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Unpacking the cross-level effects of tenure diversity, explicit knowledge, and knowledge sharing on individual creativity

Lucy L. Gilson[1]*, Hyoun Sook Lim[1], Margaret M. Luciano[1] and Jin Nam Choi[2]

[1]School of Business, University of Connecticut, Storrs, Connecticut, USA
[2]College of Business Administration, Seoul National University, South Korea

The composition of the workforce with regard to organizational tenure is rapidly changing. In this paper, we examine the cross-level effects of tenure diversity on individual-level creativity. In keeping with the categorization-elaboration model, we propose individual-level explicit knowledge as a mediating mechanism between tenure diversity and individual creativity, and knowledge sharing as moderating the relationship between tenure diversity and individual explicit knowledge. Using a sample of 341 Korean insurance agents from 76 groups, we find that knowledge sharing moderates the relationship between tenure diversity and individual explicit knowledge. Results further support the direction of the hypothesized relationships, with tenure diversity positively influencing individual explicit knowledge at high levels of knowledge sharing and exhibiting a negative influence at low levels. Individual explicit knowledge carries these indirect effects to individual creativity, although directional significance was only found at extremely high and low values.

Practitioner Points

- Tenure diversity is now a fact of organizational life that managers need to embrace. While our results suggest that tenure diversity is positively related to individual creativity, individual explicit knowledge and knowledge sharing play important roles in the association.
- Knowledge sharing appears to be a key boundary condition, which modifies the influence of tenure diversity on individual explicit knowledge. Working in a diverse group is not enough; the knowledge has to be shared.

*Correspondence should be addressed to Lucy L. Gilson, School of Business, University of Connecticut, 2100 Hillside Drive, Storrs, CT 06269-1041, USA (e-mail: lgilson@business.uconn.edu).

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- Individual explicit knowledge mediates the relationship between tenure diversity and individual creativity; it carries a positive indirect effect when knowledge sharing is high and a negative indirect effect when knowledge sharing is low. For complex jobs, where creativity is desired, but much of the work is independent, managers need to encourage employees with diverse levels of tenure to share experiences and ways of performing their tasks.

Groups are becoming more diverse, and managing group diversity continues to be a challenge. This challenge is exacerbated by the fact that research findings in this area are inconclusive and mixed (see Milliken & Martins, 1996; Williams & O'Reilly, 1998 for reviews), suggesting that there is still much we do not know about when and how group diversity influences organizationally relevant outcomes (van Knippenberg & Schippers, 2007). Despite the proliferation of diversity research, one area that has received surprisingly scant consideration is organizational tenure (Jackson, Joshi, & Erhardt, 2003). Tenure refers to the length of time an individual employee has worked for an organization and represents the accumulation of specialized organizationally relevant knowledge and information (Sturman, 2003; Tesluk & Jacobs, 1998). With the changing nature of jobs and work, understanding the effects of tenure diversity is critical as employees now, more than ever before, are willing and able to change jobs resulting in groups that can be comprised of individuals with a range of organizational tenure.

The dynamic nature of jobs, work, and organizations place a premium on the development of new products, processes, and procedures, which requires creativity (Amabile, 1996; Shalley, Zhou, & Oldham, 2004). Creativity has been defined as the production of ideas, products, or procedures that are novel or original, and potentially useful or practical (Amabile, 1996; Shalley, 1991). Theorists claim that diversity should be beneficial for creativity because working with individuals from different backgrounds or with different experiences should provide access to a broader range of knowledge, skills, network ties, and resources (e.g., Milliken, Bartel, & Kurtzberg, 2003; Nemeth, 1986; Perry-Smith & Shalley, 2003; Shin, Kim, Lee, & Bian, 2012). However, results suggest a double-edged sword with diversity sometimes improving, and on other occasions hindering, creative endeavours (Bantel & Jackson, 1989; Choi, 2007; Sethi, Smith, & Park, 2001). These findings, like many others within the diversity literature, suggest that main-effect diversity models may not tell the whole story (van Knippenberg & Schippers, 2007) and that researchers need to consider more complex relationships that capture the 'processes underlying the positive and negative effects of diversity' (van Knippenberg, De Dreu, & Homan, 2004, p. 1008). In this work, we use the categorization-elaboration model (CEM) to examine the relationship between group-level tenure diversity and individual-level creativity. Specifically, we propose that the relationship between group tenure diversity and individual creativity is mediated by individual explicit knowledge, and the relationship between tenure diversity and individual explicit knowledge is moderated by group-level knowledge sharing (see Figure 1).

Tenure diversity

In keeping with the compositional approach (Tsui & Gutek, 1999), we conceptualize diversity as a group-level variable that refers to the degree to which there are differences between individuals on any number of visible, work related, or deep-level characteristics. Diversity plays an important role in groups because individuals categorize themselves and others based on these attributes, and different mixes of said characteristics are purported to affect group interactions and performance (van Knippenberg & Schippers, 2007).

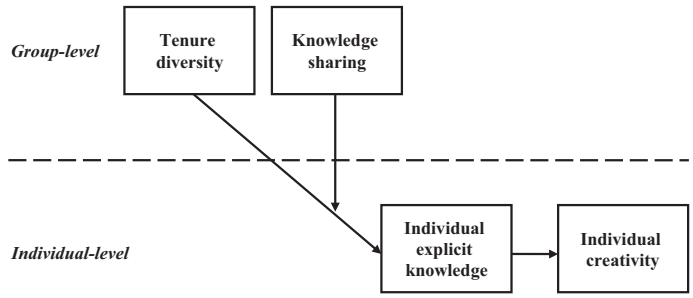

Figure 1. Hypothesized model.

While there are many diversity attributes, organizational tenure is one that has not received much research attention (c.f., Chi, Huang, & Lin, 2009; Jackson *et al.*, 2003). In part, this could be because historically, individuals tended to remain in one organization for most of their career. When individuals' remain in one organization, tenure is highly correlated with age, and prior research suggests that visible demographic characteristics are the first used to categorize individuals into different groups (Pelled, 1996; Tsui, Egan, & O'Reilly, 1992). However, given the fast-paced nature of today's jobs, technology, and the global labour market, individuals now change jobs multiple times during their career-making groups and organizations much more diverse with regard to organizational tenure (OECD, 2010). The US Department of Labor estimates that the average employee will have 10–14 jobs by the age of 38. This change means that older employees may now also be newer employees and that age no longer serves as an accurate proxy for organizationally relevant expertise or tenure. In 2010, roughly half of the working population of North America (Canada, Mexico and the USA) had less than 5 years of tenure with their current employer (OECD, 2010; U.S. Bureau of Labor Statistics, 2010). These numbers are similar for Asia-Pacific (Australia, 59%; Korea, 69%) and Europe (France, 38%, Germany, 39%, United Kingdom, 45%; OECD, 2010).

Unlike industry experience, organizational tenure reflects the length of time an individual has been working at their current organization, and thus, the time when organizationally relevant skills and knowledge can be accrued. Organizational tenure is distinct from job experience (Quinones, Ford, & Teachout, 1995) in that an employee can have a great deal of knowledge regarding how to perform the tasks required for a job, but know very little about a specific organization's systems, means to secure resources, norms, or who to ask for help and assistance (Sturman, 2003). Organizational tenure further reflects knowledge acquired through socialization (Joshi & Jackson, 2003; Rollag, 2004). Employees socialized together share experiences and an understanding of organizational history. Through organizational tenure, individuals acquire tacit and explicit knowledge about firm-specific procedures and practices that can ultimately help job and organizational performance (Nonaka, 1994).

Groups that are diverse with regard to tenure are comprised of individuals who range in the length of time they have worked for an organization. This suggests that a diverse group may have both seasoned members who know how things get done in 'this' organization, the steps that need to be taken, and the people who 'need' to be involved, as well as newcomers who are not yet familiar with the policies, procedures, and systems. In contrast, more homogeneous groups have members who all joined the organization at a similar point in time and therefore have shared experiences when it comes to culture, history, and what has

or has not been done or worked in the past. In this work, we will examine how and when working in a group with diverse tenure influences individual creativity.

Theory and hypotheses

The information/decision-making perspective asserts that diversity is beneficial for creativity because diverse groups have a broader range of knowledge and skills, different perspectives with regard to problem solving, access to a wider network, and a variety of viewpoints (e.g., Bantel & Jackson, 1989; van Knippenberg *et al.*, 2004). However, empirical findings have been mixed (Williams & O'Reilly, 1998). It has been suggested that when teams are highly diverse, members struggle to understand one another and consequently fail to share information, and therefore, the benefits to creativity and innovation are not fully realized (van Knippenberg & Schippers, 2007). Adding to the complexity, research further posits that when teams are homogeneous (less diverse), they are either more likely to share information and take risks – which is beneficial for creativity, *or* struggle to be creative because all members have access to the same information and networks (Jehn, Northcraft, & Neale, 1999). These inconclusive findings are consistent with CEM (van Knippenberg *et al.*, 2004), which integrates the information/decision-making and social categorization perspectives. Consequently, we suggest CEM may be a more appropriate lens through which to examine the relationship between tenure diversity and creativity.

The CEM posits that because diversity can have both positive and negative effects on group outcomes, it is important to consider the processes through which diversity affects outcomes in conjunction with moderators of these relationships. More specifically, CEM argues that attention needs to be given to the information processing (elaboration) that takes place between those who have access to divergent information (diversity) and outcomes, as well as what might amplify or hinder information elaboration (van Knippenberg *et al.*, 2004). To date, CEM research has primarily examined group-level outcomes (e.g., Homan *et al.*, 2008; Kearney, Gebert, & Voelpel, 2009), and yet, many individuals who work as a part of a group have individual performance goals and rewards (Pearsall, Christian, & Ellis, 2010; Siemsen, Balasubramanian, & Roth, 2007). Therefore, in this work, we adopt a cross-level focus to extend prior work on CEM by examining an individual-level outcome (creativity) and seeking to understand how and when tenure diversity affects individual creativity through individual explicit knowledge and group knowledge sharing. Understanding individual creativity is important because it is a mean through which employees can create value for an organization (George, 2007). Furthermore, individual creativity has a positive association with individual job performance (e.g., Gong, Huang, & Farh, 2009) and team creativity (Tagger, 2002).

In the remainder of this paper, we examine how and when tenure diversity influences individual creativity. In particular, we start with a discussion on the moderating effect of knowledge sharing on the tenure diversity – individual explicit knowledge association. Specifically, we argue that working in a group that is diverse with regard to tenure will only affect individual explicit knowledge when knowledge sharing takes place. Simply being exposed to others with differing levels of tenure will not, on its own, affect an individual's stock of explicit knowledge. Following this, we examine the relationship between explicit knowledge and creativity. Although a positive association between domain-relevant skills and creativity is at the foundation of the componential model of creativity (Amabile, 1983; Conti, Coon, & Amabile, 1996; Ruscio, Whitney, & Amabile, 1998; Tagger, 2002), when skills are conceptualized as knowledge, this association has

received less attention. Lastly, we put the model together and propose that individual explicit knowledge will carry the indirect effects of the interaction of tenure diversity and knowledge sharing to individual creativity.

Moderating role of knowledge sharing

Extending Nonaka and Takeuchi's (1995) knowledge creation model, we define explicit knowledge as knowledge that is developed or formulated into a comprehensive or in-depth understanding rather than a 'general idea' of how things work. In other words, explicit knowledge can be specifically related to an industry, job, or domain. For example, in the insurance industry, sales agents need to have knowledge on the industry as well as the specific products and services their firm offers. This specific knowledge is at the core knowledge required in the insurance industry (Fan & Cheng, 2006). Individuals acquire this explicit knowledge in many different ways. For instance, explicit knowledge is gained through direct experiences such as academic learning or on the job training (Leonard-Barton, 1998; Tracey, Tannenbaum, & Kavanagh, 1995). In addition, explicit knowledge also can be obtained through interacting with others who have different experiences and expertise (Boud & Middleton, 2003; Felstead *et al.*, 2005; Karlsson, Anderberg, Booth, Odenrick, & Christmansson, 2008). Therefore, individual explicit knowledge is based upon both acquired knowledge and an awareness of said knowledge. Consequently, possessing explicit knowledge also can mean being aware of where knowledge resides. Because individuals with varying levels of tenure have different levels of organizationally specific knowledge and information, working in diverse groups should have the potential to influence individual explicit knowledge.

In groups, it has been argued that it is not necessary for any one individual to possess knowledge about everything, but rather the key is knowing who in the group has the necessary pieces of information or expertise. This understanding of who knows what is referred to as transactive memory (Austin, 2003; Lewis, 2003). Transactive memory requires that an understating of where knowledge resides within a group is shared between members. Research on transactive memory systems suggests that team performance is enhanced not when everyone knows everything, but when members are clear as to who knows what and who to turn to when they need a specific piece of information (Austin, 2003; Lewis, 2003). However, this distributed relationship is ineffective unless the information is shared.

The basic premise of the information/decision-making perspective is that diverse groups allow members access to non-overlapping knowledge and resources which should be beneficial for creativity (Ancona & Caldwell, 1992; Hoffman, 1959; Williams & O'Reilly, 1998). What this framework does not directly state is that this non-overlapping knowledge first needs to be shared. Knowledge sharing is defined as 'the provision or receipt of task information, know-how, and feedback regarding a product or procedure' (Cummings, 2004, p. 352). Prior research suggests that information sharing is a necessary, but not sufficient precursor to individual creativity (Augier, Shariq, & Vendelo, 2001; Paulus, 2000). In other words, it is only when knowledge is shared that individuals are able to access to non-overlapping information from others in their groups (Richter, Hirst, van Knippenberg, & Baer, 2012). However, when knowledge is not shared, the effect of diversity may become negative (Richter *et al.*, 2012) because new information is limited or even non-existent. Thus, working in diverse groups where knowledge is not shared is more likely to result in categorization processes rather than information elaboration process.

The CEM proposes that for a positive relationship between diversity and outcomes to ensue, group members need to 'elaborate upon task-relevant information and perspectives'

(van Knippenberg *et al.*, 2004, p. 1010) and that this relationship depends on moderator variables that are information/decision-making processes (van Knippenberg *et al.*, 2004). In our model, we propose that the tenure diversity – explicit knowledge relationship is moderated by knowledge sharing. Working in groups that are more diverse with regard to amount of tenure means working with others who possess different knowledge, skills, and perspectives, which in turn can enhance an individual's explicit knowledge, but only when knowledge is shared. In other words, high levels of sharing serve to amplify a positive association between the amount of tenure diversity and individual explicit knowledge. In contrast, when knowledge is not shared, the relationship between tenure diversity and explicit knowledge is dampened. In this latter instance, individual group members hold onto their own expertise, and the opportunity to add to one's explicit knowledge is missed. Therefore, we propose that the nature of the relationship between tenure diversity and explicit knowledge is moderated by knowledge sharing.

Hypothesis 1: Knowledge sharing moderates the relationship between tenure diversity and individual explicit knowledge, such that the relationship is (a) positive when knowledge sharing is high and (b) negative when knowledge sharing is low.

Individual explicit knowledge and individual creativity

One of the dominant frameworks in the creativity literature is Amabile's (1996) componential model. This model argues that to be creative, individuals must have domain-relevant skills, meaning they must understand the processes and procedures necessary to complete their work (Conti, Coon, & Amabile, 1996; Tagger, 2002). In other words, to be creative, individuals must have a substantial level of knowledge about a domain, job, or task. As mentioned previously, explicit knowledge refers to an in-depth or comprehensive understanding of a field, specific job, domain, or industry. For example, Fan and Cheng (2006) identified the explicit knowledge of insurance agents using the Delphi technique to delve into the competencies essential for successful performance. Applying the logic from the componential model of creativity, individual explicit knowledge can be conceptualized as a raw material or input necessary for creativity. Individuals who possess high levels of explicit knowledge should have a more fully developed understanding of their domain, work, or job and be able to evaluate and incorporate new information, play with ideas, and generate creative ideas. The definition of creativity entails both novelty and usefulness and having explicit knowledge should allow individuals to be creative rather than 'foolish' (March, 1976). Prior research has argued that with experience (Tripsas, 1997), individuals are better equipped to generate novel and appropriate solutions (Mumford & Gustafson, 1988; Simonton, 1999). Therefore, we propose that individual explicit knowledge will be positively associated with individual creativity.

Hypothesis 2: Individual explicit knowledge is positively related to individual creativity.

Tenure diversity, explicit knowledge, knowledge sharing, and individual creativity

Thus far, we have hypothesized that the relationship between tenure diversity and explicit knowledge is moderated by knowledge sharing and that explicit knowledge is positively associated with individual-level creativity. In keeping with CEM and the *value-in-diversity* approach, in this final section, we put these parts together and hypothesize a mediated moderation.

At the group level, both CEM and creativity research propose that diversity can be beneficial because it stimulates cognitive processes and information elaboration (Hülsheger, Anderson, & Salgado, 2009; van Knippenberg & Schippers, 2007; Perry-Smith, 2006). We extend this logic to the individual level and suggest that working in groups that are diverse with regard to amounts of organizational tenure *should* increase exposure to and awareness of different perspectives, points of view, and experiences. When knowledge is shared, working in groups with members who have different amounts of organizational tenure should add to an individual's stock of explicit knowledge because of the accessibility to non-overlapping knowledge (Richter *et al.*, 2012). In turn, this will result in new ways of thinking through a problem or creative approaches to work (e.g., De Dreu & West, 2001; Nemeth, 1986). Creativity requires that individuals understand what has been done and what can be done, before they strive to set new boundaries (Sternberg & O'Hara, 2000). With regard to tenure diversity, it *should* be beneficial to work with individuals who know what has previously been done in the organization, or how things get done so that time is not wasted trying approaches or working on ideas that have not worked in the past. Conversely, it also may be beneficial to work with individuals who have limited organizational knowledge, do not have prior experiences, and are not bound by what has or has not been done or worked before.

However, as argued previously, simply being exposed to individuals with different levels of organizational tenure does not guarantee that explicit knowledge will be positively affected or that creativity will ensue. In other words, knowledge sharing is necessary to facilitate the positive association. In contrast, when knowledge is not shared, the relationship might in fact turn negative (Parkhe, 1991; Richter *et al.*, 2012). Stated differently, when working with individuals who are diverse and knowledge is not shared, individuals do not get the benefits of information elaboration necessary to add to their explicit knowledge and subsequently enhance creativity. Therefore, working in a diverse group where information is not shared can result in the negative categorization attributions rather than the information elaboration benefits. Research on transactive memory systems suggest that how teams use knowledge is a key to their success and that the presence of knowledge alone is not enough (Austin, 2003). Therefore, we propose that group-level diversity and knowledge sharing, through explicit knowledge, will influence individual creativity.

Hypothesis 3: The indirect effect of tenure diversity on individual creativity via individual explicit knowledge is moderated by knowledge sharing, such that the indirect effect is (a) positive when knowledge sharing is high, (b) negative when knowledge sharing is low.

Method

Data collection

Data were gathered as a part of larger research project at a Korean insurance company. Of the 1,830 questionnaires distributed to employees and branch managers, 1,077 (912 employees and 165 managers) were returned for a response rate of 59%. However, only employees whose survey could be matched to their managers were retained (N = 341 employees and 76 groups). To verify whether our sample was representative of the population, we compared the two samples and found there were no significant differences with regard to the gender (.45 vs. .50; t [1067] = 1.53, *n.s.*), age (39.77 vs. 39.50; t [1067] = .41, *n.s.*), education (1.56 vs. 1.59; t [1067] = .56, *n.s.*), or organizational tenure (3.74 vs. 3.93; t [1067] = .57, *n.s.*).

Employees in this study are insurance agents who work in complex competitive jobs in a rapidly changing industry.[1] In the organization we studied, the job complexity is increased as the company is frequently introducing new products, while existing products can be altered to fit specific customer needs. On the whole, agents work independently – their goal is to sell products to new and existing clients and to maintain client relationships. Performance (pay and merit) is based solely on their individual sales numbers. However, employees are all members of groups who share resources, have a single manager, and all training is conducted in groups, thus necessitating interaction and cooperation among members. Prior to our data collection, the company participated in a large government-funded programme to implement life-long learning practices for creativity and innovation. This programme focused on getting agents to talk more to one another, share ideas and suggestions, and continue to learn new approaches to performing their jobs.

Measures

Tenure Diversity was calculated based on employee tenure that was reported as the number of years and months the employee had worked for the current organization. Tenure scores ranged from 1 month to 23 years (mean = 3.93 years, *SD* = 4.85). In our sample, 75% of the employees had less than 5.12 years of tenure (positively skewed) which is the norm for this industry where there is a great deal of turnover within the first 5 years. At the same time, we have a range of tenure among employees which allows us to model the effect of tenure diversity on individual creativity.

Tenure diversity is conceptually defined as a variable that separates employees based on the length of time they have worked at the organization (separation). Therefore, aligned with our conceptual definition, group diversity was calculated using the group-level standard deviation. Accordingly, tenure diversity was calculated as follows:

$$\text{Tenure diversity} = \sqrt{\frac{(S_i - S_{\text{mean}})^2}{n}}$$

where S_i is a focal individual's tenure, S_{mean} is the aggregated mean tenure of individual in the work group, and n is the total number of respondents in the work group. Higher scores indicate that the work group is more diverse, as compared to other groups. In our analysis, we also included the group-level mean as a control to account for the variance from the amount of tenure and isolate the effect of tenure diversity (see Choi, 2007 for an example). Tenure diversity scores ranged from .11 to 10.82 years (mean = 3.52 years, *SD* = 2.62).

Individual explicit knowledge was measured using modified items based on prior research on competence in the insurance industry (Fan & Cheng, 2006). To adapt this measure for our Korean sample, we piloted Fan and Cheng's four items on knowledge relevant to the insurance industry; professional knowledge of insurance and finance, know-how for customer service, computer application skill, and expert knowledge of insurance products to a sample of nine supervisors and 41 employees (n = 50). To

[1] *To validate the nature of the occupation of insurance agents, we extracted the occupational profile of insurance agents from O*NET, an occupational information resource database provided by the United States Department of Labor, According to O*NET, the nature of insurance agents' occupation is highly competitive and requires complex problem solving in their tasks.*

determine the applicability of item content, we asked a series of open-ended questions asking for examples of the job knowledge necessary for success. Results suggested agents should have knowledge regarding the industry, products, and customer service; however, computer application was not listed as a relevant job skill in this context. Based on these results, explicit knowledge was measured with three items (α = .81), 'To what extent do you possess knowledge regarding your (1) profession, (2) industry products, and (3) customer service?' Responses were coded using a six-point Likert-type scale ranging from 1 'very little' to 6 'a lot.'

Knowledge sharing was measured using three items based on the work of Faraj and Sproull (2000) that captures the extent to which individuals perceive that *their group* engages in knowledge sharing behaviours (α = .95). Sample items include 'Knowledge and skills in my group are substantially shared in problem solving,' and 'There is exchange of information, and sharing of knowledge among my group members.' Responses were coded using a six-point Likert-type scale ranging from 1, 'strongly disagree' to 6 'strongly agree.' Within-group inter-rater agreement averaged across work groups, $r_{wg(j)}$ (James, Demaree, & Wolf, 1993), and intra-class correlations (ICCs) were used to ascertain the appropriateness of aggregation (Chen, Mathieu, & Bliese, 2004). The median value $r_{wg(j)}$ was .94 (range = 0.00–1.00), and 91% of the groups reported an $r_{wg(j)}$ above the .70, which is sufficient to support the use of this measure at the group level. The ICC (1) and ICC (2) were .40 and .57, respectively, also lending support to aggregation.

Individual creativity was ascertained by asking managers to rate each employee using Janssen's (2000) first three items. These items all deal with idea generation, which is consistent with our definition of creativity. Items include '(*employee name*) generates new ideas for difficult issues,' '(*employee name*) searches out new working methods, techniques, or instruments,' and '(*employee name*) generates original solutions for problems.' Responses were coded using a six-point Likert-type scale ranging from 1 'strongly disagree' to 6 'strongly agree' (α = .94).

Covariates

We collected additional demographic information to control for a number of individual differences that are indicators of diversity; age, gender, and education level. These variables were modelled at both the individual- and group levels. Gender and educational diversity were calculated using an entropy-based index (Teachman, 1980);

$$H = -\sum_{i=1}^{n} P_i(\ln P_i)$$

where i is a particular category, n is the total number of possible categories, and P_i is the probability that a member of the particular category is a part of the group. Additionally, we collected group size, as it has the potential to increase the knowledge pool (Gilson & Shalley, 2004; Taylor & Greve, 2006). In accordance with Becker (2005), we tested for the significance of the potential covariates (individual age, gender, education; group size, group mean age, age diversity, gender diversity, and educational diversity) on individual creativity: all relationships were non-significant. Therefore, these covariates were not included in the subsequent analyses.

Analytic strategy

Given the multi-level nature of our study, we first computed a null model for our individual-level outcome variable to examine the systematic variability of between-group variance (Raudenbush & Bryk, 2002). The null model indicated that 39.05% of the total variance in individual creativity resided between groups, which provides sufficient variance to test for cross-level effects. Following the procedure proposed by Zhang, Zyphur, and Preacher (2009) for testing multi-level mediation using hierarchical linear models (Raudenbush & Bryk, 2002), the effects of tenure diversity on individual creativity were assessed using a series of equations in intercepts- and slope-as-outcomes models (See Table 1). Notably, we adhered to suggestions regarding group mean centering of level 1 variables and reintroducing the means at level 2 to address the possible confounding of within-group and between-group effects in the context of multi-level mediation. Prior to centering any variables, we computed Z scores to facilitate comparisons of the magnitudes of effects across levels of analysis (Mathieu, Aguinis, Culpepper, & Chen, 2012; Mathieu & Taylor, 2007).

Results

Means, standard deviation, correlations, and internal consistency reliabilities (α) are reported in Table 2. Because individual explicit knowledge and group knowledge sharing were obtained from the same source, prior to hypotheses testing, we examined the discriminant validity of these variables. We conducted a confirmatory factor analysis

Table 1. A Series of equations in intercepts- and slopes-as-outcomes models for the meso-mediation with moderation

	Step 1	Step 2	Step 3
2-1-1	Model 1	Model 2	Model 3
Model with Moderator	L 1: Individual creativity$_{ij}$ = β_{0j} + β_{1j} (tenure$_{ij}$−aggregated tenure$_{ij}$) + r_{ij} L 2: β_{0j} = γ_{00} + γ_{01} (aggregated tenure$_j$) + γ_{02} (tenure diversity$_j$) + γ_{03} (knowledge sharing$_j$) + γ_{04} (tenure diversity × knowledge sharing$_j$) + u_{0j} β_{1j} = γ_{10}	L 1: Individual explicit knowledge$_{ij}$ = β_{0j} + β_{1j} (tenure$_{ij}$−aggregated tenure$_{ij}$) + r_{ij} L 2: β_{0j} = γ_{00} + γ_{01} (aggregated tenure$_j$) + γ_{02} (tenure diversity$_j$) + γ_{03} (knowledge sharing$_j$) + γ_{04} (tenure diversity × knowledge sharing$_j$) + u_{0j} β_{1j} = γ_{10}	L 1: Individual creativity$_{ij}$ = β_{0j} + β_{1j} (tenure$_{ij}$−aggregated tenure$_{ij}$) + β_{2j} (individual explicit knowledge$_{ij}$ −aggregated explicit knowledge$_{ij}$) + r$_{ij}$ L 2: β_{0j} = γ_{00} + γ_{01} (aggregated tenure$_j$) + γ_{02} (aggregated explicit knowledge$_j$) + γ_{03} (tenure diversity$_j$) + γ_{04} (knowledge sharing$_j$) + γ_{05} (tenure diversity × knowledge sharing$_j$) + u_{0j} β_{1j} = γ_{10} β_{2j} = γ_{20}

Note. The equations are adapted from Zhang *et al.* (2009) and are revised for our meso-mediation with moderation testing.

(CFA) using AMOS 19 with maximum-likelihood estimation procedures. According to the guidelines established by Mathieu and Taylor (2006), our two-factor CFA model yielded sufficient fit to the data [$\chi^2(8) = 14.29$, *n.s.*; CFI = .98; SRMR = .06], and all indicators exhibited significant ($p < .01$) relationships with their intended latent variable. Next, we tested the alternative model where all items loaded onto a single factor. This model resulted in a poor fit to the data [$\chi^2(9) = 69.85, p < .01$; CFI = .82; SRMR = .36]. Finally, a chi-square difference test confirmed that the two-factor model achieved a significantly better fit [$\Delta\chi^2(1) = 55.56, p < .01$].

Results from the tests of our cross-level meditational model are summarized in Table 3. Hypothesis 1 predicts that knowledge sharing moderates the relationship between tenure diversity and individual explicit knowledge such that the relationship is (a) positive when knowledge sharing is high and (b) negative when knowledge sharing is low. As shown in model 2, the overall interaction between tenure diversity and knowledge sharing on individual explicit knowledge was significant ($\gamma = .12$, $SE = .06$, $p < .05$) and explained 9% of the variance in individual explicit knowledge.

To understand the nature of the moderation, we used simple slopes computations and graphed the interaction using 'high' (1 *SD* above the mean) and 'low' (1 *SD* below the mean) values, following the procedure recommended by Aiken and West (1991). Although the slopes at high (+1 *SD* above the mean) and low levels (−1 *SD* below the mean) of knowledge sharing were in the hypothesized directions (see Figure 2), the simple slope tests were not significant (high knowledge sharing $\gamma = .09$, t = 0.9, *n.s.*; low knowledge sharing $\gamma = -.15$, $t = -1.5$, *n.s.*). We further examined the directionality of the interaction, by computing the simple slopes using the Johnson–Neyman technique. The results derived using this technique suggest that when the coefficient is less than the lower bound, it is significant and negative, when the coefficient is between the lower and upper bounds, it is not significant, and when the coefficient is greater than the upper bound, it is significant and positive (Preacher, Curran, & Bauer, 2006). Using the 95% region of significance, the lower bound was -1.41, and the upper bound was 1.91. In our sample of 76 groups, 7 (9.2%) were below the lower bound, 69 (91.8%) were between the bounds, and 0 (0.0%) were above the upper bound. Together, these results lend some support to hypothesis 1 as knowledge sharing significantly moderates the relationship between tenure diversity and individual explicit

Table 2. Descriptive statistics, correlations, and reliability coefficients

Variables	*M*	*SD*	1	2	3	4	5	6
Individual level[a]								
1 Individual creativity	3.97	1.15	(.94)					
2 Tenure	3.93	4.85	.12	–				
3 Individual explicit knowledge	3.77	0.89	.17	.25	(.81)			
Group level[b]								
4 Aggregated tenure	3.93	2.96	.04	.61	.11	–		
5 Tenure diversity	3.52	2.62	.13	.49	.09	.81	–	
6 Knowledge sharing	4.23	1.04	.05	−.02	.11	−.03	.01	(.95)

Note. An interpretation of the correlations should be conducted with caution because cross-level correlations were calculated by assigning average group scores to all members and were not adjusted for lack of independence.

Internal consistency reliabilities (α) are in parentheses. [a]$N_{individual} = 341$. [b]$N_{group} = 76$.

If $|r| \geq .11$, $p < .05$; if $|r| \geq .17$, $p < .01$.

Table 3. Level 2-1-1 model with moderator results

	Individual creativity				Individual explicit knowledge	
	Model 1		Model 3		Model 2	
Predictor	Coefficient	*SE*	Coefficient	*SE*	Coefficient	*SE*
Individual level						
Tenure	.17**	.04	.14**	.04	.28**	.06
Individual explicit knowledge (CWC)	–	–	.11*	.05	–	–
Group level						
Aggregated tenure	−.26†	.14	−.29*	.14	−.07	.15
Aggregated explicit knowledge	–	–	.35	.21	–	–
Tenure diversity	.30*	.12	.32*	.14	−.03	.11
Knowledge sharing	.07	.08	.03	.10	.10*	.05
Interaction						
Tenure diversity x Knowledge sharing	−.08	.10	−.12	.10	.12*	.06
~R^2	.06		.09		.09	

Note. All variables are standardized. †$p < .10$, *$p < .05$, **$p < .01$.
~R^2 calculations were computed following Snijders and Bosker (1999) formulas.

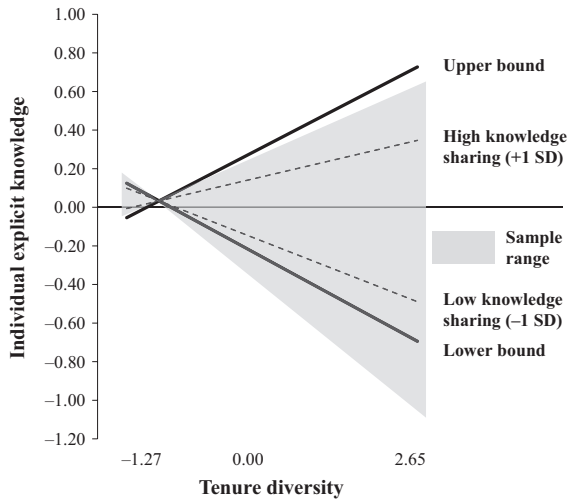

Figure 2. Tenure diversity – knowledge sharing interaction on individual explicit knowledge.
Note. Upper and lower bound of knowledge sharing in our sample were computed using the Johnson–Neyman technique. Using the 95% region of significance, the lower bound was at −1.41 *SD*, and the upper bound was at 1.91 *SD*.

knowledge in the expected directions. Specifically, evidence for a significant negative effect (H1b) was sparse, whereas a significant positive effect (H1a) was not displayed potentially due to range restrictions in our data.

Hypotheses 2 proposed a positive relationship between individual explicit knowledge and creativity. In model 3, when explicit knowledge was added as a predictor of individual creativity, the relationship was positive and significant ($\gamma = .11$, $SE = .05$, $p < .05$). Thus, hypothesis 2 was fully supported.

Lastly, we tested whether the interaction effect of tenure diversity and knowledge sharing was related to individual creativity via its influence on individual explicit knowledge. To test whether the moderation is mediated, we used the Monte Carlo method (a form of parametric bootstrapping) for constructing confidence intervals (CI) for indirect effects as recommended by Bauer, Preacher, and Gil (2006). Using the beta coefficients and standard errors from Table 3, we created 20,000 iterations using the interactive tool created by Selig and Preacher (2008). Researchers have advocated using bootstrapping tests for multilevel mediation effects (e.g., MacKinnon, Lockwood, & Williams, 2004), particularly for variables that are not normally distributed (Pituch & Stapleton, 2008).

We began probing the nature of this mediated moderation by computing the confidence interval of the indirect effect for the entire sample; the 95% CI included zero [−.0013, .0376]. Given the relatively low power of our statistical analysis, in part attributable to the small number of groups (j = 76) and average individuals per group ($n_{average}$ = 4.49) in our sample (Mathieu *et al.*, 2012), we also tested for mediation using the 90% CI [.0002, .0325] and obtained *marginal* support for an overall mediated moderation. The results of simulation studies by Bauer *et al.* (2006) suggest that for smaller sample sizes, the standard errors of the average indirect effect estimate are overestimated producing CIs that are too wide and thus more likely to include zero (p. 150). Although a 90% CI may more appropriately balance Type I and Type II errors, we still advocate interpreting this result with caution as a complete understanding of the factors influencing statistical power in multilevel designs are still being investigated (Mathieu & Chen, 2011, p. 631).

To more fully explore the indirect effects at high and low levels of knowledge, we next used the non-significant simple slopes values at +1/−1 *SD*; the indirect effects were accordingly, not significant (knowledge sharing +1 *SD*: 90% CI: [−.0114, .0371], knowledge sharing −1 *SD*: 90% CI: [−.0469, .0050]). However, using the values at the lower bound simple slope computed using the Johnson–Neyman technique (−1.41), we found evidence of a marginally significant negative indirect effect at low levels of knowledge sharing (90% CI: [−.1061, −.0022]). As the upper bound computed using the Johnson–Neyman technique (1.91) was beyond the range of our data set, we tested the indirect effects at high levels of knowledge sharing using the maximum value of knowledge sharing (1.64) in our data set; we found evidence of a marginally significant positive indirect effect at the highest levels of knowledge sharing (90% CI: [.0010, .0509]). These results provide marginal support for H3a and H3b, but only at very high and very low amounts of knowledge sharing.

In sum, our results provide support for the influence of tenure diversity on individual explicit knowledge being moderated by the group's level of knowledge sharing, which in turn influences individual creativity. We found limited support for positive effects at high levels of knowledge sharing and slightly stronger support for negative effects at low levels of knowledge sharing. However, these directional effects only obtained significance towards the extremes of our data range.

Discussion

With the changing nature of work and jobs, tenure diversity will, over next few years, become a topic that more and more managers need to understand and hopefully embrace. In this work, we seek to unpack the relationship between tenure diversity and individual

creativity. Although many individuals work closely with others, share resources, and are trained as a part of a group, they are often rewarded and incentivized based on individual-level performance. However, because employee creativity can substantially contribute to organizational innovation, effectiveness, and survival (Amabile, 1996; Shalley *et al.*, 2004), understanding the relationship between group-level diversity and individual creativity is an important contribution to research and theory.

In extending CEM to the individual level, we unpack the cross-level effects of tenure diversity, explicit knowledge, and knowledge sharing on individual creativity. Specifically, we find that knowledge sharing significantly moderates the relationship between tenure diversity and individual explicit knowledge. With a more fine-grained examination of the nature of the moderation, we find limited support for the positive effect at high levels of knowledge sharing; however, we find slightly stronger support for the negative effect of tenure diversity on explicit knowledge at low levels of knowledge sharing. As the specific directional effects only obtained significance towards the extremes of our data range, the overall moderation results need to be interpreted with caution. What these results suggest is that, while the main-effect models might not always work, the more complex associations are truly 'messy.' One reason for this messiness may be the range restriction in our knowledge sharing variable. This restriction in range means that the specific directional effects would likely be stronger if more groups had relatively higher and lower levels of knowledge sharing than were included in our data.

The relationship between individual explicit knowledge and individual creativity was fully supported, allowing us to test the fully mediated moderation model. In testing the full model, we find that the influence of tenure diversity on individual explicit knowledge is moderated by the group's level of knowledge sharing, which in turn leads to individual creativity. Again, some of these effects were only visible in the outer bounds of our data – as with all data, ours has some limitations, and therefore, we urge future researchers to embrace the complexity and continue to further examine cross-level mediated moderation relationships.

Theoretical implications

Based on the value-in-diversity and information/decision-making approaches, it is usually assumed that diversity will be beneficial for creativity because it increases the knowledge pool, range of experiences, and networks that members are able to access. However, results have not always supported this contention (van Knippenberg & Schippers, 2007; Milliken & Martins, 1996; Williams & O'Reilly, 1998), and limited work has been able to explain the inconclusive findings (van Knippenberg & Schippers, 2007). Using CEM and extending it to the individual level, we propose and find that the relationship between tenure diversity and individual creativity is mediated by individual explicit knowledge is moderated by the group's level of knowledge sharing. From a theoretical standpoint, it is intriguing to find both (a) the positive relationship between tenure diversity and explicit knowledge when knowledge sharing is extremely high and (b) the negative relationship when knowledge sharing is low in the same sample. Fully consistent with CEM logic, our findings provide a theoretical contribution to diversity research in that CEM should be further used in cross-level research.

Knowledge is posited as important in both the diversity and creativity literatures. For instance, the creativity literature has long argued that domain-relevant skills are necessary for creativity (Amabile, 1983, 1996). Additionally, the diversity literature argues that many of the benefits of diversity result from the knowledge and information

obtained from different others (Williams & O'Reilly, 1998). In addition, to building awareness and understanding of different perspectives, working with diverse others also may make individuals more aware of the knowledge they already possess. In effect, having to explain one's point of view to others with different perspectives also can expand one's explicit knowledge. Our findings add to these domains by providing empirical support for the positive relationship between explicit knowledge and individual creativity.

Taken together our results advance diversity research, in particular, the area of tenure diversity, in that we demonstrate *how* and *when* tenure diversity affects individual creativity by extending CEM to the individual level.

Practical implications

Organizations are frequently looking for employee creativity as a means to drive innovation, and ultimately organizational success and viability. Our results indicate that working in groups with members of diverse tenure positively influences individual creativity, which suggests that where possible, managers should construct groups to maximize tenure diversity when creativity is a desired outcome.

Furthermore, we find that the effects of tenure diversity are enhanced when members share knowledge, suggesting that at the group-level managers need to encourage knowledge sharing as a means to enhance the positive association between tenure diversity and explicit knowledge on individual creativity. For managers, this means working to increase opportunities for knowledge to be shared. One possible way to facilitate knowledge sharing is through group training sessions and meetings where communication is encouraged. The organization in our study implemented life-long learning practices for all employees working in groups. Specifically, once a week learning sessions were conducted where group members got together and discussed different aspects of product knowledge or sales strategies. By setting up these sessions and providing employees time and opportunities to communicate with other members, knowledge is more likely to be shared in groups.

Limitations and future research directions

As with all research, the present study has a number of limitations. First, while using field data collected from several respondents is a strength of our study, we were only able to analyse data from 37.39% of the original sample. Work by Allen, Stanley, Williams, and Ross (2007) demonstrates that the true effects of predictors are likely to be underestimated when response rates are low or when analysing incomplete data. Given this, one possible explanation for some of the weak effects might be attributed to response rate and loss of data in the analyses. That said, given that this is field data our response rate is comparable with other studies (e.g., Choi, 2007; Tsui, Porter, & Egan, 2002; Tsui *et al.*, 1992). In addition, the data in our study are cross-sectional; therefore, we are unable to examine whether over time, tenure diversity increases explicit knowledge, and whether these changes impact creativity. We encourage future researchers to design longitudinal field studies to examine the nature of these relationships.

A second limitation is our measurement of explicit knowledge. Owing to the lack of empirical work in this area, we adapted previous work that had examined competences in the insurance industry (Fan & Cheng, 2006). Furthermore, a pilot test was conducted to both verify and improve the accuracy of the measure; however, future work should

consider the explicit knowledge construct in more depth. For example, there could be trade-offs between industry-, job-, and organization-specific knowledge that warrant additional consideration. Also, as our measure of knowledge is collected from employees using survey items, future research is needed to confirm our model using a more objective measures of knowledge.

Third, the present study only examined organizational tenure diversity. Group, industry, and other forms of tenure also may be related to individual creativity via explicit knowledge and knowledge sharing. Prior diversity research has found that the amount of time an individual has worked in an industry could be as or more relevant than how long they have worked for a specific organization. Unfortunately, we did not have these variables in our data, but we urge future researchers to consider them with creativity and other outcome measures. Furthermore, we speculate relationships we found here also may apply to numerous other types of functional (e.g., department affiliation, work location) diversity. However, we caution that there are likely additional contextual moderators that determine whether the diverse knowledge, skills, abilities, and perspectives of group members can be transferred or transformed into enhanced individual creativity.

Conclusion

In conclusion, our findings suggest that for individual creativity, tenure diversity matters. More importantly, the associations are cross-level with explicit knowledge serving as a mediating mechanism and knowledge sharing as a moderator in the group tenure diversity –individual creativity relationship. In this study, we reveal both positive and negative effects of tenure diversity, emphasizing the importance of moving beyond main effects associations, and considering more complex models. Overall, our study extends the contentions made by CEM, that there is value-in-diversity. For tenure diversity, this value occurs when knowledge is shared, via its influence on individual explicit knowledge.

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