digit to zero. If everything matches from the fourth to the first digit of the SIC codes, the value was zero. If all four digits were different, the value was four.

Preacquisition alliance. I controlled for the previous relationship between the acquirer and the target in the form of a strategic alliance. A previous strategic alliance may influence collaborations between inventors of the acquirer and the target in the postacquisition period because they already know each other (Martin & Shalev, 2017; Porrini, 2004). As a binary variable, I coded it as zero if the focal acquirer and the target had no strategic alliance experience

in the five years preceding the acquisition's effective date. If a strategic alliance experience existed, I coded it as one. Because the interorganizational relationship depreciates, I considered strategic alliance experience for the five years preceding the acquisition's effective date (Yang, Lin, & Peng, 2011).

Acquisition experience (Acquirer). An acquirer's capability to coordinate the acquirer and a target after an acquisition deal is associated with value creation because organizations learn from their experiences (Argote & Miron-Spektor, 2011; Levitt & March, 1988). I counted the acquirer's number of acquisition experiences in high-technology industries for its entire history (Puranam et al., 2006; Puranam & Srikanth, 2007). From the SDC Platinum database, I considered only the number of deals in which the focal acquirer obtains more than 50 percent of its target for the first time.

Acquisition attitude (Hostile). The acquisition attitude of an acquirer is highly associated with the perceived threat of a target's inventors (Larsson & Finkelstein, 1999; Ranft & Lord, 2000). From the SDC Platinum database, I obtained the attitude of the focal acquisition. If the acquisition was hostile, I coded it as one and zero otherwise.

Structural integration. The postacquisition integration process is related to an acquirer's leverage of its target (Puranam & Srikanth, 2007; Schweizer, 2005) and influences the anxiety of the target's inventors (Ellis et al., 2011; Pablo, 1994). I coded this variable as a binary variable, giving it a value of one if the target was structurally integrated and zero otherwise.

Relative size of knowledge base. The knowledge base of an organization is related to the absorptive capacity of the focal organization (Cohen & Levinthal, 1990). The relative size of the knowledge bases of an acquirer and its target is also associated with innovation activities in the postacquisition phase (Ahuja & Katila, 2001). To control for this effect, I counted the number of patents that the focal acquirer and the corresponding targets filed for in the previous five years from the acquisition date. I calculated the ratio of the size of the knowledge base between an acquirer and its corresponding target (the knowledge base size of an acquirer over that of its target).

Analytical Approach

I employed a negative binomial model for the analysis. The dependent variable is measured as the number of patent applications in which the focal retained inventor participated with the acquirer's inventors. This dependent variable is a countable and nonnegative integer. The participation of the target's inventors in postacquisition joint inventions is the number of occurrences within a certain period (five years following the acquisition's effective date). The Poisson regression model was one potential model for this countable dependent variable. However, maximum likelihood theory assumes an asymptotical normal distribution with the same mean and variance values (Cameron & Trivedi, 2013; Greene, 2011). The mean of the dependent variable was not equal to its variance, which violates the prerequisite condition for the Poisson regression model (Cameron & Trivedi, 2005, 2013). This overdispersion of the dependent variable estimates standard errors of coefficients that were too small, resulting in small p values with higher significance levels than the actual values. One rule of thumb for

testing overdispersion is the Cameron Trivedi (CT) test (Cameron & Trivedi, 1990). If the dependent variable's variance is twice its mean or more, the dependent variable is overdispersed. The negative binomial regression model, which is extended from the Poisson model, was appropriate for addressing this overdispersed dependent variable (Cameron & Trivedi, 2013; Greene, 2007; Greene, 2011).

The sample of this research consists of targets' retained inventors. This may cause a sample selection bias issue (Heckman, 1979). Retained inventors of a target are distinguished from inventors who voluntarily or involuntarily left the target during the acquisition process. Thus, the sample (consisting of only retained inventors) was not randomly selected. To address this sample selection issue, I used a two-stage regression model. In the first stage, I estimated a probit regression model. The dependent variable of the first-stage model was the binary variable indicating whether a focal inventor remains postacquisition. If the focal inventor was shown in the patent application records under the acquirer or target in the postacquisition period, I coded it as one. If not, I coded it as zero. I included the gender of each inventor as an instrumental variable for the analysis (Agarwal, Ganco, & Ziedonis, 2009; Raffiee, 2017). Compared with male employees, female employees are more likely to move from one company to another (Campbell, Ganco, Franco, & Agarwal, 2012; Kim & Marschke, 2005; Light & Ureta, 1992). On the other hand, there may be no unobservable heterogeneity across genders in terms of collaboration with other inventors or participation in innovation projects with innovation capability-related variables such as knowledge scope, the knowledge familiarity of the acquirer and the target, and previous innovation performance before the acquisition. I calculated the

inverse Mills ratio from the first-stage regression and included it in the second-stage model (i.e., negative binomial regression model).

RESULTS

Insert Table 8 about Here

Main Analysis

Table 8 presents the descriptive statistics and correlations among the variables. In Table 8, most correlations between the variables were low. However, some pairs of variables showed a relatively high correlation of over 0.5. The independent variable of the relative innovation performance between the acquirer and the target seemed to be correlated with the acquirer's acquisition experience ($\rho = 0.74$) and structural integration ($\rho = 0.51$). Between control variables, the knowledge scope of an inventor and his or her previous performance seemed to be correlated ($\rho = 0.58$). These variables were conceptually different measures. These values of correlations may be high enough to create a collinearity issue in the analysis. I conducted a variance inflation factor (VIF) test to determine whether the variables in the analysis models had collinearity.

Insert Table 9 about Here

The results of the VIF test are presented in Table 9. Most variables in Table 9 showed low VIF values. Their values were below 2.5, which was the conservative criterion for multicollinearity (Johnston, Jones, & Manley, 2018). The independent variable of relative innovation performance between the acquirer and the target before the acquisition had a value of 3.33. This value was

slightly higher than the conservative value of 2.5. However, this value was far below 10, which was regarded as the rule of thumb for collinearity (Vittinghoff, Glidden, Shiboski, & McCulloch, 2012). It was also less than 5, which was another conservative criterion for collinearity (Menard, 2002). The mean value of the VIF test was 1.65, which was far below any criterion for collinearity (5.0 or 10.0). Hence, I concluded that there was no multicollinearity issue in my analysis.

Insert Table 10 about Here

The results of the first-stage probit regression model are presented in Model 1 of Table 10. I used the cluster standard errors with the target inventors. The dependent variable for the first-stage analysis was whether the target inventors remained in either the acquirer (if the target was integrated into the acquirer) or the target (if the target was not integrated into the acquirer) in the postacquisition period. If the target inventors remained postacquisition, the dependent variable was coded as one. If not, it was coded as zero. In the first-stage model, I used the gender of the target inventors as an instrument variable. Based on the first-stage regression results, I calculated the inverse Mills ratio and included it in the second-stage model.

Models 2, 3, and 4 of Table 10 represent the results of the main analysis (the second-stage analysis with known survivals or remaining inventors). I used the cluster standard errors with the target's inventors in all three models. In Model 2, I included only the control variables and the inverse Mills ratio obtained from the first-stage analysis in the negative binomial model with year and industry fixed effects. In Model 2, I tested my first hypothesis regarding the effect of labor market condition (i.e., unemployment rate) on the participation of the target's retained inventors in postacquisition joint inventions. The coefficient was positive ($\beta = 3.601$) and

slightly significant ($p < 0.10$). However, in the full model (Model 6), the coefficient was positive and significant ($\beta = 4.289$, $p < 0.05$). Thus, the first hypothesis was partially supported.

The second hypothesis was tested in Model 3. The relative performance between the acquirer and the target significantly influenced the participation of the target's retained inventors in postacquisition joint inventions ($\beta = 0.153$, $p < 0.001$). In the full model (Model 6), the impact was still positive and significant ($\beta = 0.153$, $p < 0.001$). When the acquirer's innovation performance was superior to the target's innovation performance, the target's retained inventors were more likely to participate in postacquisition joint inventions. Thus, the second hypothesis was supported.

The third hypothesis is related to the influence of the relative standing of retained inventors from the acquirer's performance criterion on postacquisition joint invention participation. This variable's regression coefficient was negative and significant in both Model 4 ($\beta = -0.004$, $p < 0.05$) and Model 5 ($\beta = -0.004$, $p < 0.01$). Thus, when the innovation performance of the target's retained inventors was superior to the acquirer's innovation performance criterion (i.e., better relative standing), the target's retained inventors were less likely to participate in postacquisition joint inventions.

Supplemental Analyses

To confirm my argument, I employed a few supplemental analyses. First, I conducted the two-stage regression model by using the negative binomial regression for target inventors with various standard error clustering options (clustered at target inventor, target, and robust). In each

model of Table 11, I coherently used the same standard error options at both the first and second stages. As shown in Table 11, the analysis results provided the same conclusion as the one I drew from Table 10.

Insert Table 11 about Here

Second, I employed the alternative measure for relative standing for hypothesis 3. In addition to relative performance from the acquirer's standard, the performance loss of the target inventors can indicate their relative position in the postacquisition phase. Following Paruchuri et al. (2006), I calculated the target inventors' performance loss by subtracting their performance percentiles only among the target inventors from their performance percentiles among all inventors of the two parties. For example, one target inventor created ten patents for the previous five years, and his performance was in the top ten percent among all target inventors. However, his performance percentile with ten patents among all target and acquirer inventors was in the top twenty-five percent. In this case, the performance loss was calculated by subtracting ten from twenty-five. A greater value of performance loss means a lower relative standing after the acquisition (i.e., the inventor faces a higher level of job security threat). In Model 6 of Table 10, the coefficient of the relative standing variable was positive and weakly significant ($\beta = 0.004$, $p < 0.10$). The greater value of the relative performance measure in Model 6 indicated a better relative standing in the postacquisition phase. On the other hand, the greater value of the performance loss measure in Model 1 of Table 12 implied a lowered position in the postacquisition phase. Thus, hypothesis 3 was consistently supported by different measures of relative standing.

Insert Table 12 about Here

DISCUSSION AND CONCLUSION

The purpose of a technological acquisition is not simply to obtain proprietary rights over a target's intellectual properties (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991; Larsson & Finkelstein, 1999; Makri et al., 2010). What is more important is learning and utilizing the knowledge obtained from the target (Coff, 2002; Larsson & Finkelstein, 1999; Makri et al., 2010). Because knowledge resides in employees (Nonaka, 1994; Singh & Agrawal, 2011), the target's inventors, as human capital, have received a great deal of attention in the literature on technological acquisitions. One primary concern of this literature is how to retain the target's human capital, particularly its key employees (Buono & Bowditch, 2003; Coff & Kryscynski, 2011; Coff, 2002; Cording et al., 2008; Hambrick & Cannella, 1993). However, previous studies have limitations in at least two aspects. First, simply retaining the target's human capital does not guarantee that the retained human capital will contribute to the acquirer's innovation activities in the postacquisition period. Second, even though key human capital is essential and valuable, human capital may not be helpful for acquirers. To address these limitations, the current paper focuses on retained inventors' behaviors and determines how they contribute to acquirers by creating value after a technological acquisition.

From the perspective of job security threat, this research investigates the factors that drive the target's retained inventors to synthesize their knowledge with the acquirer's knowledge and contribute to the acquirer's innovation activities. This paper argues that the threats to job security that the target's retained inventors perceive is a driving force for them to participate in postacquisition joint inventions. When labor market conditions are less favorable for them (i.e., a high unemployment rate), when the relative performance of the acquirer is better than that of the target, and when the standing of the target inventors is lower than that of the acquirer's inventors, the target inventors are more likely to participate in postacquisition joint inventions. Under such conditions, the retained inventors of the target perceive a greater degree of job security threat because they have fewer alternatives outside their current organization and occupy a more

disadvantageous position during competition with other inventors in both the acquirer and the target. By participating in postacquisition joint inventions, they can demonstrate their unique value, as human capital, to their organizations by synthesizing their knowledge with the acquirer's knowledge, constructing the social capital in the acquirer's community, and developing their capability to hybridize the knowledge of the acquirer and the target.

This research contributes to studies on technological acquisition by focusing on the behaviors of targets' retained inventors in the postacquisition period. The literature on technological acquisition has highlighted retaining targets' employees, particularly its key employees such as star scientists and executives (Coff & Kryscynski, 2011; Hambrick & Cannella, 1993; Steigenberger & Mirc, 2020; Younge et al., 2015). Few studies have focused on the actual behaviors of these retained inventors after a technological acquisition deal. Because the knowledge of these two parties is synthesized through interactions among the inventors of the two parties (Fleming, 2001; Nonaka, 1994; Singh & Agrawal, 2011), the actual behaviors of a target's retained inventors are crucial for acquirers to learn and utilize the target's knowledge. I investigate the participation of the target's retained inventors in postacquisition joint inventions. This research reveals that the threat to job security is a driving force for these inventors to participate in postacquisition joint inventions. Thus, in such a situation, they are more likely to synthesize their knowledge with the acquirer's knowledge and contribute to the latter's innovation activities.

This paper also contributes to the human capital literature. Previous studies have emphasized the negative aspects of job security threats (Amabile & Conti, 1999; Cartwright & Cooper, 1993; Freeman & Cameron, 1993; Matteson & Ivancevich, 1990). Particularly in the technological acquisition context, the threats to job security perceived by a target's retained inventors have been considered an important concern that must be alleviated or eliminated (Ivancevich et al., 1987; Nahavandi & Malekzadeh, 1988; Seo & Hill, 2005; Stahl, Larsson, Kremershof, & Sitkin, 2011; Teerikangas, 2012). Contrary to the findings in previous studies, this research reveals that the perceived threats to job security from the labor market, the relative positions of acquirer and target, and the position of each inventor relative to that of the acquirer's inventors can offer benefits to acquirers in terms of learning and utilizing the target's knowledge. Rather than simply

eliminating any threat to job security, acquirers can use the perception of this threat to encourage retained inventors to behave in ways that benefit acquirers.

This study also challenges an underlying assumption in previous studies, i.e., that key employees are beneficial for organizations (Kehoe & Tzabbar, 2015; Molloy & Barney, 2015; Oettl, 2012; Ranft & Lord, 2000; Tzabbar & Kehoe, 2014). Although key employees are crucial for innovation performance, I argue that the importance of these key employees varies depending on conditions and situations, such as the technological acquisition context. If an organization hires an employee or inventor from another organization, his or her innovation performance is a key criterion for him or her being hired (Prato & Ferraro, 2018; Tzabbar & Kehoe, 2014). However, in the technological acquisition context, the target's inventors involuntarily face increased competition among the inventors in both the acquirer and the target due to the technological acquisition. Depending on their perceived threat to job security, the retained inventors of the target take different actions in the postacquisition period. Those whose innovation performance is better than that of the acquirer's inventors (the new comparison group) are more likely to express their opinions and resist the acquirer's changes. Contrary to conventional wisdom, relatively low performers should thus search for opportunities to stay in their organizations in response to any threat to job security.

Last, this research has managerial implications. Managers should note the positive aspect of job security threats. A job security threat has typically been considered an emotion to be eliminated (Seo & Hill, 2005). However, in the acquisition context, such negative emotions among the target's human capital can contribute to value creation after the acquisition. Managers can find a way to exploit the job security threats faced by the target's inventors to create value through technological acquisition. Another managerial implication is that human capital experiencing positional loss after the acquisition can contribute to acquirers. A conventional axiom regarding acquisition is that since not all employees are necessary, high performers are important human capital (Ranft & Lord, 2000). However, I highlight the importance of relatively low performers in the acquisition context. Acquirers may not achieve the expected innovation performance not only because of the complementarity fit between an acquirer and its target but also because of relatively low levels of performer participation in postacquisition joint inventions. Therefore, in

the target selection process, managers need to evaluate the relative standings of the target's human capital.

Limitations and Future Research

I acknowledge a few limitations in this research that can lead the way to future research. The first limitation is the generalizability of the findings. The boundary condition of this research is target inventors in publicly traded companies. An acquisition between publicly traded companies can differ from one between a public company and a private company. Compared to private or startup companies, publicly traded companies have more established work processes and organizational cultures (Capron & Shen, 2007; Graebner, Heimeriks, Huy, & Vaara, 2017; Haspeslagh & Jemison, 1991). Usually, employees in startups prefer a less formal workplace atmosphere. The degree of resistance to an acquisition may vary depending on whether employees belong to public companies, while the behavioral mechanism of the inventors in private companies may also differ. Future research needs to address this limitation.

Another limitation stems from the use of patent data. These patent data reveal the actual collaborations of inventors and their affiliations in patent application documents (Carnabuci & Operti, 2013; Fleming et al., 2007; Sorenson, Rivkin, & Fleming, 2006). However, these data show only the innovation activities that are internally considered successful innovation outcomes, which merits the applications to patent offices for intellectual property rights (Hoisl, 2007). Despite such limitations, this study makes a contribution by revealing who among a target's inventors creates innovation outcomes with an acquirer's inventors. It is thus worth investigating the behaviors of targets' retained employees using information or records other than patent data.

Finally, this research focuses only on the participation of retained inventors in postacquisition joint inventions after a technological acquisition; it does not consider the nature of these joint projects. In the postacquisition period, acquirers initiate different types of joint projects, such as explorative and exploitive projects (March, 1991). Depending on the nature of these projects, the behaviors of retained inventors may vary. Future studies can therefore investigate how the

retained inventors of the target behave differently depending on the nature of postacquisition joint inventions.

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COMPREHENSIVE DISCUSSION

The purpose of this dissertation is to advance research on technological acquisition. Previous studies have investigated the influence of technological acquisition (quantitative or qualitative) on innovation performance by focusing on organizational-level factors, such as organizational fit (Rao, Yu, & Umashankar, 2016; Sarala & Vaara, 2010), knowledge fit (Ahuja & Katila, 2001; Graebner, Heimeriks, Huy, & Vaara, 2017; Gulati & Puranam, 2009), or the innovation and managerial capabilities of an acquirer or its target (Cloodt, Hagedoorn, & Van Kranenburg, 2006; Park, Howard, & Gomulya, 2018). These organizational-level factors influence innovation activities in the postacquisition phase. However, previous studies have been limited in their explanations of how an acquirer can learn, share, and utilize its target's innovation capabilities. Organizational-level factors are good proxies for anticipating the innovation potential between an acquirer and its target. These factors show the likelihood of innovation potential rather than the detailed innovation processes that require interactions between employees.

In this thesis, I attempt to investigate the microfoundation of innovation in the postacquisition phase by focusing on innovation behaviors between the employees of an acquirer and those of its target in the postacquisition phase. Inventors play a crucial role in the innovation process (Singh & Agrawal, 2011). As agents with self-interest and knowledge reservoirs, employees lead, participate in, and resist participating in innovation activities within their organizations (Criscuolo, Salter, & Ter Wal, 2014; Fleming, 2001; Guler & Nerkar, 2012). Investigating who among acquirers' employees participates in postacquisition joint inventions is crucial to understand the mechanism of the innovation process between an acquirer and its target. Despite the importance of this subject, we know little about how such inventor participation behaviors occur in the postacquisition phase.

In Chapter 2, I attempt to reveal this mechanism by focusing on the innovation activities of acquirer inventors, particularly their participation behaviors in relation to postacquisition joint inventions. In the context of technological acquisitions in the high-technology industry in the United States, I investigate the innovation behaviors of acquirer inventors, particularly their

participation in collaborative inventions between an acquirer and its target. I call these innovation inventions postacquisition joint inventions.

From the competitive crowding perspective, I hypothesize that acquirer inventors who face increasing competitive crowding within their knowledge niche due to an inflow of inventors from the corresponding target into the acquirer are more likely to participate in postacquisition joint inventions. By doing so, they can gain access to the target's knowledge, build social capital in the target's knowledge community, and develop the capability of hybridizing the knowledge of the acquirer and its target. Target inventors who share the same knowledge niche have a dual influence encompassing complementarity and substitution. Because these inventors possess the target's knowledge, acquirer inventors can learn the target's knowledge by participating in postacquisition joint inventions. However, they are also competitors or substitutes because they share the same knowledge niche. At least immediately after the technological acquisition deal is closed, the target inventors are a source of self-differentiation for those who face a high level of increased competitive crowding due to the inflow of target inventors into the acquirer. However, the high-status inventors of an acquirer are less likely to participate in postacquisition joint inventions. They are less sensitive to increased competitive crowding from target inventors due to their established, stable positions and cognitive limitations.

I test the same hypotheses with target inventors. As is the case for acquirer inventors, increased competitive crowding from acquirer inventors influences the target's inventors to participate in postacquisition joint inventions. However, the status impact is not supported. This partial support implies that other mechanisms underlie target inventors' behaviors in relation to participating in postacquisition joint inventions.

In Chapter 3, I focus on the innovation activities of target inventors in the postacquisition phase. In the same research context (acquisitions in the high-technology industry of the United States), I develop hypotheses from the job security threat perspective. By investigating target inventors' behaviors related to participating in postacquisition joint inventions, I find that those who have a higher level of position loss due to the focal acquisition are more likely to participate in postacquisition joint inventions to learn the acquirer's knowledge, synthesize their knowledge

with that of their acquirer, build social capital within the acquirer, and develop their capability of hybridizing the knowledge of the two parties (i.e., acquirer and target). Those with greater position loss are more likely to suffer job security threats even if they are retained in the postacquisition phase. In sum, acquirer inventors who are under substitute pressure participate in postacquisition joint inventions. Similarly, target inventors who experience job security threats also participate in postacquisition joint inventions.

This dissertation contributes to the literature on acquisitions (or M&As), social network evolution, competitive crowding, status, and human resource management. First, I contribute to the acquisition literature by revealing the mechanism of human-side integration in the postacquisition phase. As knowledge repositories (Kogut & Zander, 1992; Nonaka, 1994) and sources of innovation capabilities (Ranft & Lord, 2000), inventors play a significant role in innovation activities by collaborating with other inventors, synthesizing their knowledge with others' knowledge and creating inventions (Ranft & Lord, 2000; Seo & Hill, 2005; Singh & Agrawal, 2011). The literature has emphasized the importance of human capital in the knowledge synthesis process (Singh & Agrawal, 2011; Younge, Tong, & Fleming, 2015). In the acquisition context, an acquirer has a limitation in achieving innovation goals only with enlarged knowledge pools and enhanced access to innovation outcomes created before the acquisition (Coff, 2002; Makinen, Haber, & Raymundo, 2012; Younge et al., 2015). Facebook CEO Mark Zuckerberg stated, "We buy companies to get excellent people" (Makinen et al., 2012). With the increasing attention to such 'acqui-hiring' in knowledge-intensive industries, the integration of the human capital of the two parties is receiving greater attention from both practitioners and academics (Makinen et al., 2012).

However, the mechanism of how and under what conditions human capital integration occurs has been underexplored. The discussions of previous studies have continued to focus on the retention of human capital (Hambrick & Cannella, 1993; Younge et al., 2015) without furthering our understanding of what retained human capital actually does. From the human capital integration

perspective, this dissertation also investigates how the inventors of the two parties actually synthesize their knowledge together in the postacquisition phase.

Another contribution to the acquisition literature is focusing on inventors' innovation behaviors to identify the microlevel process of innovation in the postacquisition phase, which involves the knowledge synthesis process between an acquirer and its target. Predicting the innovation impact of technological acquisition is crucial for an acquirer (Haspeslagh & Jemison, 1991; Rao et al., 2016). Although previous studies have provided insight into the innovation impact of technological acquisition, those studies have been limited in their explanation of why a technological acquisition often fails to deliver the expected innovation outcomes despite the careful evaluation of innovation potential during due diligence (Rao et al., 2016; Schweizer, 2005; Sirower, 1997). Those studies have shown only the likelihood of knowledge synthesis in knowledge areas where there is knowledge complementarity between an acquirer and its target; they have not explicitly provided evidence that innovation outcomes are actually created in that knowledge area (Rao et al., 2016). They have also failed to provide answers to why technological acquisition fails to deliver expected innovation outcomes despite innovation potential between the two parties and how innovation outcomes are created between the two parties.

In this study, I argue that high innovation potential between the two parties does not necessarily mean that the inventors of the two parties who possess such knowledge will participate in postacquisition joint inventions. Inventors' interests and concerns (e.g., career development, promotion, and job security) are not always aligned with their organizations' strategic goals

(Simon, 1991). The findings of this dissertation reveal that acquirer inventors who face a higher level of increased competitive crowding in their knowledge niches from target inventors are more likely to participate in postacquisition joint inventions than those who face a lower level of such crowding. High-status inventors are less sensitive to such an increase in competitive crowding from target inventors. Target inventors who experience greater job security threat in the postacquisition phase are more likely to participate in postacquisition joint inventions. By exploring who among acquirer inventors will synthesize their knowledge with that of the target and vice versa, I identify the microlevel process of knowledge synthesis between an acquirer and its target in the postacquisition phase. In conclusion, inventors who are most confident in their positions in the acquisition context are least likely to participate in postacquisition joint inventions. Inventors who are best able to contribute to the innovation process between an acquirer and its target are the least motivated to do so. With this conclusion, this dissertation provides answers to questions on the failure to deliver the expected innovation synergy and the creation of unexpected outcomes.

This dissertation also makes an empirical contribution to the technological acquisition literature. As a measure of knowledge synthesis between an acquirer and its target, postacquisition joint inventions in which the inventors of both parties participate can reflect the human-side integration and knowledge synthesis of the two parties in the postacquisition phase. Previous studies have focused on aggregated innovation outcomes to investigate the innovation impact of technological acquisition (Ahuja & Katila, 2001; Paruchuri, Nerkar, & Hambrick, 2006). However, such a focus is limited in its reflection of human-side integration in the postacquisition phase. Aggregated performance contains both inventions created by inventors of the same

organization (i.e., only acquirer investors or target inventors) and those created by inventors of the two parties together. Such aggregated performance may provide a biased view of the innovation impact of technological acquisition from the perspective of human-side integration. Despite the increase in aggregated performance, an acquirer may fail to achieve its innovation goal without the knowledge synthesis process between the two parties. Organizations implement technological acquisition at the risk of its disruptive impact on innovation activities (Graebner et al., 2017; Paruchuri et al., 2006). Even though aggregated performances are reduced, an acquirer may achieve its technological acquisition goal of knowledge synthesis between the two parties by collaboration between inventors of two parties. Thus, to examine the innovation impact of technological acquisition from the perspective of human capital integration, it is necessary to shift the focus from overall performance to collaborative inventions created by inventors of both parties.

Second, this dissertation contributes to the social network evolution literature by providing insight into how actors belonging to different social networks form relationships after the boundary between their social networks collapses. Previous social network evolution studies have focused on actors' embeddedness and network positions in the context of their tie formation behaviors (Eisenman & Paruchuri, 2019; Paruchuri & Awate, 2017). One underlying assumption is that network boundaries are static. Most such studies have investigated the tie formation mechanism and network changes within a single social network. We have a limited understanding of how two social networks change over time when the boundary between them collapses. By investigating the innovation activities of the inventors of an acquirer and its target after an acquisition, this dissertation contributes to the social network evolution literature by

showing that these innovation activities can be a driving force for actors in one network to form relationships with those in another network when the boundary between them collapses.

In Figure 4, I examine the acquisition deal between Lam Research Corporation and Novellus Systems in December 2011 to exhibit the change in inventor collaboration networks in the acquisition context. The two social networks are interrelated after the acquisition deal by postacquisition joint inventions in which inventors of the two parties collaborate.

Insert Figure 4 about Here

Third, this dissertation contributes to the signaling literature. The high status or superior performance of actors has been considered a signal of high-quality partners to others (Lee, 2010; Paruchuri, 2010). Such actors are more likely to be involved in forming new relationships with others and to be selected as partners (Lee, 2010; Paruchuri, 2010). However, the signaling mechanism does not seem to work for inventors in the acquisition context when they select their collaboration partners from the opposite organization. In the case of acquirer inventors, those who have lower status are more likely to collaborate with the target inventors on postacquisition joint inventions. This means that there are inventors on the target side who also participate in postacquisition joint inventions. Similarly, the target inventors who come to occupy relatively lower postacquisition positions in terms of innovation performance are more likely to participate in postacquisition joint inventions with the acquirer inventors. Those who are less attractive to each other in terms of status and relative standing are more likely to collaborate.

These results imply that actors who are less confident in their positions in the boundary-collapsing situation are more likely to form ties with those in the other social network. This mechanism is contrary to the conventional findings of previous social network studies that high-status actors or high performers are more apt to form ties with others due to their advantageous positions (Baum, Calabrese, & Silverman, 2000; Burt, 2004; Lee, 2010). As previous studies have found, actors are more likely to form ties with those who are complementary (Hagedoorn, 1993).

To gain a better understanding, subsequent studies need to investigate the partner selection mechanism between inventors of the two parties. By doing so, we can determine whether the mechanism of individual-level partner selection is the same as the mechanism of partner selection between organizations, such as a strategic alliance (Baum, Cowan, & Jonard, 2010; Hagedoorn, 1993; Mindruta, Moeen, & Agarwal, 2016; Mitsuhashi & Greve, 2009; Vasudeva, Spencer, & Teegen, 2013), corporate venture capital investment (Park & Steensma, 2012), or acquisition (Makri, Hitt, & Lane, 2010; Rao et al., 2016). Future studies should also explore the inventor composition of each postacquisition joint invention to examine whether there is one star inventor working with other low-status inventors or relatively low performers working together.

The fourth contribution of this dissertation is to the organizational ecology literature, particularly research on competitive crowding. Unlike previous studies that have focused on competitive crowding within one boundary, such as geographical boundaries (Baum & Mezias, 1992), or one organization (Liu, Srivastava, & Stuart, 2016), this dissertation provides insight into the dynamic perspective of competitive crowding in the boundary-collapsing context. Technological

acquisition provides a good context for investigating how the increase in competitive crowding in one actor's niche due to the collapse of two separately existing niches influences that actor's collaboration behaviors with actors in the opposite niche. More importantly, I investigate the behaviors of employees who experience increased competitive crowding within their knowledge niches due to an inflow of employees from an acquisition partner organization. Depending on their knowledge niches, an acquirer's inventors face various levels of increased competitive crowding, which compels them to behave differently in their differentiation activities to sustain their position in their organizations (Liu et al., 2016). Furthermore, even though some attempts have been made to apply organizational ecology or crowding perspectives (Liu et al., 2016), such attempts have been very limited. This dissertation further extends the scope of the competitive crowding perspective to intraorganizational research.

This dissertation also contributes to the human capital literature. Previous studies on human capital, particularly in the acquisition context, have focused on the retention of employees, particularly key employees (Coff, 2002; Hambrick & Cannella, 1993; Wulf & Singh, 2011; Younge et al., 2015). Retaining the human capital of a target is important in terms of securing the innovation capability that an acquirer expects and achieving the anticipated level of innovation performance in the postacquisition phase (Coff, 2002). However, together with such retention, the actual behaviors of employees in relation to participating in the innovation activities pursued by their acquirer (utilizing its target's knowledge) are important. This dissertation emphasizes the actual innovation activities of retained inventors after an acquisition and investigates who among the retained inventors of a target contributes to the innovation activities sought by an acquirer.

Furthermore, this dissertation provides a result contrary to the conventional findings in the literature. Previous studies have emphasized the retention of key human capital, such as high performers and executives (Kehoe & Tzabbar, 2015; Molloy & Barney, 2015; Oettl, 2012; Ranft & Lord, 2000; Tzabbar & Kehoe, 2014). They have also emphasized the negative aspects of job security threats (Amabile & Conti, 1999; Cartwright & Cooper, 1993; Freeman & Cameron, 1993; Matteson & Ivancevich, 1990). Particularly in the technological acquisition context, it has been considered important to alleviate or eliminate the threat to job security perceived by targets' retained inventors (Ivancevich, Schweiger, & Power, 1987; Nahavandi & Malekzadeh, 1988; Seo & Hill, 2005; Stahl, Larsson, Kremershof, & Sitkin, 2011; Teerikangas, 2012). Contrary to these findings, this research reveals that perceived job security threats from the labor market, the relative position between the acquirer and the target, and the relative position of each inventor to the acquirer's inventors can generate benefits for acquirers in terms of learning and utilizing the target's knowledge. Rather than simply eliminating the threat of job security, acquirers can use the perception of this threat to encourage retained inventors to behave in ways that benefit the acquirers.

Finally, this dissertation has managerial implications for why some acquisitions are successful. The findings indicate answer that the behaviors of employees after the acquisition are important. First, managers should examine the behaviors of the employees of both acquirer and target, identify who will contribute to value creation after the acquisition, and maximize the use of those contributors. During the due diligence period, an acquirer and its target evaluate each other's innovation potential. Acquirers examine the organizational fit, cultural fit, knowledge fit

(complementarity), innovation and managerial capabilities of themselves and their targets. However, such organizational-level factors are not enough for a successful acquisition, particularly a technological acquisition. During the due diligence period, an acquirer's managers should examine the different pressures that each employee will face due to the acquisition: Who will contribute to realizing the projected potential of an acquirer and its target in the postacquisition phase, both inside the acquirer and inside the target? By investigating this issue, an acquirer's managers can identify the source of the necessary innovation synergy. Even if the two organizations fit well in terms of technology and organizational culture, an acquisition could be a waste of financial resources if there is no one to participate in postacquisition joint inventions (Chaudhuri & Tabrizi, 1999; Eccles, Lanes, & Wilson, 1999). Managers should know that the target's inventors who are best able to synthesize the knowledge of the two parties with the acquisition partner's inventors are the least likely to contribute to the acquirer's innovation goal achievement.

Second, managers should consider how to encourage capable employees to participate in the value creation process after the acquisition. My dissertation shows that an acquirer's employees who experience higher substitute pressure and possess lower status are more likely to become involved in the knowledge synthesis process between an acquirer and its target. A target's employees who perceive a higher level of job security threat to their lower relative standing are more likely to participate in the knowledge synthesis process between the two parties. These findings imply that relatively less capable employees may lead to a lower level of innovation quality or quantity. An acquirer may find it difficult to achieve the expected innovation outcomes because of the behavioral motivation of employees. Thus, managers need to consider such

participation of employees on both sides in the target selection process and make a policy to encourage or endorse employees' participation.

Despite these theoretical and managerial contributions, this dissertation has limitations. The first such limitation relates to data availability and accessibility. For the empirical research in Chapters 2 and 3, patent data from the USPTO are used. With US patent application records, I can identify inventions that have ended, the inventors belonging to that organization, and their collaboration behaviors in the postacquisition phase (Paruchuri et al., 2006). However, patent application data do not show all the inventions of the inventors of acquirers and their targets (Fleming, 2001). Applications to the USPTO cover only finished inventions for the exclusive right to the corresponding intellectual property. Successful inventions receive intellectual property rights (Balachandran & Hernandez, 2018; Fleming, 2001; Hoisl, 2007; Paruchuri et al., 2006). Hidden inventions (organizations intentionally hide some inventions to avoid exposing them to their competitors) or ongoing invention projects cannot be tracked in the USPTO database. Although I conducted this research to investigate inventors' participation in collaborative inventions, only completed inventions are observable, which is a limitation of my research data. In future studies, I may need alternative proxy variables to measure innovation projects in the postacquisition phase.

The nature of postacquisition joint inventions can differ. For example, some postacquisition joint inventions are explorative, and others are exploitative (Levitt & March, 1988; March, 1991). Depending on the nature of innovation inventions, the risks vary (March, 1991). Exploratory inventions are riskier than exploitative inventions. Such different levels of risk are related to who

participates in these collaborative inventions. In addition, exploratory inventions may require a combination of participants who have more distant knowledge of each other. The findings of this research that inventors work with those whose knowledge is moderately different in postacquisition joint inventions may vary in different contexts. For exploratory inventions, target inventors may work with acquisition partner's inventors whose knowledge is extremely different from theirs. Future research should address this limitation.

Another limitation of this dissertation is that I investigate only the innovation behaviors of inventors in the postacquisition period. Due to this boundary condition, our understanding of the behaviors of employees in other departments, such as finance, accounting, and marketing, is still limited. In addition, the behaviors of employees across the departments of the two parties need to be investigated in the future. However, I believe that this dissertation provides a foundation that can be extended to employees' collaboration behaviors in other departments or across departments.

The boundary conditions of the empirical research in Chapters 2 and 3 are related to the generalizability of the findings of this thesis. This dissertation narrows the examined acquisition deals to those between public organizations in the high-technology industry of the United States. Private and public companies differ in many respects, such as company size, organizational structure, organizational culture, and work processes (Capron & Shen, 2007; Graebner et al., 2017; Haspeslagh & Jemison, 1991). Future research should explore whether the theoretical mechanisms identified in this dissertation apply to acquisition deals between public

organizations and private organizations or between private organizations. Subsequent research needs to explore whether the findings of this study apply to such cases.

The final limitation of this work is the subsequent innovation behavior of participating in postacquisition joint inventions. I restrict my observation of the postacquisition period to five years from each acquisition deal to examine the initial responses of inventors in the postacquisition period. However, we know little about the innovation behaviors of inventors over time. Do they (the inventors of acquirers and their targets) participate more or less in postacquisition joint inventions? Is this trend limited to joint inventions during the first five years? Future research should investigate this topic using a wider time scope.

FINAL CONCLUSION AND SUMMARY

The purpose of this dissertation is to investigate the microlevel mechanism of innovation between an acquirer and its target in the postacquisition phase. In Chapter 1, I review the literature on the innovation impact of acquisition and studies on employees in the acquisition context. By reviewing those studies, I identify the limitations of the acquisition literature and discuss future research directions for how employees contribute to the knowledge synthesis process between an acquirer and its target and under what conditions they do so. With such a research opportunity, I conduct two empirical studies. As one knowledge synthesis process, I suggest postacquisition joint inventions where inventors of both parties (i.e., acquirer and its corresponding target) collaborate in the postacquisition phase. I investigate employees' behaviors of participating in postacquisition joint inventions in Chapters 2 and 3.

In Chapter 2, I investigate acquirer inventors' behaviors of participating in postacquisition joint inventions from the niche perspective. Among acquirer inventors, those who face increased competitive crowding from target inventors in their niche of knowledge are more likely to participate in postacquisition joint inventions. Differentiation to occupy advantageous positions in the competition among inventors of both parties is the underlying mechanism of their participation. However, depending on their status in their home organizations, the impact varies. Higher-status inventors are less sensitive than lower-status inventors to increased competitive crowding in their niche of knowledge.

In Chapter 3, I examine the participation of target inventors in postacquisition joint inventions from the job security threat perspective. I find that target inventors who perceive a higher level of job security threat after the acquisition are more likely to participate in postacquisition joint inventions. Those inventors perceive the greater level of job security threat when the unemployment rate is high at the time of the acquisition, the acquirer's innovation performance is better than that of the target, and their relative standing in terms of innovation performance is reduced due to the acquisition.

In conclusion, inventors who are confident in the postacquisition phase and best able to create innovation outcomes with the acquisition partner's inventors are least likely to participate in postacquisition joint inventions. Inventors who perceive the negative aspects of acquisition (e.g., increased competition and job security threats) for sustaining their status in their organizations are more likely to participate in postacquisition joint inventions, thus contributing to the acquirer's innovation goals for the acquisition (i.e., synthesizing the knowledge of the two parties).

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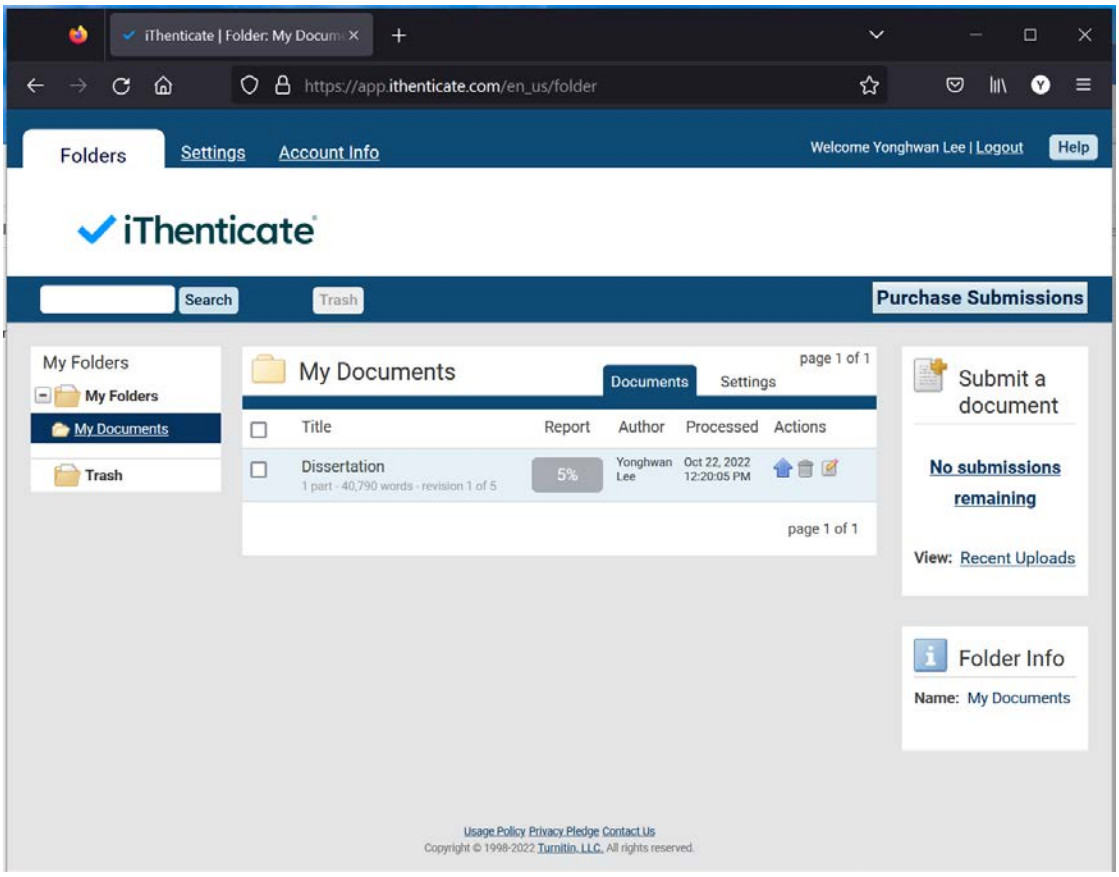

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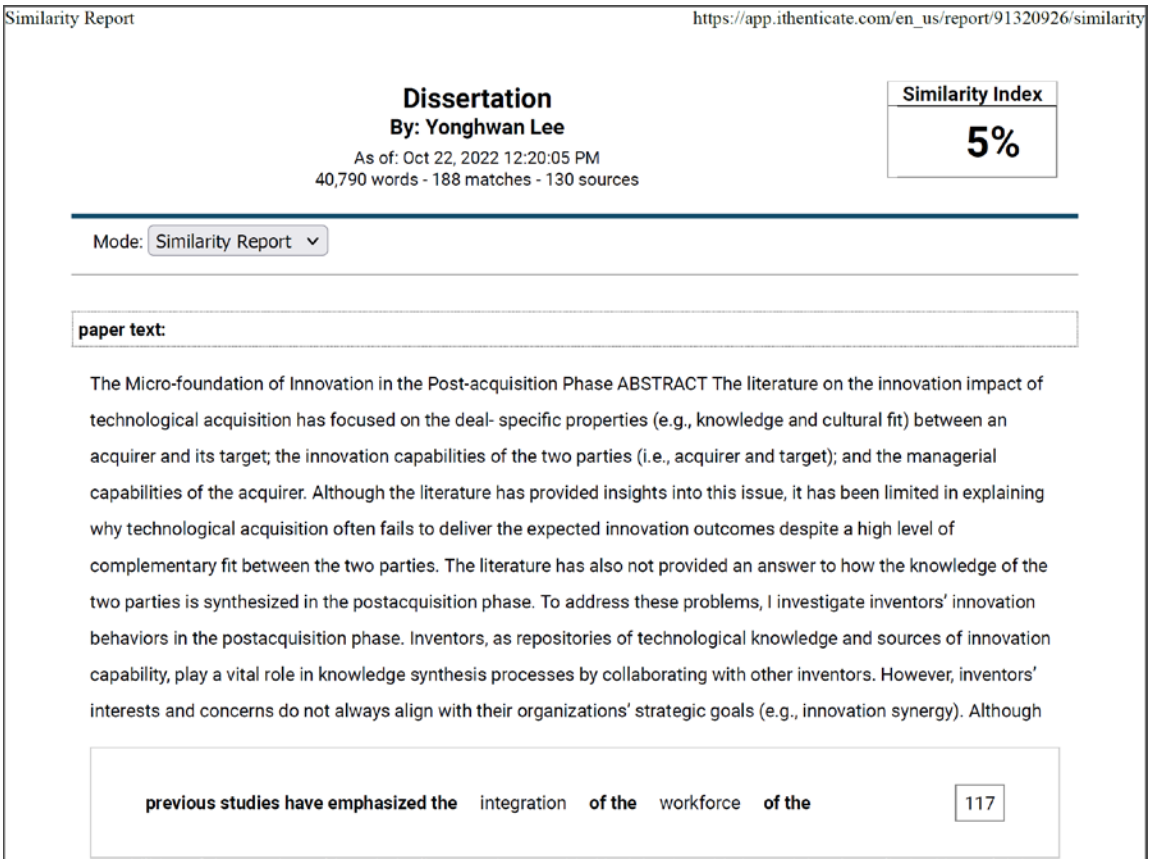

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The Micro-foundation of Innovation in the Post-acquisition Phase ABSTRACT The literature on the innovation impact of technological acquisition has focused on the deal- specific properties (e.g., knowledge and cultural fit) between an acquirer and its target; the innovation capabilities of the two parties (i.e., acquirer and target); and the managerial capabilities of the acquirer. Although the literature has provided insights into this issue, it has been limited in explaining why technological acquisition often fails to deliver the expected innovation outcomes despite a high level of complementary fit between the two parties. The literature has also not provided an answer to how the knowledge of the two parties is synthesized in the postacquisition phase. To address these problems, I investigate inventors' innovation behaviors in the postacquisition phase. Inventors, as repositories of technological knowledge and sources of innovation capability, play a vital role in knowledge synthesis processes by collaborating with other inventors. However, inventors' interests and concerns do not always align with their organizations' strategic goals (e.g., innovation synergy). Although

previous studies have emphasized the integration **of the** workforce **of the** 117

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Figure 1. Framework for the Literature Review

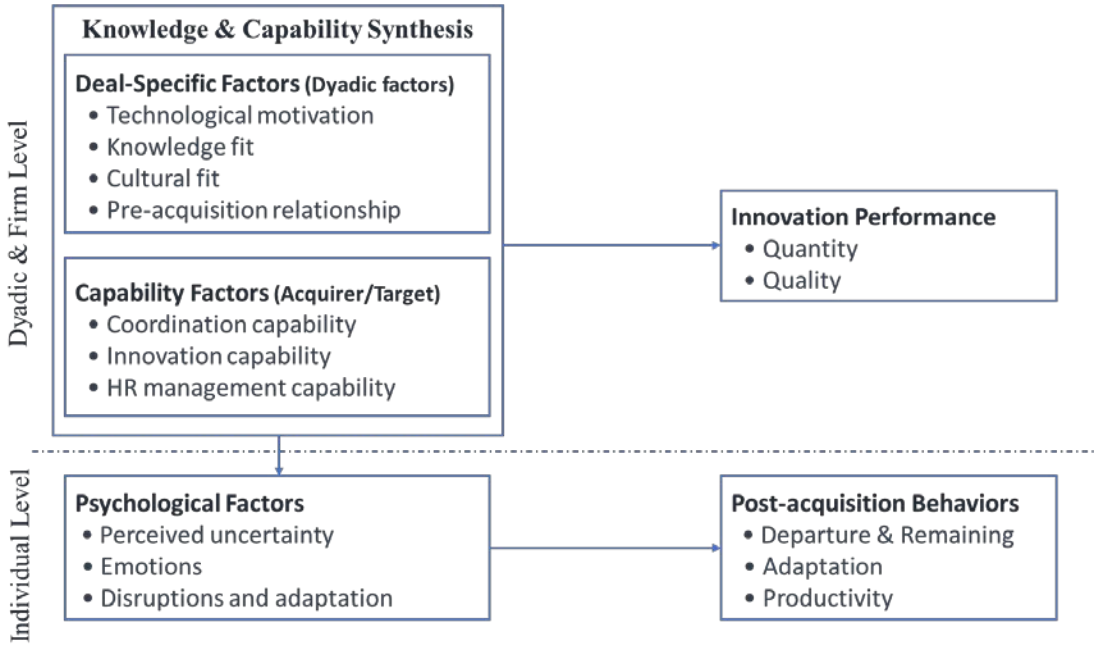
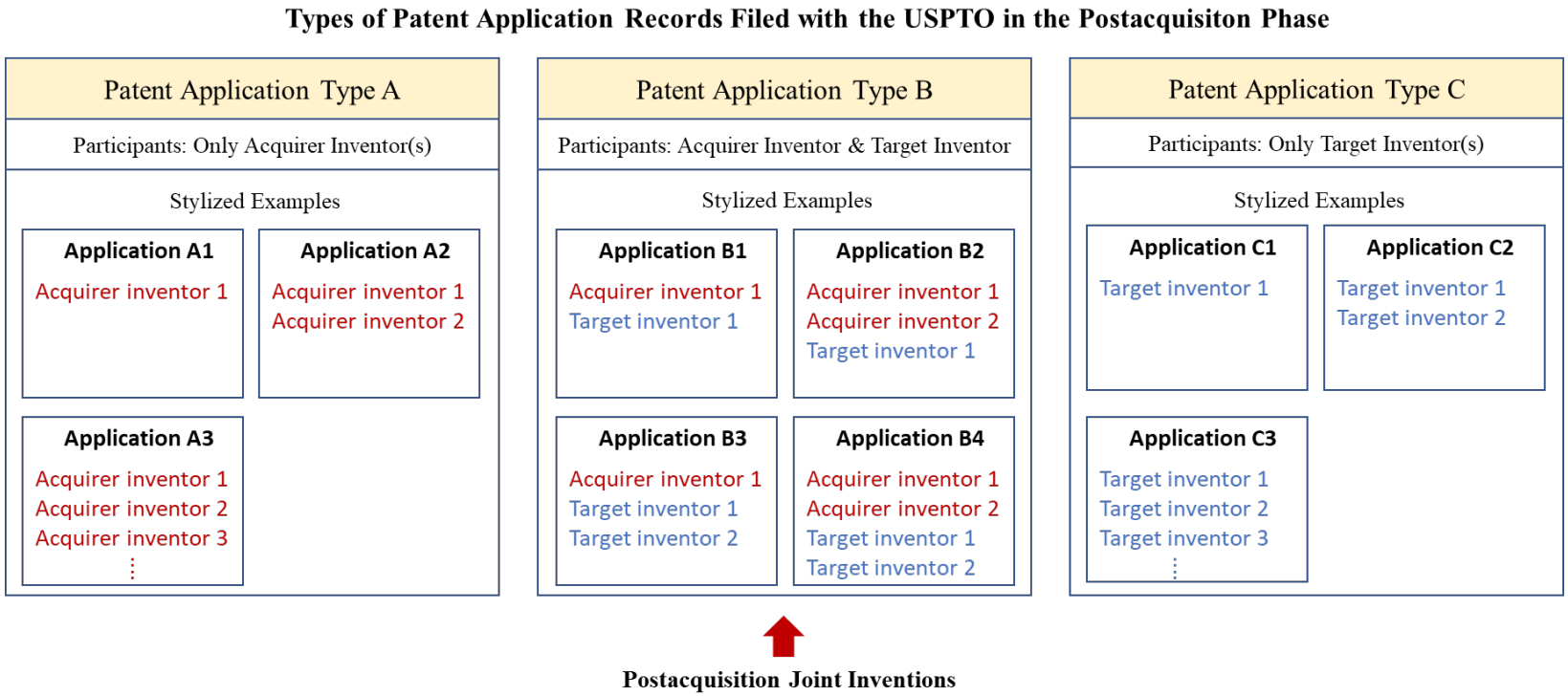
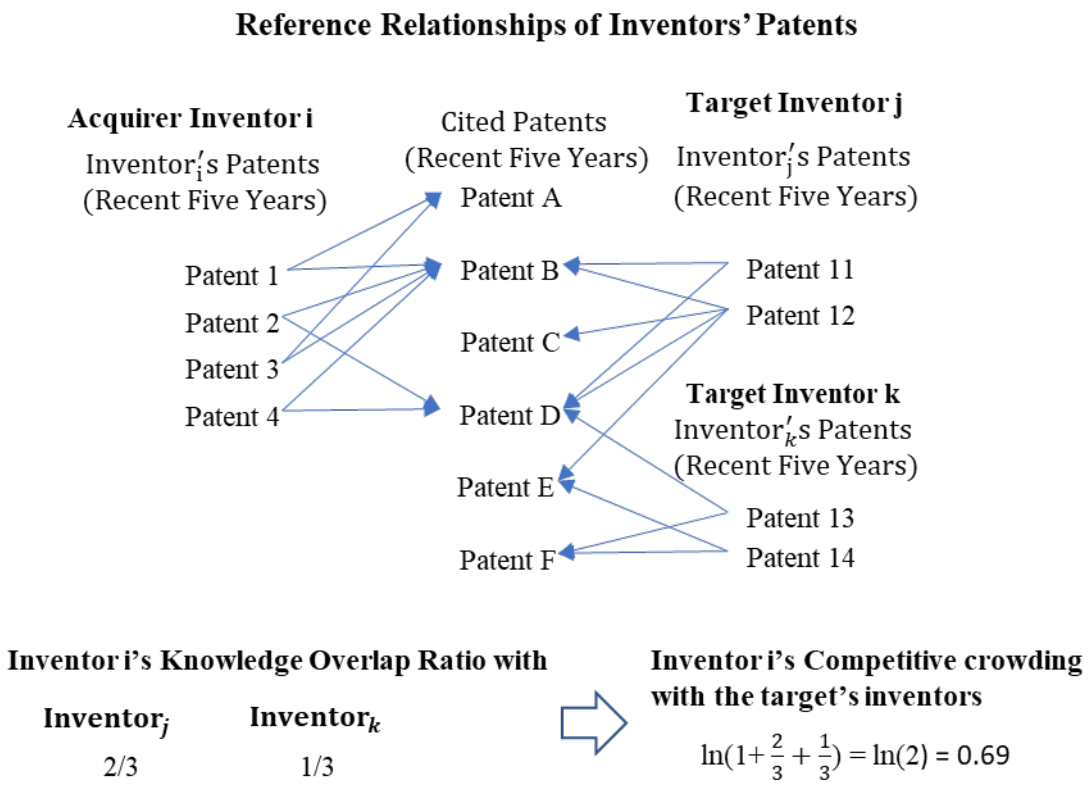


Figure 2. Postacquisition Joint Invention



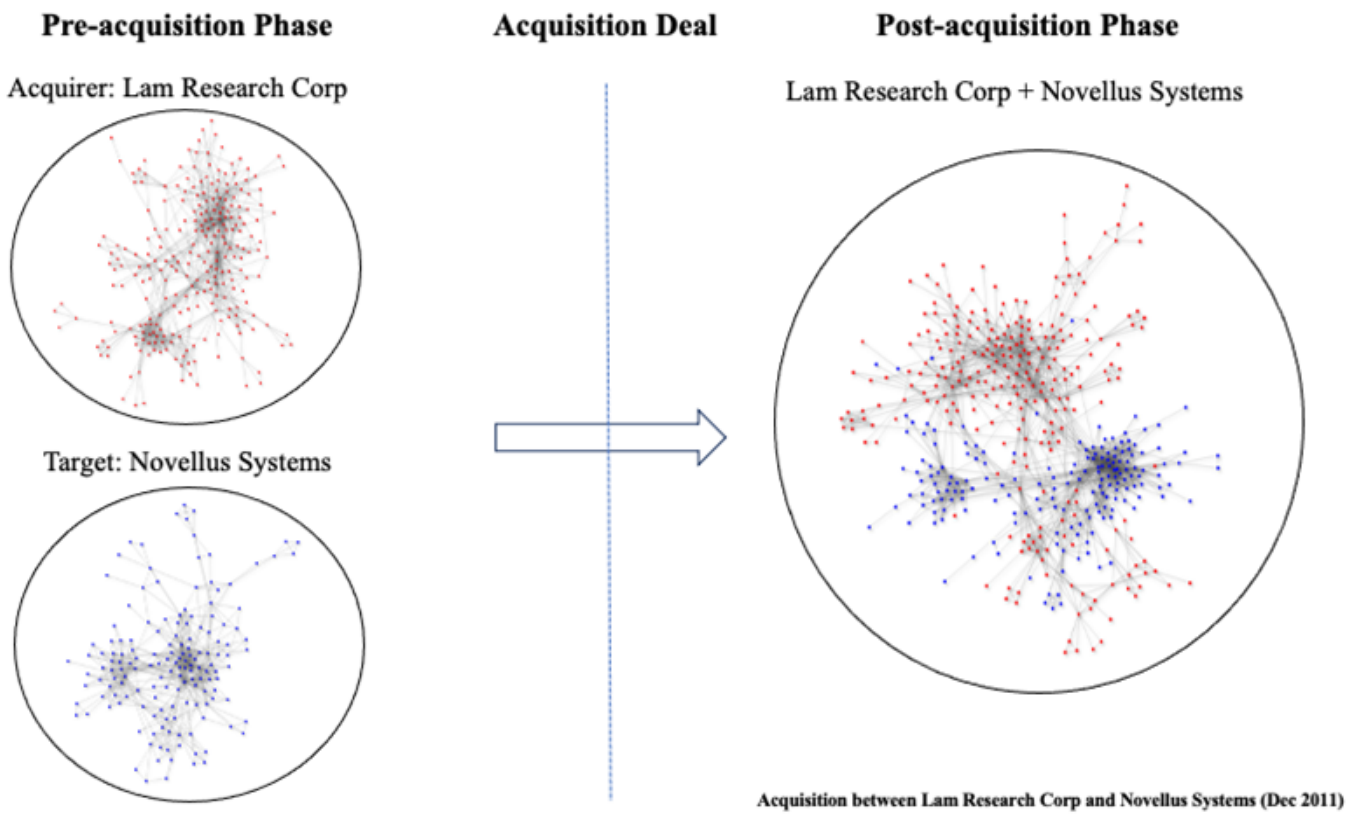
Note: There are three types of patent applications depending on the participants composition (Type A, B, and C). Each patent application contains the names of participants (i.e., inventors). Patents application containing the inventors of both acquirer and target (e.g., Patent B1, B2, B3, and B4) are considered postacquisition joint inventions. For example, in Application B2, two acquirer inventors and one target inventor participate in this invention. Application B2 is considered postacquisition joint invention. I measured postacquisition joint inventions of each inventor as follows. For example, Acquirer inventor 1 has seven inventions (Application A1, A2, A3, B1, B2, B3, and B4). Among seven inventions, I identify four Type B inventions (i.e., Application B1, B2, B3, and B4), and counted them as postacquisition joint inventions.

Figure 3. The Increased Competitive Crowding from Target's Inventors



Note: $Inventor_i$ (an acquirer inventor) has created four patents for recent five years while citing three patents (Patent A, B, and D). Those three cited patents consist of $inventor_i'$s knowledge space. There are two target inventors (Inventor j and k). Each of them has created two patents for recent five years. Among three cited patents of $Inventor_i$, two cited patents (Patent B and D) are overlapped between $Inventor_i$ and $Inventor_j$. In this case, the ratio of knowledge overlap between $Inventor_i$ and $Inventor_j$ is 2/3. In a similar way, the ratio of knowledge overlap between $Inventor_i$ and $Inventor_k$ is 1/3. The increased competitive crowding with the target inventors the $Inventor_i$ faces in his or her knowledge niche is calculated as ln(1+2/3+1/3) = ln(2)≈0.69

Figure 4. Change of Inventor Collaboration Networks in the Acquisition Context



Note 1: The acquisition between Lam Research Corp and Novellus Systems (December 2011)
Note 2: In the figure, the largest components of the two parties (i.e., Lam Research Corporation and Nobellus Systems) are presented. Red dots represent Lam Research Corporation's inventors (i.e., engineers, scientists, etc.). Blue dots are inventors of Novellus Systems. The link between two dots indicates their collaborative relationship. Inventors of one side can form collaborative tie with those of the other side by participating in postacquisition joint inventions.

Table 1. Descriptive Statistics and Correlations (Acquirer Inventors)

No. Variables	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.
1. Postacquisition joint inventions (with target inventors)	0.01	0.13	1.00							
2. Competitive crowding (from target inventors)	0.09	0.41	0.07***	1.00						
3. Status (in home organization)	-0.12	1.01	-0.01*	-0.00	1.00					
4. Competitive crowding (from acquirer inventors)	2.29	1.02	-0.01***	-0.11***	0.01**	1.00				
5. Previous innovation performance (logged)	2.66	1.02	0.02***	-0.04***	-0.00	0.04***	1.00			
6. Tenure (logged)	1.62	0.80	-0.02***	-0.02***	0.00	0.10***	0.37***	1.00		
7. Knowledge familiarity to the acquirer	0.06	0.12	-0.00	0.00	0.00	0.13***	0.05***	0.09***	1.00	
8. Knowledge familiarity to the target	0.00	0.01	0.13***	0.05***	-0.00	-0.00	-0.01*	-0.03***	-0.00	1.00
9. Knowledge scope	1.32	0.70	0.02***	-0.12***	-0.01***	0.05***	0.59***	0.27***	0.01***	-0.00
10. Unique collaborators	8.66	10.00	0.00	0.02***	0.00	0.30***	0.46***	0.32***	0.13***	-0.01***
11. Ratio of unique collaborators	0.72	0.29	-0.00	-0.00	-0.01***	-0.11***	-0.34***	-0.21***	-0.09***	-0.01**
12. Geographical distance (logged)	6.52	2.09	-0.02***	-0.23***	0.01*	-0.00	-0.00	0.04***	-0.01***	-0.03***
13. Technological distance	0.51	0.24	-0.04***	-0.21***	-0.00	-0.05***	0.02***	0.01**	-0.02***	-0.06***
14. Industrial distance	2.74	1.70	-0.03***	-0.23***	0.04***	0.01***	0.04***	0.04***	-0.03***	-0.05***
15. Preacquisition alliance	0.07	0.26	0.00	-0.05***	0.01***	0.08***	0.04***	0.03***	0.03***	0.00
16. Acquisition experience (Acquirer)	56.76	46.34	-0.04***	-0.02***	0.05***	0.02***	0.03***	0.05***	-0.04***	-0.05***
17. Acquisition attitude (Hostile)	0.02	0.13	0.03***	-0.02***	0.01*	-0.02***	-0.01**	-0.01***	0.02***	0.02***
18. Structural integration	0.64	0.48	-0.03***	-0.01*	0.04***	-0.09***	0.02***	0.06***	-0.01***	-0.04***
19. Relative size of knowledge base (Target/Acquirer)	0.05	0.26	0.08***	0.15***	-0.01***	-0.05***	-0.02***	-0.03***	0.02***	0.07***

*Note: n = 135,159 * p<0.05 ** p<0.01 *** p<0.001*

No. Variables	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
9. Knowledge scope	1.00										
10. Unique collaborators	0.35***	1.00									
11. Ratio of unique collaborators	-0.26***	-0.25***	1.00								
12. Geographical distance (logged)	0.05***	-0.02***	0.02***	1.00							
13. Technological distance	0.11***	-0.04***	0.02***	0.23***	1.00						
14. Industrial distance	0.10***	-0.00	-0.00	0.22***	0.44***	1.00					
15. Preacquisition alliance	0.08***	0.00	0.01***	0.09***	0.19***	0.13***	1.00				
16. Acquisition experience (Acquirer)	-0.16***	0.04***	-0.07***	-0.08***	-0.14***	0.39***	-0.05***	1.00			
17. Acquisition attitude (Hostile)	0.05***	0.01***	0.01***	-0.00	0.11***	-0.00	-0.04***	-0.13***	1.00		
18. Structural integration	-0.06***	0.01*	-0.03***	0.13***	0.06***	0.20***	0.07***	0.30***	-0.01***	1.00	
19. Relative size of knowledge base (Target/Acquirer)	-0.01*	-0.03***	0.01***	-0.11***	-0.16***	-0.17***	-0.02***	-0.15***	0.08***	-0.16***	1.00

*Note: n = 135,159 * p<0.05 ** p<0.01 *** p<0.001*

Table 2. VIF Test Results (Acquirer Inventors)

No.	Variable	VIF
1.	Competitive crowding (from target inventors)	1.15
2.	Status (in home organization)	1
3.	Competitive crowding (from acquirer inventors)	1.19
4.	Previous innovation performance (logged)	1.91
5.	Tenure (logged)	1.22
6.	Knowledge familiarity to the acquirer	1.04
7.	Knowledge familiarity to the target	1.01
8.	Knowledge scope	1.73
9.	Unique collaborators	1.5
10.	Ratio of unique collaborators	1.18
11.	Geographical distance (logged)	1.16
12.	Technological distance	1.55
13.	Industrial distance	1.83
14.	Preacquisition alliance	1.07
15.	Acquisition experience (Acquirer)	1.67
16.	Acquisition attitude (Hostile)	1.04
17.	Structural integration	1.17
18.	Relative size of knowledge base (Target/Acquirer)	1.1
	Mean VIF	1.31

Table 3. Results of Two-Stage Negative Binomial Regression Analysis (Acquirer Inventors)

	First Stage Probit	Second Stage Negative Binomial		
	Model 1	Model 2	Model 3	Model 4
Constant	0.199***	-0.656	-0.842	-0.941
	(0.017)	(1.366)	(1.439)	(1.431)
Inverse Mills ratio		-3.888+	-5.188*	-5.007*
		(1.987)	(2.117)	(2.090)
Firm-specific/Deal-level Covariates				
Geographical distance (logged)	-0.009***	-0.126***	-0.046	-0.050
	(0.001)	(0.032)	(0.035)	(0.035)
Technological distance	-0.045***	-2.615***	-2.530***	-2.562***
	(0.006)	(0.326)	(0.326)	(0.324)
Industrial distance	-0.002+	-0.041	0.014	0.015
	(0.001)	(0.047)	(0.045)	(0.045)
Preacquisition alliance	0.072***	1.565***	1.670***	1.688***
	(0.006)	(0.253)	(0.257)	(0.256)
Acquisition experience (Acquirer)	0.000*	-0.025***	-0.029***	-0.029***
	(0.000)	(0.004)	(0.004)	(0.004)
Acquisition attitude (Hostile)	0.006	1.824***	1.811***	1.850***
	(0.007)	(0.251)	(0.248)	(0.248)
Structural integration	0.032***	-0.855***	-0.891***	-0.886***
	(0.003)	(0.176)	(0.190)	(0.189)
Relative size of knowledge base (Target/Acquirer)	-0.014***	0.796***	0.727***	0.731***
	(0.004)	(0.106)	(0.107)	(0.107)
Inventor-level Covariates				
Gender (Male)	-0.017***			
	(0.004)			
Competitive crowding (from acquirer inventors)	-0.034***	0.023	0.090	0.085
	(0.002)	(0.071)	(0.071)	(0.070)
Previous innovation performance (logged)	-0.105***	0.917***	1.053***	1.037***
	(0.003)	(0.179)	(0.190)	(0.187)
Tenure (logged)	-0.104***	-0.054	0.114	0.097
	(0.002)	(0.171)	(0.181)	(0.178)
Knowledge familiarity to the acquirer	-0.165***	0.508	0.734	0.703
	(0.010)	(0.812)	(0.688)	(0.685)
Knowledge familiarity to the target	-0.664***	32.001***	26.938***	26.803***
	(0.121)	(3.649)	(3.139)	(3.095)
Knowledge scope	-0.345***	0.866	1.269*	1.216*
	(0.004)	(0.529)	(0.569)	(0.561)
Unique collaborators	-0.014***	0.045+	0.060*	0.058*
	(0.000)	(0.024)	(0.026)	(0.025)
Ratio of unique collaborators	0.766***	-2.345*	-3.156*	-3.068*
	(0.007)	(1.163)	(1.245)	(1.235)
H1: Competitive crowding (from target inventors)			1.117***	1.089***
			(0.089)	(0.087)
Status (in home organization)				-0.033
				(0.048)
H2: Competitive crowding (from target inventors)				-0.189*
× Status (in home organization)				(0.091)
Year Fixed Effect	Included	Included	Included	Included
Industry Fixed Effect	Included	Included	Included	Included
LnAlpha	.	3.480***	3.289***	3.291***
	.	(0.123)	(0.128)	(0.129)
Log Likelihood	-305700	-3410.886	-3321.047	-3316.678
Pseudo R-Square	0.1677	0.1860	0.2074	0.2085
N	813,235	135,159	135,159	135,159

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 4. Supplemental Analysis: Different Standard Error Options (Acquirer Inventors)

	Second Stage Negative Binomial	
	Model 1 Clustering (Acquirer-Inventor)	**Model 2** Clustering (Acquirer)
Constant	-0.941	-0.941
	(1.429)	(2.059)
Inverse Mills ratio	-5.007*	-5.007+
	(2.088)	(2.813)
Firm-specific/Deal-level Covariates		
Geographical distance (logged)	-0.050	-0.050
	(0.035)	(0.060)
Technological distance	-2.562***	-2.562***
	(0.324)	(0.719)
Industrial distance	0.015	0.015
	(0.045)	(0.105)
Preacquisition alliance	1.688***	1.688**
	(0.256)	(0.591)
Acquisition experience (Acquirer)	-0.029***	-0.029***
	(0.004)	(0.007)
Acquisition attitude (Hostile)	1.850***	1.850***
	(0.248)	(0.417)
Structural integration	-0.886***	-0.886*
	(0.189)	(0.393)
Relative size of knowledge base (Target/Acquirer)	0.731***	0.731*
	(0.107)	(0.348)
Inventor-level Covariates		
Competitive crowding (from acquirer inventors)	0.085	0.085
	(0.070)	(0.095)
Previous innovation performance (logged)	1.037***	1.037***
	(0.187)	(0.227)
Tenure (logged)	0.097	0.097
	(0.177)	(0.249)
Knowledge familiarity to the acquirer	0.703	0.703
	(0.685)	(0.953)
Knowledge familiarity to the target	26.803***	26.803***
	(3.095)	(6.009)
Knowledge scope	1.216*	1.216
	(0.561)	(0.742)
Unique collaborators	0.058*	0.058+
	(0.025)	(0.033)
Ratio of unique collaborators	-3.068*	-3.068+
	(1.233)	(1.612)
H1: Competitive crowding (from target inventors)	1.089***	1.089**
	(0.087)	(0.336)
Status (in home organization)	-0.033	-0.033
	(0.048)	(0.044)
H2: Competitive crowding (from target inventors)	-0.189*	-0.189*
× Status (in home organization)	(0.091)	(0.083)
Year Fixed Effect	Included	Included
Industry Fixed Effect	Included	Included
LnAlpha	3.291***	3.291***
	(0.129)	(0.301)
Log Likelihood	-3316.678	-3316.678
Pseudo R-Square	0.2085	0.2085
N	135159	135159

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 5. Supplemental Analysis: Different Regression Models (Acquirer Inventors)

	Second Stage	
	Model 1 Zero-Inflated Negative Binomial	**Model 2** OLS
Constant	1.743*	0.027**
	(0.819)	(0.010)
Inverse Mills ratio	-2.252+	-0.028**
	(1.225)	(0.011)
Firm-specific/Deal-level Covariates		
Geographical distance (logged)	-0.002	0.000
	(0.018)	(0.000)
Technological distance	-0.462**	-0.015***
	(0.166)	(0.003)
Industrial distance	0.039	0.001**
	(0.025)	(0.001)
Preacquisition alliance	0.121	0.013***
	(0.225)	(0.004)
Acquisition experience (Acquirer)	-0.002	-0.000***
	(0.002)	(0.000)
Acquisition attitude (Hostile)	0.504**	0.026***
	(0.159)	(0.008)
Structural integration	-0.222*	-0.002
	(0.092)	(0.001)
Relative size of knowledge base (Target/Acquirer)	-0.043	0.029***
	(0.036)	(0.005)
Inventor-level Covariates		
Competitive crowding (from acquirer inventors)	0.010	0.000
	(0.045)	(0.000)
Previous innovation performance (logged)	0.405***	0.007***
	(0.110)	(0.001)
Tenure (logged)	0.067	-0.001
	(0.102)	(0.001)
Knowledge familiarity to the acquirer	0.927***	0.001
	(0.216)	(0.004)
Knowledge familiarity to the target	2.036**	1.172***
	(0.640)	(0.219)
Knowledge scope	0.592+	0.007*
	(0.330)	(0.003)
Unique collaborators	0.024	0.000
	(0.015)	(0.000)
Ratio of unique collaborators	-1.143	-0.016**
	(0.695)	(0.006)
H1: Competitive crowding (from target inventors)	0.144***	0.018***
	(0.036)	(0.002)
Status (in home organization)	0.032	-0.000
	(0.033)	(0.000)
H2: Competitive crowding (from target inventors)	-0.101*	-0.003*
× Status (in home organization)	(0.043)	(0.001)
Year Fixed Effect	Included	Included
Industry Fixed Effect	Included	Included
LnAlpha	-11284.165***	
	(0.044)	
Log Likelihood	-769.036	82500.003
R-Square	.	0.0292
Pseudo R-Square	.	.
N	135159	135159

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 6. Supplement Analysis: Discrete Status Variables (Acquirer Inventors)

	Second Stage Negative Binomial		
	Model 1 Status (Top10%)	**Model 2** Status (Top15%)	**Model 3** Status (Top20%)
Constant	-0.884	-0.976	-1.012
	(1.437)	(1.440)	(1.433)
Inverse Mills ratio	-5.112*	-4.913*	-4.863*
	(2.109)	(2.110)	(2.103)
Firm-specific/Deal-level Covariates			
Geographical distance (logged)	-0.046	-0.048	-0.048
	(0.035)	(0.035)	(0.035)
Technological distance	-2.551***	-2.570***	-2.571***
	(0.326)	(0.325)	(0.325)
Industrial distance	0.011	0.010	0.012
	(0.045)	(0.045)	(0.045)
Preacquisition alliance	1.703***	1.723***	1.710***
	(0.256)	(0.255)	(0.256)
Acquisition experience (Acquirer)	-0.029***	-0.029***	-0.029***
	(0.004)	(0.004)	(0.004)
Acquisition attitude (Hostile)	1.816***	1.834***	1.843***
	(0.248)	(0.248)	(0.249)
Structural integration	-0.885***	-0.883***	-0.871***
	(0.189)	(0.189)	(0.189)
Relative size of knowledge base (Target/Acquirer)	0.728***	0.719***	0.710***
	(0.107)	(0.106)	(0.105)
Inventor-level Covariates			
Competitive crowding (from acquirer inventors)	0.085	0.075	0.079
	(0.070)	(0.070)	(0.070)
Previous innovation performance (logged)	1.051***	1.039***	1.037***
	(0.189)	(0.189)	(0.189)
Tenure (logged)	0.114	0.093	0.088
	(0.180)	(0.180)	(0.179)
Knowledge familiarity to the acquirer	0.750	0.724	0.740
	(0.681)	(0.676)	(0.664)
Knowledge familiarity to the target	26.661***	26.579***	26.478***
	(3.092)	(3.067)	(3.033)
Knowledge scope	1.246*	1.182*	1.170*
	(0.568)	(0.568)	(0.567)
Unique collaborators	0.059*	0.057*	0.057*
	(0.026)	(0.026)	(0.026)
Ratio of unique collaborators	-3.100*	-2.994*	-2.961*
	(1.243)	(1.245)	(1.241)
H1: Competitive crowding (from target inventors)	1.148***	1.169***	1.187***
	(0.091)	(0.094)	(0.096)
Status (in home organization)	-0.346+	-0.385*	-0.414**
	(0.195)	(0.161)	(0.150)
H2: Competitive crowding (from target inventors)	-0.393*	-0.418**	-0.395**
× Status (in home organization)	(0.184)	(0.147)	(0.138)
Year Fixed Effect	Included	Included	Included
Industry Fixed Effect	Included	Included	Included
LnAlpha	3.280***	3.278***	3.267***
	(0.127)	(0.127)	(0.127)
Log Likelihood	-3316.816	-3313.645	-3310.993
Pseudo R-Square	0.2085	0.2092	0.2098
N	135159	135159	135159

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 7. Supplemental Analysis: Two-Stage Negative Binomial Regression Analysis for Target Inventors

	First Stage Probit	Second Stage Negative Binomial		
	Model 1	**Model 2**	**Model 3**	**Model 4**
Constant	-0.529***	0.428	-0.046	-0.035
	(0.093)	(2.356)	(2.323)	(2.323)
Inverse Mills ratio		-2.333	-2.383	-2.392
		(1.868)	(1.828)	(1.828)
Firm-specific/Deal-level Covariates				
Geographical distance (logged)	-0.007*	0.042	0.043	0.043
	(0.003)	(0.035)	(0.035)	(0.035)
Technological distance	0.136***	0.138	0.169	0.171
	(0.033)	(0.361)	(0.355)	(0.355)
Industrial distance	-0.009	-0.120+	-0.103+	-0.103+
	(0.006)	(0.063)	(0.062)	(0.062)
Preacquisition alliance	-0.631***	4.430***	4.415***	4.411***
	(0.071)	(0.938)	(0.914)	(0.915)
Acquisition experience (Acquirer)	0.002***	-0.015***	-0.017***	-0.017***
	(0.000)	(0.004)	(0.004)	(0.004)
Acquisition attitude (Hostile)	0.282***	0.354	0.402	0.400
	(0.068)	(0.526)	(0.514)	(0.515)
Structural integration	-0.069**	0.523*	0.471+	0.471+
	(0.021)	(0.246)	(0.245)	(0.245)
Relative size of knowledge base (Target/Acquirer)	-0.010*	0.024	0.043	0.042
	(0.004)	(0.048)	(0.044)	(0.044)
Inventor-level Covariates				
Gender (Male)	-0.060***			
	(0.018)			
Competitive crowding (from acquirer inventors)	-0.051***	-0.053	-0.041	-0.041
	(0.007)	(0.094)	(0.091)	(0.091)
Previous innovation performance (logged)	-0.169***	0.831**	0.858***	0.859***
	(0.010)	(0.257)	(0.252)	(0.253)
Tenure (logged)	-0.077***	0.150	0.191	0.192
	(0.010)	(0.123)	(0.121)	(0.121)
Knowledge familiarity to the acquirer	-0.135+	2.257**	2.199**	2.205**
	(0.071)	(0.832)	(0.825)	(0.825)
Knowledge familiarity to the target	-0.200***	-1.358*	-1.210+	-1.212+
	(0.050)	(0.643)	(0.621)	(0.621)
Knowledge scope	-0.323***	0.350	0.334	0.338
	(0.016)	(0.442)	(0.436)	(0.436)
Unique collaborators	-0.011***	0.052**	0.049**	0.049**
	(0.001)	(0.018)	(0.018)	(0.018)
Ratio of unique collaborators	0.855***	-0.764	-0.773	-0.780
	(0.028)	(1.235)	(1.211)	(1.211)
H1: Competitive crowding (from target inventors)			0.244***	0.246***
			(0.042)	(0.042)
Status (in home organization)				0.013
				(0.045)
H2: Competitive crowding (from target inventors) × Status (in home organization)				0.005
				(0.024)
Year Fixed Effect	Included	Included	Included	Included
Industry Fixed Effect	Included	Included	Included	Included
LnAlpha	.	1.268***	1.220***	1.219***
	.	(0.121)	(0.121)	(0.122)
Log Likelihood	-11147.571	-1860.262	-1847.451	-1847.386
Pseudo R-Square	0.1738	0.1062	0.1123	0.1124
N	32279	4751	4751	4751

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 8. Descriptive Statistics and Correlations (Target Inventors)

No. Variables	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.
1. Postacquisition joint inventions (with acquirer inventors)	0.17	0.65	1.00							
2. Unemployment rate	6.23	1.70	-0.00	1.00						
3. Relative innovation performance (Firm level)	1.49	2.98	0.02	-0.20***	1.00					
4. Relative standing (Inventor level)	6.72	19.59	0.07***	0.05***	-0.08***	1.00				
5. Previous innovation performance (logged)	2.60	0.98	0.11***	0.05**	-0.02	0.51***	1.00			
6. Tenure (logged)	1.61	0.71	0.06***	0.07***	0.06***	0.14***	0.37***	1.00		
7. Knowledge familiarity to the acquirer	0.02	0.08	0.01	0.21***	-0.06***	-0.01	0.05***	0.06***	1.00	
8. Knowledge familiarity to the target	0.07	0.13	-0.03	0.18***	0.02	-0.01	0.00	0.11***	0.45***	1.00
9. Knowledge scope	1.29	0.63	0.07***	0.06***	-0.17***	0.34***	0.58***	0.23***	0.08***	0.00
10. Unique collaborators	8.14	9.09	0.04**	0.10***	-0.04*	0.16***	0.41***	0.18***	0.08***	0.01
11. Ratio of unique collaborators	0.71	0.30	0.03*	0.01	-0.03	-0.11***	-0.33***	-0.22***	-0.14***	-0.17***
12. Geographical distance (logged)	5.50	2.64	0.02	-0.12***	-0.13***	0.01	-0.02	0.08***	0.02	-0.02
13. Technological distance	0.33	0.27	0.02	-0.06***	0.11***	0.05***	0.03	0.06***	-0.13***	0.07***
14. Industrial distance	1.33	1.59	0.04**	-0.15***	0.04**	0.05***	-0.00	0.02	-0.12***	-0.03
15. Preacquisition alliance	0.02	0.12	0.14***	0.21***	0.02	-0.02	-0.03*	0.05***	-0.01	-0.04**
16. Acquisition experience (Acquirer)	21.09	24.13	-0.01	-0.06***	0.74***	-0.05***	-0.02	0.08***	-0.03	0.02
17. Acquisition attitude (Hostile)	0.04	0.21	0.08***	-0.08***	-0.12***	-0.01	-0.02	0.03	-0.06***	0.14***
18. Structural integration	0.24	0.43	0.05***	-0.22***	0.51***	-0.03	-0.01	0.09***	-0.10***	-0.02
19. Relative size of knowledge base (Target/Acquirer)	1.03	1.90	-0.07***	0.16***	-0.34***	0.03*	0.03*	-0.13***	0.03*	-0.04**

*Note: n = 4,722 * p<0.05 ** p<0.01 *** p<0.001*

No. Variables	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
9. Knowledge scope	1.00										
10. Unique collaborators	0.32***	1.00									
11. Ratio of unique collaborators	-0.23***	-0.24***	1.00								
12. Geographical distance (logged)	0.03*	-0.13***	-0.02	1.00							
13. Technological distance	0.02	-0.12***	-0.05***	0.29***	1.00						
14. Industrial distance	-0.00	-0.13***	-0.01	0.14***	0.59***	1.00					
15. Preacquisition alliance	-0.00	-0.07***	0.02	-0.08***	-0.03*	0.14***	1.00				
16. Acquisition experience (Acquirer)	-0.08***	-0.06***	-0.01	-0.16***	0.01	0.01	0.17***	1.00			
17. Acquisition attitude (Hostile)	0.05**	-0.08***	0.01	0.06***	0.30***	0.35***	-0.03	-0.11***	1.00		
18. Structural integration	-0.17***	-0.12***	0.00	0.06***	0.07***	0.01	-0.02	0.33***	-0.01	1.00	
19. Relative size of knowledge base (Target/Acquirer)	-0.06***	0.08***	0.04*	-0.38***	-0.27***	-0.10***	-0.05***	-0.18***	0.07***	-0.24***	1.00

*Note: n = 4,722 * p<0.05 ** p<0.01 *** p<0.001*

Table 9. VIF Test Results (Target Inventors)

No.	Variable	VIF
1.	Unemployment rate	1.3
2.	Relative innovation performance (Firm level)	3.33
3.	Relative standing (Inventor level)	1.39
4.	Previous innovation performance (logged)	2.29
5.	Tenure (logged)	1.24
6.	Knowledge familiarity to the acquirer	1.37
7.	Knowledge familiarity to the target	1.41
8.	Knowledge scope	1.71
9.	Unique collaborators	1.33
10.	Ratio of unique collaborators	1.21
11.	Geographical distance (logged)	1.44
12.	Technological distance	1.88
13.	Industrial distance	1.78
14.	Preacquisition alliance	1.21
15.	Acquisition experience (Acquirer)	2.43
16.	Acquisition attitude (Hostile)	1.28
17.	Structural integration	1.48
18.	Relative size of knowledge base (Target/Acquirer)	1.58
	Mean VIF	1.65

Table 10. Results of Two-Stage Negative Binomial Regression Analysis (Target Inventors)

	First Stage Probit	Second Stage Negative Binomial				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0.655***	-0.986	-21.871*	-0.823	-1.692	-26.399**
	(0.090)	(2.630)	(8.615)	(2.584)	(2.712)	(8.909)
Inverse Mills ratio		-0.811	-0.811	-0.719	-0.358	-0.269
		(1.964)	(1.964)	(1.921)	(2.012)	(1.969)
Firm-specific/Deal-level Covariates						
Geographical distance (logged)	-0.006+	0.001	0.001	0.013	-0.001	0.011
	(0.003)	(0.036)	(0.036)	(0.036)	(0.036)	(0.037)
Technological distance	0.113***	-0.178	-0.178	-0.295	-0.163	-0.279
	(0.033)	(0.369)	(0.369)	(0.373)	(0.363)	(0.367)
Industrial distance	-0.008	-0.117+	-0.117+	-0.125+	-0.116+	-0.125+
	(0.006)	(0.064)	(0.064)	(0.066)	(0.063)	(0.066)
Preacquisition alliance	-0.585***	3.739***	3.739***	4.040***	3.515***	3.816***
	(0.069)	(0.919)	(0.919)	(0.919)	(0.948)	(0.947)
Acquisition experience (Acquirer)	0.002***	-0.015**	-0.015**	-0.028***	-0.014**	-0.027***
	(0.000)	(0.004)	(0.004)	(0.006)	(0.004)	(0.006)
Acquisition attitude (Hostile)	0.301***	0.866	0.866	0.644	0.937+	0.714
	(0.067)	(0.563)	(0.563)	(0.561)	(0.565)	(0.563)
Structural integration	-0.071***	0.366	0.366	0.237	0.359	0.231
	(0.021)	(0.243)	(0.243)	(0.251)	(0.240)	(0.247)
Relative size of knowledge base (Target/Acquirer)	-0.010**	-0.234**	-0.234**	-0.157*	-0.235**	-0.158*
	(0.004)	(0.074)	(0.074)	(0.071)	(0.074)	(0.071)
Inventor-level Covariates						
Gender (Male)	-0.058**					
	(0.018)					
Previous innovation performance (logged)	-0.167***	0.679*	0.679*	0.673*	0.667*	0.660*
	(0.010)	(0.268)	(0.268)	(0.261)	(0.268)	(0.261)
Tenure (logged)	-0.077***	0.066	0.066	0.090	0.030	0.055
	(0.010)	(0.130)	(0.130)	(0.129)	(0.134)	(0.133)
Knowledge familiarity to the acquirer	-0.173*	2.065*	2.065*	1.865*	1.936*	1.739*
	(0.071)	(0.863)	(0.863)	(0.872)	(0.875)	(0.884)
Knowledge familiarity to the target	-0.230***	-1.679*	-1.679*	-1.589*	-1.715*	-1.627*
	(0.050)	(0.673)	(0.673)	(0.659)	(0.675)	(0.662)
Knowledge scope	-0.310***	0.001	0.001	-0.031	-0.085	-0.117
	(0.016)	(0.443)	(0.443)	(0.437)	(0.449)	(0.444)
Unique collaborators	-0.013***	0.030	0.030	0.028	0.025	0.022
	(0.001)	(0.021)	(0.021)	(0.021)	(0.022)	(0.022)
Ratio of unique collaborators	0.896***	0.243	0.243	0.271	0.582	0.608
	(0.027)	(1.363)	(1.363)	(1.337)	(1.402)	(1.375)
H1: Unemployment rate			3.601+			4.289*
			(1.886)			(1.933)
H2: Relative innovation performance (Firm level)				0.153***		0.153***
				(0.035)		(0.035)
H3: Relative standing (Inventor level)					-0.004*	-0.004*
					(0.002)	(0.002)
Year Fixed Effect	Included	Included	Included	Included	Included	Included
Industry Fixed Effect	Included	Included	Included	Included	Included	Included
LnAlpha	.	1.237***	1.237***	1.204***	1.232***	1.197***
	.	(0.126)	(0.126)	(0.128)	(0.125)	(0.127)
Log Likelihood	-11159.03	-1829.09	-1829.09	-1820.32	-1828.13	-1819.41
Pseudo R-Square	0.1730	0.1119	0.1119	0.1162	0.1124	0.1166
N	32279	4722	4722	4722	4722	4722

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 11. Supplemental Analysis: Different Standard Error Options (Target Inventors)

	Second Stage Negative Binomial	
	Model 1 Clustering (Target)	**Model 2** Clustering (Robust)
Constant	-26.399*	-26.399**
	(11.965)	(8.928)
Inverse Mills ratio	-0.269	-0.269
	(2.576)	(1.971)
Firm-specific/Deal-level Covariates		
Geographical distance (logged)	0.011	0.011
	(0.055)	(0.037)
Technological distance	-0.279	-0.279
	(0.467)	(0.366)
Industrial distance	-0.125	-0.125+
	(0.099)	(0.065)
Preacquisition alliance	3.816**	3.816***
	(1.245)	(0.948)
Acquisition experience (Acquirer)	-0.027**	-0.027***
	(0.008)	(0.006)
Acquisition attitude (Hostile)	0.714	0.714
	(0.744)	(0.564)
Structural integration	0.231	0.231
	(0.338)	(0.247)
Relative size of knowledge base (Target/Acquirer)	-0.158	-0.158*
	(0.099)	(0.071)
Inventor-level Covariates		
Previous innovation performance (logged)	0.660*	0.660*
	(0.328)	(0.262)
Tenure (logged)	0.055	0.055
	(0.228)	(0.133)
Knowledge familiarity to the acquirer	1.739	1.739*
	(1.395)	(0.884)
Knowledge familiarity to the target	-1.627+	-1.627*
	(0.838)	(0.662)
Knowledge scope	-0.117	-0.117
	(0.593)	(0.444)
Unique collaborators	0.022	0.022
	(0.031)	(0.022)
Ratio of unique collaborators	0.608	0.608
	(1.713)	(1.377)
H1: Unemployment rate	4.289+	4.289*
	(2.570)	(1.937)
H2: Relative innovation performance (Firm level)	0.153**	0.153***
	(0.050)	(0.036)
H3: Relative standing (Inventor level)	-0.004+	-0.004*
	(0.002)	(0.002)
Year Fixed Effect	Included	Included
Industry Fixed Effect	Included	Included
LnAlpha	1.197***	1.197***
	(0.257)	(0.129)
Log Likelihood	-1819.405	-1819.405
Pseudo R-Square	0.1166	0.1166
N	4722	4722

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*

Table 12. Supplemental Analysis: Alternative Relative Standing Measure (Target Inventors)

	Second Stage Negative Binomial
	Model 1
	Performance
	Loss
Constant	-27.206**
	(8.866)
Inverse Mills ratio	-0.665
	(1.936)
Firm-specific/Deal-level Covariates	
Geographical distance (logged)	0.006
	(0.037)
Technological distance	-0.320
	(0.373)
Industrial distance	-0.123+
	(0.065)
Preacquisition alliance	4.060***
	(0.921)
Acquisition experience (Acquirer)	-0.027***
	(0.006)
Acquisition attitude (Hostile)	0.747
	(0.566)
Structural integration	0.206
	(0.254)
Relative size of knowledge base (Target/Acquirer)	-0.144*
	(0.071)
Inventor-level Covariates	
Previous innovation performance (logged)	0.663*
	(0.264)
Tenure (logged)	0.097
	(0.129)
Knowledge familiarity to the acquirer	1.923*
	(0.881)
Knowledge familiarity to the target	-1.615*
	(0.665)
Knowledge scope	-0.049
	(0.441)
Unique collaborators	0.029
	(0.021)
Ratio of unique collaborators	0.382
	(1.349)
H1: Unemployment rate	4.515*
	(1.918)
H2: Relative innovation performance (Firm level)	0.155***
	(0.035)
H3: Performance Loss (Inventor level)	0.005+
	(0.003)
Year Fixed Effect	Included
Industry Fixed Effect	Included
LnAlpha	1.204***
	(0.128)
Log Likelihood	-1816.246
Pseudo R-Square	0.1169
N	4722

Note 1: Standard errors in parentheses
*Note 2: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001*