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The “human side” of open innovation: The role of employee diversity in firm-level openness

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ABSTRACT

The use of external knowledge for innovation (i.e., inbound or outside-in open innovation) has received substantial attention in the innovation literature. However, the “human side” of open innovation is still poorly understood. We consider the role of employee characteristics with respect to predicting firm-level openness. Drawing on the human capital, learning and creativity literatures, we theorize that knowledge diversity of the firm’s employees is positively associated with employees’ ability to identify and absorb external knowledge, which aggregates to increased firm-level openness—that is, firms’ use of external knowledge in their pursuit of innovation. Based on a combination of three data sources, namely, two survey data sources and register data, we find support for our hypothesis that employees’ educational diversity is positively associated with firm-level openness. However, we find no direct association between employees’ work history diversity and firm-level openness but rather—as also hypothesized—a conditional relationship based on educational background, which implies that diverse work history only has a positive impact at higher levels of educational diversity. To reduce endogeneity concerns, we undertake a series of robustness checks.

1. Introduction

The innovation field increasingly highlights the sourcing of knowledge for innovation across the boundaries of the firm (Dahlander and Gann, 2010; West et al., 2014). In particular, the literature on “open innovation” stresses that firms’ openness to external sources of knowledge is an important driver of innovation performance (Laursen and Salter, 2006; West and Bogers, 2014). Much recent research explores the antecedents, processes, and outcomes of open innovation. Firm-level antecedents to open innovation include specific configurations of organizational design (Foss et al., 2011, 2013; Laursen and Salter, 2006; Leiponen and Helfat, 2010), absorptive capacity (de Faria et al., 2010; de Jong and Freel, 2010; Fabrizio, 2009), and culture (Burcharth et al., 2014; Dodgson et al., 2006; Herzog and Leker, 2010).

There is growing interest in assessing open innovation at a more micro level than the organization *per se*. Recent examples are Du et al.’s (2014) study of open innovation projects, Salter et al.’s (2015) study of individual-level openness and idea generation in R&D, Dahlander et al.’s (2016) study of elite boundary spanners, Ahn et al.’s (2017) study on the role of CEO characteristics in facilitating open innovation in SMEs, and Ranguis and Černe’s (2017) study of the relationship

between leadership, openness and innovation performance. In spite of such studies, the individual-level factors that determine firm-level openness—that is, the “microfoundations” (Felin et al., 2015) of open innovation—remain relatively ill understood (Bogers et al., 2017). As a result, most research on open innovation still “neglects the human side” (Gassmann et al., 2010: 218), so that “we still know little about how individuals who take up the open innovation role draw upon their networks to support them in this role” (West et al., 2014: 809).

The relative lack of focus on the individual-level attributes of open innovation is at odds with Chesbrough’s (2003) early argument that the availability of highly educated individuals and the mobility of skilled labor constitute key factors that are important for driving the shift toward open innovation. Indeed, extant literature has argued for a positive association between job mobility and innovation based on the argument that such mobility brings new human capital—that is, employees’ knowledge, skills and abilities obtained through education, training, experience, and so on (Becker and Huselid, 2006; Coff and Kryscynski, 2011; Hunter et al., 2012)—into the firm and increases the diversity of the firm’s knowledge bases (Cohen and Levinthal, 1990; Fleming and Marx, 2006). However, the specific mechanisms through which this diversity is established and enacted still need to be better

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understood (Gassmann et al., 2010; Østergaard et al., 2011; Talke et al., 2010). For example, in the context of open innovation, much attention has been given to absorptive capacity as being instrumental in integrating externally sourced knowledge (West and Bogers, 2014), but few studies provide a theory-grounded explanation of the connection between open innovation and absorptive capacity, and how they cut across individual and organizational levels of analysis (Bogers et al., 2017).

In this study, we relate to the open innovation phenomenon by offering a theory of how diversity in a firm affects its use of external knowledge in their pursuit of innovation. Specifically, we theorize how employee diversity affects openness to external knowledge sources at the firm level. Our logic builds on key work on human capital (Becker, 1962) and its strategic role (Campbell et al., 2012; Crocker and Eckardt, 2014; Huselid et al., 1997; Lepak and Snell, 1999; Youndt et al., 1996), the literature on learning and creativity in organizations (Amabile, 1988; Levinthal and March, 1993; March, 1991; Mumford and Gustafson, 1988) and absorptive capacity theory (Cohen and Levinthal, 1990; Lewin et al., 2011). We focus on work history diversity and educational diversity to explain how such diversity increase employees' exposure to and ability to integrate external knowledge sources to enable overall openness at the level of the firm. Empirically, we exploit access to population-wide register employee data that allows us to construct strong measures of human capital. We match these data with a large-scale paired-respondent survey, which encompasses 480 firm-level observations, and we employ several robustness tests to validate our findings and meet possible endogeneity concerns due to potential omitted variable bias. While we find support for our hypothesized association between employees' educational diversity and firm-level openness, we find no direct influence from employees' work history diversity, although we do find a positive interaction effect between the two types of diversity with respect to their impact on openness. In our analysis, we therefore further explore how educational diversity may serve as a prerequisite for the relation between work history diversity and openness to external knowledge sources.

In sum, we directly address the “human side” of open innovation (Gassmann et al., 2010) by linking human capital antecedents to firms' use of external sources of knowledge for innovation—thereby providing part of the missing microfoundations of open innovation. More generally, our findings contribute to the literature by more strongly connecting open innovation, absorptive capacity, human capital, and diversity—thereby responding to the call for more theorizing and multi-level research in this domain (Bogers et al., 2017). Our theory suggest that firms with a diverse human capital pool are at an advantage with respect to engaging in open innovation, as they can exploit existing diversity and may not have to create such diversity by means of hiring new employees. As such, our findings may help guide recruitment practices in firms that wish to support or expand open innovation strategies. However, the particular nature of the underlying relations needs to be carefully considered in order to make meaningful theoretical conjectures as well as managerial recommendations. We discuss our main contributions as well as key limitations of our study, paying particular attention to endogeneity concerns that may arise in this context.

2. Employees as a research gap in open innovation

Innovation involves knowledge recombination that may result in the creation and appropriation of economic value and possibly competitive advantage (Arora et al., 2016; Laursen and Salter, 2014; Zahra and George, 2002). Research on open innovation shows how firms rely on external sources of knowledge to accelerate the innovation process (Dahlander and Gann, 2010; West and Bogers, 2014). Research has shown that firms source external knowledge from a variety of sources (such as suppliers, customers or universities) using different kinds of mechanisms (such as scouting, sourcing, licensing or collaboration)

(Chesbrough and Bogers, 2014; Laursen and Salter, 2006).

Open innovation is typically conceptualized as knowledge inflows or outflows at the level of the organizational boundary, with most attention going to the knowledge inflows or inbound part of open innovation—that is, the use of external knowledge sources to accelerate innovation (West et al., 2014). Most empirical work focuses on the firm-level tools and mechanisms for obtaining (searching, enabling, acquiring) external knowledge, while there is also some work on how to integrate and commercialize the resulting innovations—focusing on firm-level attributes, such as absorptive capacity, culture, and competences (West and Bogers, 2014). However, these research streams say little about the role of individuals in open innovation. One exception is the study by du Chatenier et al. (2010), which studied the individual-level competencies that lead to brokering solutions in open innovation. More recently, Salter and colleagues investigated R&D professionals' open innovation challenges and coping strategies (Salter et al., 2014), and another study considered how individuals' openness to external knowledge sources affects their ideation performance (Salter et al., 2015). Interestingly, Dahlander et al. (2016) found that individuals with an external focus are only more innovative (measured by patents) under conditions of high attention allocation to those sources—thus raising further questions about how individuals influence openness within their firm. Moreover, using a sample of Korean SMEs, Ahn et al. (2017) showed that CEOs' characteristics, namely, positive attitude, entrepreneurial orientation, patience and education, can play an important role in facilitating open innovation. Most recently, Rangus and Černe (2017) showed how leadership influence tactics and employee openness affect innovation performance at the individual and team levels.

The lack of focus on individuals' involvement in knowledge flows across the boundary of the firm is at odds with classic work on “gatekeepers.” These are individuals who connect external and internal sources of innovation (Allen, 1977; Tushman and Katz, 1980), and on “absorptive capacity,” in which an organization's ability to evaluate and utilize outside knowledge “will build on prior investment in the development of its constituent, *individual* absorptive capacities” (Cohen and Levinthal, 1990: 131; emphasis added). Additionally, recent evidence suggests that roles enabling individuals to get external knowledge into the firm are becoming more distributed across the organization (Ettlie and Elsenbach, 2007; Whelan et al., 2010).

Individual-level absorptive capacity can be increased through networking, motivation, education and skills (Lenox and King, 2004; Minbaeva et al., 2003) as well as overcoming hindrances to the identification and integration of new knowledge, such as individuals' cognitive biases (Bettis and Prahalad, 1995; Eggers and Kaplan, 2013). Being able to absorb new knowledge is particularly important in the context of innovation, which requires new combinations of previously unconnected pieces of knowledge. Thus, when employees hold increasingly diverse knowledge, this may facilitate the identification and integration of relevant external knowledge to create novel recombinations (Allen, 1977; Cohen and Levinthal, 1990; Mednick, 1962). As such, employees' knowledge bases can be important determinants of a firm's ability to access external sources of knowledge for innovation (Larrañeta et al., 2012; Tsai and Wang, 2008). To address this gap, we theorize how certain individual-level attributes—specifically related to employees' knowledge diversity—aggregate to firm-level use of external knowledge for innovation.

3. Theory and hypotheses

3.1. Human capital and open innovation: considering knowledge diversity

We build our theorizing in relation to the role of individuals in the open innovation process in terms of human capital, that is, the stock of knowledge (including knowledge of social relations, norms, routines, etc., as well as personality attributes) that gives an individual the ability

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