Unraveling the impact of workforce age diversity on labor productivity : the moderating role of firm size and job security

UNRAVELING THE IMPACT OF WORKFORCE AGE DIVERSITY ON LABOR PRODUCTIVITY: THE MODERATING ROLE OF FIRM SIZE AND JOB SECURITY

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Previous literature has suggested both positive and negative effects of age diversity on labor productivity: positive because of the potential knowledge complementarities between employees of different ages, negative because of the age-related value differences that might reduce cohesion and cooperation, hampering firm performance. Using a Belgian sample of 5,892 organizational observations (2008-2011), we unraveled these countervailing effects in two ways. First, we built on prior studies to suggest that the effect of age diversity depends on the particular shape of the age distribution: positive when it is heterogeneous (i.e., variety) and negative when it is polarized (i.e., polarization). This was supported by our findings. Second, we explored the moderating impact of two contextual contingencies, firm size and job security. As expected, the positive effect of age variety is reinforced in large firms and in firms where job security is high. Although firm size also emphasizes the negative effect of age polarization on productivity, job security, unexpectedly, does not moderate this relationship. Our study offers a valuable contribution to the literature as it reveals the boundary conditions of the competing implications of age diversity and, thus, allows one to account for the inconclusive findings reported in previous literature.

INTRODUCTION

One of the key contemporary challenges facing developed societies is the aging of their populations, which also has an irrevocable effect on the workforce age composition within organizations (European Commission, 2012). People are generally working longer and

organizations are retaining older employees, resulting in increased age diversity on the work floor. These trends recently spurred researchers to investigate the implications of employee age diversity in relation to organizational performance (Grund & Westergaard-Nielsen, 2008a; Kunze et al., 2011).

Research on demographic diversity in teams and organizations, including age diversity, builds on two competing theoretical perspectives, implying that diversity is a double-edged sword with both positive and negative effects on organizational performance (Grund & Westergaard-Nielsen, 2008a; Kunze et al., 2011; Kunze, Boehm, & Bruch, 2013; van Dijk & van Engen, 2013; Williams & O'Reilly, 1998). On the one hand, to the extent that age diversity creates a pool of complementary age-specific knowledge and skill-based differences, potential synergies can be realized (Horwitz & Horwitz, 2007; Lazear, 1999; Williams & O'Reilly, 1998). According to the information/decision-making perspective, mixing people of different ages could, therefore, stimulate employee creativity, problem-solving capacity, decision-making quality, employee productivity, and ultimately organizational performance. On the other hand, based on theories of social similarity and categorization, demography researchers have argued that age diversity may also entail differences in values which might hamper cohesion, social integration, and cooperation among employees (Byrne, 1971; Carton & Cummings, 2012; van Dijk & van Engen, 2013), ultimately reducing organizational performance.

Given these competing forces it is not surprising that empirical research on the performance effects of demographic diversity in general and age diversity in particular is fragmented and inconclusive (Grund & Westergaard-Nielsen, 2008a; Harrison & Klein, 2007; Klein & Harrison, 2007; Kunze et al., 2011; van Dijk & van Engen, 2013). For example, Kunze et al., (2011) reported that age diversity has a negative effect on firm performance, mediated by affective commitment. Grund and Westergaard-Nielsen (2008a), in contrast, found that age

diversity has an inverted U-shaped relationship with labor productivity.

Taken together, these inconclusive findings "may be traced back to researchers' neglect of possible mediators and moderators in the relationship between age diversity and outcomes in the studies on organizational demography" (Kunze et al., 2011, p. 265). While Kunze et al. (2011) focused on unmasking the mediating role of a perceived climate of age discrimination, in this paper we propose that to reconcile the theoretical and empirical ambiguities it is important to investigate *when* age diversity has positive or negative effects on organizational performance. This question has remained understudied in prior literature, and will be addressed here by arguing that whether the positive knowledge-based synergies can be realized or the negative value-based problems are prompted will depend on: (i) the particular shape of the workforce age distribution (variety vs. polarization), and (ii) two important moderators—firm size and job security—that shape the organizational context in which workforce age diversity is embedded.

First, we build on the pioneering conceptual study of Harrison and Klein (2007) to argue that the specific type of age diversity will determine whether knowledge- or value-based age-related differences become salient, resulting in either a positive or a negative effect on organizational performance (see also Carton & Cummings, 2012). Specifically, we disentangle 'age diversity' by explicitly identifying two distinct age distributions: *age variety* and *age polarization*. Age variety—referring to the heterogeneity of ages—is expected to make knowledge differences manifest, encouraging the favorable synergies that increase firm performance. Conversely, age polarization—referring to the separation of the workforce into distinct homogeneous subgroups—is expected to elicit age-related value-based subgroups, triggering the negative outcomes of diversity (e.g., hampered collaboration) that reduce organizational performance.

Second, following recent research on work group diversity (including age diversity; e.g.,

Boehm, Dwertmann, Kunze, Michaelis, Parks, & McDonald, 2014; Carton & Cummings, 2012; Hogg & Terry, 2000; Kunze et al., 2011; Tsui, Porter, & Egan, 2002), we argue that the impact of workforce age composition is likely to depend on the basic context in which people have to work together. Therefore, we introduce two important moderators, *firm size* and *job security*, which are expected to affect the extent to which either the potential advantages or disadvantages of the different types of age diversity come to the fore. We first hypothesize that in large firms, which have a more developed internal labor market, age-specific knowledge differences can more effectively be exploited than in small firms (Pfeffer & Cohen, 1984). As large firms are better able to optimize the match between employees and jobs, we expect that the positive effect of age variety on firm performance will be stronger in large firms. At the same time, we predict that the negative effect of age polarization on firm performance will be reinforced in large firms, as the mere size of the age-related subgroups makes value-based age differences more salient, fostering negative group processes (Boehm et al., 2014).

Our second moderator is job security, referring to the extent to which firms offer long-term employment to their employees. As job security represents a signal of an organization's long-term investments in its employees, from a social exchange perspective (Blau, 1964) employees are expected to reciprocate with behaviors that benefit the organization, such as working cooperatively and sharing their diverse (here, age-related) knowledge and expertise (Galunic & Anderson, 2000; Leana & Van Buren, 1999; Sun, Aryee, & Law, 2007). Therefore, we propose that job security enhances the positive effect of age variety and diminishes the negative impact of age polarization on organizational performance.

Figure 1 illustrates the theoretical model tested in the present paper. For this purpose we used a unique, large panel dataset comprising 5,892 annual observations from 1,983 Belgian organizations (2008 to 2011). Following other researchers (Batt & Colvin, 2011; Kunze et al., 2013), we use firm-level labor productivity as a dependent variable, as this is an indicator based

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on added value and as such is optimally suited to assess the contribution of the workforce to firm performance.

Figure 1. Research Framework
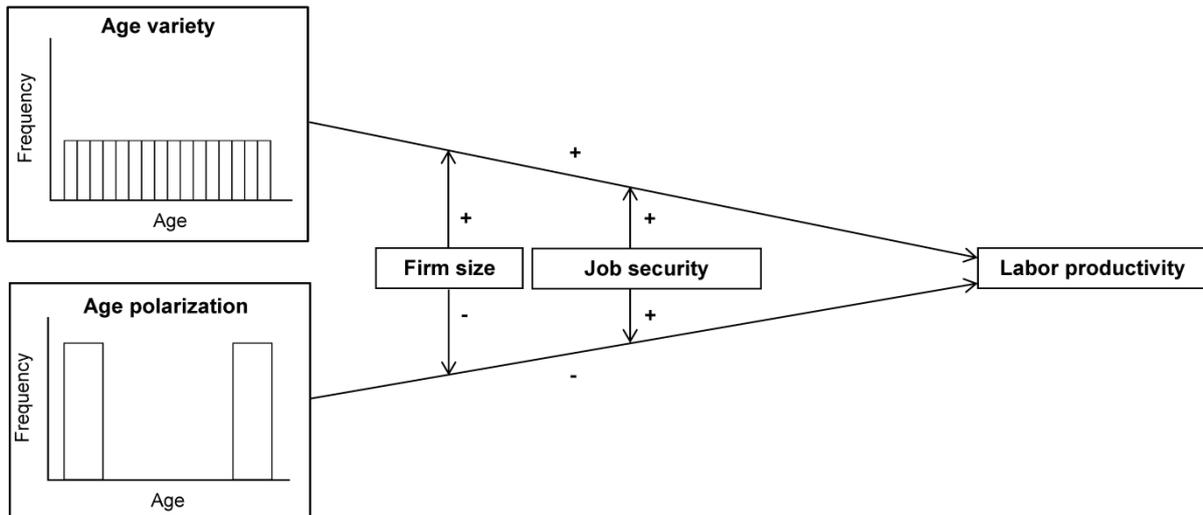
Our study contributes to the literature on demographic diversity as it reveals the boundary conditions of the competing implications of age diversity in relation to organizational performance. We empirically demonstrate that it is important to account explicitly for the particular shape of the age distribution as suggested by Harrison and Klein (2007), and for the context in which workforce age demography is embedded. By identifying when age diversity has positive or negative effects we are able to reconcile the opposing theoretical perspectives and to account for the inconclusive findings reported in the literature.

THEORY AND HYPOTHESES DEVELOPMENT

Age-Related Differences and Theoretical Perspectives on their Effects

In line with Grund and Westergaard-Nielsen (2008a), we suggest that age diversity entails two different types of age-related differences—differences in knowledge and values. First, employees of different ages possess distinct types of *knowledge and cognitive abilities* (e.g., Horn & Cattell, 1967). Younger individuals tend to have more up-to-date technological

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knowledge and a greater mental capacity to adapt to new situations, such as intellectual speed and efficiency in learning (Bugg, Zook, DeLosh, Davalos, & Davis, 2006; Horn & Cattell, 1967; Skirbekk, 2004). In contrast, over their longer lifespan older individuals acquire mental aptitudes that are assumed to accumulate with experience and learning, such as in-depth (operational) knowledge and problem-solving skills (Grund & Westergaard-Nielsen, 2008a; Horn & Cattell, 1967; Skirbekk, 2004).

Second, people who differ in age usually also have different *values*. Individuals of different ages have distinct historical experiences, training and socialization, which all affect their values and the way they think about work and life (Cherrington et al., 1979; Parry & Urwin, 2011; Wagner, 2007). Values also change as people grow older (Cherrington et al., 1979; Parry & Urwin, 2011), because what people value is linked to the stage of life they are in—for example, young people at an early stage in their career or older people with grandchildren (Wagner, 2007). Prior value research, for instance, has shown that older people give work a more central role in their lives and have a stronger belief in the value of hard work, while younger individuals tend to prioritize friends and leisure over work (Cherrington et al., 1979; Smola & Sutton, 2002; van der Velde, Feij, & van Emmerick, 1998). In other words, while older adults are said to "live to work," younger people "work to live" (Sullivan, Forret, Carraher, & Mainiero, 2009).

As employees' ages reflect differences in both knowledge and values, the literature has been dominated by two competing perspectives on the effects of age diversity on firm performance (Carton & Cummings, 2012; Harrison & Klein, 2007; Klein & Harrison, 2007; van Dijk & van Engen, 2013; Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). The information/decision-making perspective suggests that the knowledge differences associated with age diversity increase firm performance. Through the sharing, combination, and integration of age-related knowledge, age diversity might improve the quality of decision-

making, creativity, and employee problem-solving capacity and efficiency, and ultimately firm-level labor productivity (Carton & Cummings, 2012; Hambrick & Mason, 1984; Harrison & Klein, 2007; Klein & Harrison, 2007; Horwitz & Horwitz, 2007; Pelled, 1996; Williams & O'Reilly, 1998). More generally, synergies may be realized when complementary age-based knowledge and skills are mixed within a firm (Grund & Westergaard-Nielsen, 2008a).

In contrast, the social categorization and similarity-attraction perspectives (Byrne, 1971; Tajfel & Turner, 1979) suggest that the value differences brought about by age diversity negatively affect labor productivity. According to these theories, employees are attracted to colleagues with similar values, opinions, and attitudes, and therefore tend to identify with coworkers of the same age (i.e., the in-group) while categorizing colleagues of dissimilar ages as being part of the out-group. This often leads to in-group favoritism and out-group stereotyping and discrimination (Carton & Cummings, 2012; Tajfel & Turner, 1979). Such processes undermine communication, cooperation, and cohesion between firm members of different ages, and might even lead to affective conflicts (Bell, Villado, Lukasik, Belau, & Briggs, 2011; Pelled, 1996). The result is that potential synergies cannot be realized and age diversity might even negatively affect labor productivity (Grund & Westergaard-Nielsen, 2008a; Klein, Knight, Ziegert, Lim, & Saltz, 2011; Kunze et al., 2011; Pelled, 1996).

Age Variety versus Age Polarization

Based on Harrison and Klein (2007), we argue that whether age synergies can be realized depends on the specific type of the age-diversity distribution (illustrated in Figure 1). *Age variety* is defined as the heterogeneity of ages represented in an organization (Harrison and Klein, 2007), reaching its maximum in a firm with an equal share of employees for each potential age group—that is, a rectangular age distribution (as in Figure 1; e.g., 47 employees having a unique age between 18 and 64). In the case of high age variety, we argue that value

differences between employees of different ages are not likely to become salient. With growing age variety, the number of different ages—and associated values—represented in the organization increases so that each employee serves as a bridge across the relatively small differences in values between his/her neighbors in the age distribution (Wegge et al., 2012). Due to the absence of large, well-delineated subgroups of employees of a similar age, it is less likely that value-based tensions between subgroups, referring to the so-called "value gap", will arise and hamper cooperation (Bell et al., 2011; Carton & Cummings, 2012; Harrison & Klein, 2007; Klein & Harrison, 2007; Pelled, 1996). As a result, organizations can take full advantage of the potential positive knowledge-based synergies brought about by age variety (Lazear, 1999; Tsui et al., 2002; Williams & O'Reilly, 1998). Moreover, the higher the age variety, the more numerous the knowledge alternatives, increasing the potential of synergies. Hence, we hypothesize:

Hypothesis 1. Age variety has a positive effect on labor productivity.

We argue, however, that when age diversity emanates as *separation* or *polarization,* age-based value differences become more salient than knowledge differences (Harrison & Klein, 2007). Age distributions are polarized when there are large, homogeneous subgroups of equal size that strongly differ in average age (see Figure 1; e.g., 50% 18-year-old and 50% 64-year-old employees). With high age polarization, value overlaps among employees within the same age subgroup accompanies value discrepancies between employees of different age groups (Carton & Cummings, 2012). The presence of clearly demarcated subgroups makes age-based value differences salient and reinforces social categorization processes. This triggers in-group/out-group dynamics that are likely to hamper cooperation and spur age-based discrimination and conflict (Carton & Cummings, 2012; Kunze et al., 2011; Wegge et al., 2008). All this precludes reaping the potential benefits of the few knowledge-based differences between the age subgroups, reducing firm productivity. Thus, we hypothesize:

Hypothesis 2. Age polarization has a negative effect on labor productivity.

The Moderating Role of Firm Size and Job Security

Firm size. When organizations grow they develop a more fine-grained division of labor associated with a growing number of hierarchical positions. As a result, large organizations have a more strongly developed internal labor market that facilitates the optimal matching of human capital to particular tasks and positions (Pfeffer & Cohen, 1984). Therefore, we argue that the positive impact of age variety on firm productivity will depend on the size of the firm in which the workforce is employed. Age variety will especially pay off in large firms where there is ample opportunity to optimally deploy age-related differences in order to stimulate employee productivity. In addition, there is a greater likelihood that employees will be distributed over jobs in ways that are consistent with age-related status norms (i.e., the supervisor is older and wiser than the subordinate; Lawrence, 1984) and with norms regarding the prototypical jobs for each age (i.e., young employees perform physically demanding labor, while older employees perform jobs that require experience; Kunze et al., 2011; Perry, 1994). Tsui, Porter, and Egan (2002) argued that as long as demographic differences are consistent with such norms, they foster individual "extrarole" behavior—that is, supportive behavior that is not prescribed in the job description, such as cooperation and knowledge sharing (O'Reilly & Chatman, 1986). More specifically, older supervisors can pass on their wisdom and experience through coaching and mentoring, and younger subordinates will also be more likely to express their unique age-related knowledge because of their respect for the supervisor's involvement (Tsui et al., 2002).

The sharing of knowledge and information will be further reinforced because in large organizations every employee will be surrounded by a relatively high number of peers who are close in age. Lau and Murnighan (1998) argued that the support of other group members will

facilitate employees feeling more confident to express opinions and ideas (see also Carton & Cummings, 2012). This increases the likelihood that age-related knowledge differences are explicitly brought to the workplace and shared and integrated by employees when completing their tasks. For all these reasons, we expect that the potential synergies associated with age variety can be reaped more easily in larger organizations. Hence, we hypothesize:

Hypothesis 3a. The positive impact of age variety on labor productivity is stronger in large (vs. small) organizations.

We further propose that firm size will also exacerbate the negative effect of age polarization. Age polarization makes value discrepancies visible particularly in large firms, reinforcing the social categorization processes that negatively affect labor productivity for several reasons (e.g., Boehm et al., 2014; Wegge et al., 2008). First, it is easier to identify value-based age groups when these groups are larger, as is the case in large polarized organizations (Boehm et al., 2014). Second, the larger the age subgroups, the more social power and support they will have within the organization and the greater the likelihood that subgroup members of both age groups will attempt to impose their values and ideas on the rest of the organization (Lau & Murnighan, 1998; Polzer, Crisp, Jarvenpaa, & Kim, 2006). This increases both the likelihood and the impact of value "clashes" between the large and powerful age subgroups. Third, in small organizations, employees usually interact with all other employees, including out-group members, on a daily basis (Boehm et al., 2014). In contrast, the larger the firm, the larger the pool of colleagues from which an employee may choose to interact with or not (Boehm et al., 2014). The similarity-attraction argument (Byrne, 1971) states that in this case employees will prefer to interact with those of a similar age, which reduces communication between employees of different ages, reinforcing in-group/out-group dynamics (Boehm et al., 2014; Wegge et al., 2008). Finally, research also suggests that the ability to resolve age-based conflicts decreases with firm size (Amason & Sapienza, 1997) because more people are

involved, and further disagreements and discussions will be perceived as payback rather than as a genuine attempt at dialogue (Amason & Sapienza, 1997; Tjosvold, 1985). For all these reasons we expect that age polarization will be negatively related to productivity, especially in large firms. Hence, the hypothesis:

Hypothesis 3b. The negative impact of age polarization on labor productivity is stronger in large (vs. small) organizations.

Job security. Job security denotes the degree to which firms guarantee continuity of employment to their employees and, therefore, also the continuity of associated valuable job features such as promotion chances and long-term career opportunities (Batt & Colvin, 2011; Davy, Kinicki, & Scheck, 1997; Greenhalgh & Rosenblatt, 1984; Zacharatos, Barling, & Iverson, 2005). Firms provide job security to demonstrate that they value their employees' contributions, experience, and involvement and that they are willing to invest time and resources in these employees (Zacharatos et al., 2005). Drawing on social exchange theory (Blau, 1964; Cropanzano & Mitchell, 2005), previous research (e.g., Delery & Doty, 1996; Jiang, Lepak, Hu, & Baer, 2012b; Leana & Van Buren, 1999; Tsui, Pearce, Porter, & Tripoli, 1997; Zacharatos et al., 2005) suggested (and found) that employees will reciprocate this supportive environment in terms of loyalty and dedication to the firm and its objectives (Leana & Van Buren, 1999; Sun et al., 2007). Hence, firm members are more likely to behave as "good organizational agents"—i.e., they are more likely to manifest behaviors that are beneficial to the firm (Galunic & Anderson, 2000; Leana & Van Buren, 1999; Sun et al., 2007; Zacharatos et al., 2005). Employees will cooperate and assist each other more often, and they will be more willing to deploy, share, and integrate their (age-related) skills and knowledge to contribute to the realization of firm goals (Arthur, 1994; Batt & Colvin, 2011; Delery & Doty, 1996; O'Reilly & Chatman, 1986; Tsui et al., 1997; Zacharatos et al., 2005). We expect that this increased degree of cooperation, stimulated by job security, will facilitate the realization of the potential

synergies associated with age variety:

>*Hypothesis 4a. The positive impact of age variety on labor productivity is stronger in organizations with a high (vs. low) degree of job security.*

A high degree of job security might also mitigate the negative impact of age polarization for similar reasons. As mentioned above, job security engenders high-quality social exchange relationships between the employees and the organization (Galunic & Anderson, 2000; Leana & Van Buren, 1999; Sun et al., 2007). This entails that employees will spend "less time doing things benefiting the individual but not the organization (e.g., social loafing, self-promotion, or unwillingness to cooperate)" (Leana & Van Buren, 1999, p. 548). Employees will be prepared to subordinate individual goals and associated actions to collective goals and actions (Leana & Van Buren, 1999). This collective pursuit of superordinate (organizational) goals diminishes the tendency of (age-diverse) subgroups to preserve their own distinctiveness (Carton & Cummings, 2012; Galunic & Anderson, 2004; Hornsey & Hogg, 2000). Mutual understanding and respect develop—also because in organizations with high levels of job security, employees simply have to work together for a longer time (Ahmad & Schroeder, 2003)—, and openness to age diversity increases (Harrison, Price, & Bell, 1998). Therefore, we argue that job security will reduce the inclination of age-polarized workforces to develop in-group favoritism and out-group discrimination, and hence it alleviates the negative impact of age polarization on labor productivity. Therefore we hypothesize:

>*Hypothesis 4b. The negative impact of age polarization on labor productivity is weaker in organizations with a high (vs. low) degree of job security.*

DATA AND METHODS

Sample

We combined two data sources to test the hypotheses. First, SDWorx Belgium, a company with

expertise in HR, payroll, and tax and legal activities, provided us with anonymized employee-level data on age, tenure, and other demographic attributes, and company-level data for a wide range of Belgian organizations for the period 2008 to 2011. Second, for each organization in this sample we gathered financial information from BEL-first, a data source containing annual reports submitted by Belgian organizations. We excluded public companies because of the specific legal system (government ownership), as well as firms in the agrarian sectors because of their relatively small representation in the dataset. Based on Grund and Westergaard-Nielsen (2008a), we only included organizations that had at least 20 employees, with Biemann and Kearney (2010) also reporting that the calculation of diversity measures is biased for smaller groups. The final sample contained 5,892 observations from 1,983 Belgian organizations over four years (2008 to 2011). The firms in this sample had on average 190 employees, ranging from 20 to 10,688. Average employee age was 39 years, ranging from 18.41 to 52.78.
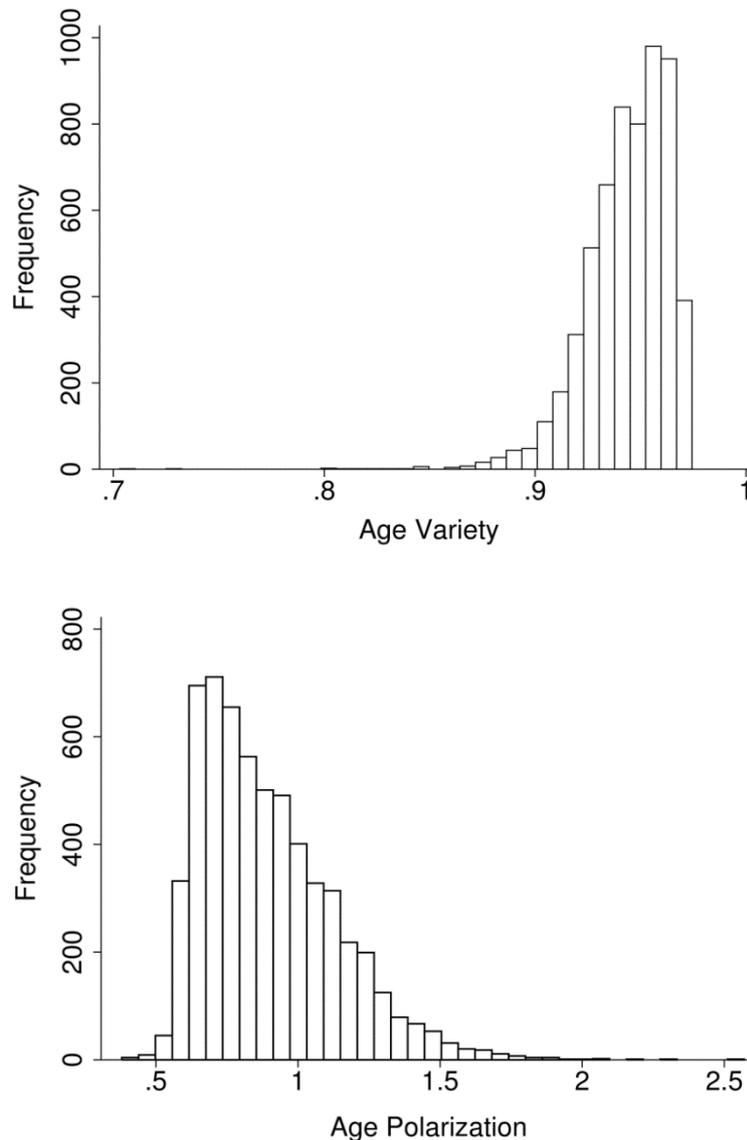
Measures

Labor productivity. Based on prior studies, *labor productivity* was measured as the firm's gross added value (i.e., revenues minus costs of materials and services and government subsidies) divided by the number of employees (Grund & Westergaard-Nielsen, 2008a). As in all previous studies using labor productivity, this variable was extremely skewed to the right. Therefore, we took the logarithm (Grund & Westergaard-Nielsen, 2008a).

Age variety. We built on Harrison and Klein (2007) to calculate age variety with Blau's index of age heterogeneity, defined as $Blau = 1 - \sum_{i=1}^{K} \pi_i^2$; with *K* indicating the number of age groups and π_i denoting the share of employees that belongs to each age group *i* (Harrison & Klein, 2007). We created an age group *i* for each age from 15 to 64, which is the range of the legal working age in Belgium (Leroy, 2011). A high Blau's index implies high age variety (minimum and maximum equals [0, 1-(1/*K*)], respectively).

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Age polarization. Harrison and Klein (2007) suggested using the standard deviation (SD) to account for polarization. The SD is mainly sensitive to the age range observed in organizations, and therefore obtains its highest value for firms in which age subgroups are the most distant. However, it ignores the relative sizes of the subgroups. As a polarization measure should theoretically be sensitive to both the distance between and the relative size (i.e., balance) of the subgroups (as in Figure 1) we used the polarization index of Esteban and Ray (1994), which was designed specifically for this purpose. This index is calculated as $P = k \sum_{i=1}^{N} \sum_{j \neq i}^{N} \pi_i^{1+\alpha} \pi_j |a_i - a_j|$ and includes both the size balance of age subgroups (π_i and π_j) and the distance between these subgroups ($|a_i$ minus $a_j|$). The α coefficient can take values between 0 and 1.6. The lower the α, the more weight is given to the distance between subgroups, and the less weight is given to subgroup balance. Therefore, α is also defined as the sensitivity to polarization. Note that if α = 0, the polarization index equals Gini's coefficient for inequality, which mainly focuses on distances (Esteban and Ray, 1994). Duclos et al., (2004) showed that when calculating the polarization index for continuous attributes (such as age), α should lie between the bounds of [0.25, 1] in order to satisfy the axioms of polarization. We set the level of α at 0.8 because it was only at this level that the correlations of the polarization index with the measures of both age variety and age inequality (i.e., the polarization index with α = 0) did not reach |.5|. In this way, we explicitly ensured that we measured two different concepts: age polarization and age variety. We also replicated our analyses with other levels of α (α = 0.4 and α = 1) to test for the robustness of our findings. This did not affect our estimates (analyses available on request). Because *k* is only a scaling factor to allow for normalization it does not influence the index values. We chose *k* = 1 (Esteban & Ray, 1994). Figure 2 shows the distribution of the values of age variety and age polarization (for α = 0.8) for all observations, revealing considerable variance between organizations for both measures.

Figure 2. Distribution of Age Variety and Age Polarization over the Total Sample of Organizations (N = 5,982)

Firm size. We measured firm size as the logarithm of the number of employees in the organization (Grund & Westergaard-Nielsen, 2008a; Kunze et al., 2011). Note that we took the number of employees converted to full-time equivalents, as registered in the organizations' annual reports.

Job security. As in Batt and Colvin (2011), we measured the extent to which firms provide job security to employees as the share of employees with a full-time and permanent contract (i.e., contract for an indefinite period).

Control variables. Following Becker (2005), we included control variables only when

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they helped to rule out alternative explanations, or when their inclusion was logical and/or prior studies had confirmed their importance in explaining labor productivity. Based on these decision rules, we selected the following variables: industry, capital intensity, the share of white-collar workers, average age, squared average age, and year of observation.

To account for *industry,* we included 16 industry dummies based on the two-digit Nace-BEL industry codes as reported in the annual reports (Huselid, 1995; Joshi & Roh, 2009; Kunze et al., 2011). *Capital intensity* was measured as fixed assets (property, plant, and equipment) divided by the number of employees (Huselid, 1995). Following Huselid (1995), we took the logarithm of this variable as it was strongly skewed to the right. The *share of white-collar workers* was calculated as the number of white-collar workers divided by the total number of employees (Grund & Westergaard-Nielsen, 2008a). We also controlled for *average age* and *squared average age* because both Grund and Westergaard-Nielsen (2008a) and Kunze et al. (2011) suggested that they affect labor productivity and might influence the effect of age diversity. Finally, as our data cover organizational observations over four years (2008-2011), we included dummies denoting the *year of observation*.

As a robustness check, we reran the analyses while controlling for other potential confounding variables, such as average tenure (Boehm et al., 2013), firm age, slack resources, and the share of male employees. The analyses (available on request) showed no changes in the results, indicating that our findings are not sensitive to the inclusion or exclusion of specific control variables.

Note that in our baseline models, we did not control for firms' labor productivity in the previous year because the correlation of this variable with our dependent variable, current labor productivity, is 0.86 ($p < .001$). Including prior labor productivity would, therefore, cause severe problems of multicollinearity. The regression results would be dominated by this variable as it would remove the variance potentially explained by the age diversity of the firm.

In other words, such an approach is likely to suppress any substantive effects of age diversity on productivity (Achen, 2000; Beck & Katz, 2011).

3.3.3. Estimation Method

Because our data cover repeated observations of firms over four years (2008-2011), ordinary least squares regressions are not appropriate as they do not account for the possibility that observations and error terms correlate across years (Fredrickson, Davis-Blake, & Sanders, 2010). Therefore, we used a panel data estimation technique to test our hypotheses (i.e., the "xtreg" command in STATA). In this study, a random effects model specification should be preferred over a fixed effects approach. This is because the fixed effects design cannot model the effects of explanatory variables that are relatively stable over time (Beck & Katz, 2001; Bell & Jones, 2015), which is the case for our key explanatory variables (age variety, polarization, firm size, and job security). We report random effects panel regression estimates with robust standard errors, clustered per firm.

One drawback of random effects panel regressions is that it is difficult to assess goodness-of-fit between models, as the R-squared is not appropriate (for a detailed discussion of this problem, we refer to Nakagawa and Schielzeth, 2013). For this reason, we reran the models using the maximum likelihood (ML) estimation method, which allows the Likelihood Ratio (LR) test to compare the fit between two models. In this way, we were able to show whether the estimated effects contributed significantly to the explanation of labor productivity. The results of these ML models were virtually identical to those of the random effects models, underscoring the robustness of our findings (available on request). We report the results of the LR tests alongside the random effects regression results (see Table 2).

Although the large sample size (N = 5,892) is one of the major strengths of this study, it also increases the likelihood of finding statistically significant results even when effect sizes

are small. Therefore, we not only report on the statistical significance of findings but also on the standardized regression parameters (we do so by standardizing all variables prior to running regressions as recommended by Dawson, 2014). The latter estimates report the effect of a one-unit standard deviation increase in the predictor variables on the increase in the number of standard deviations in labor productivity. Such standardization facilitates the comparison and evaluation of the relative effect sizes of different explanatory variables.

3.4. RESULTS

Table 1 reports descriptive statistics and correlations of all variables under study, and Table 2 presents the standardized regression parameter estimates. Model 1, including control variables and moderators only, indicates that productivity was positively affected by the firm's capital intensity ($B = 0.286$, $p < .001$), by the share of white-collar workers ($B = 0.292$, $p < .001$), and by the level of job security ($B = 0.084$, $p < .001$). In line with prior studies (Grund & Westergaard-Nielsen, 2008a), employees' average age had an inverted U-shaped relationship with labor productivity ($B_{age} = 0.679$, $p < .001$; $B_{age^2} = -0.572$, $p < .001$). The estimated net effect of firm size on labor productivity appeared to be only marginally significant ($B = -.032$, $p < .10$).

Table 1. Means, Standard Deviations, and Correlations of (Unstandardized Version of) Variables Used in the Analyses

Variable	Min	Max	Mean	SD	1	2	3	4	5	6	7	8	9
1. Productivity	0.18	8.34	4.40	0.62	-								
2. Firm size	3.04	9.28	4.61	0.98	.053***	-							
3. Capital intensity	.00	11.47	3.71	1.81	.427***	.148***	-						
4. White collar (%)	.00	1.00	.62	.38	.276***	-.076***	-.058***	-					
5. Average age	18.41	52.78	38.99	4.50	.190***	.097***	.138***	-.103***	-				
6. Age²	338.79	2,785.80	1,540.76	342.82	.182***	.087***	.131***	-.101***	.996***	-			
7. Job security	.00	1	.81	.19	.261***	.023#	.096***	-.070***	.164***	.153***	-		
8. Age variety	.70	.97	.94	.02	.023#	.581***	.154***	-.257***	.244***	.207***	-.031*	-	
9. Age polarization	0.38	2.57	0.89	0.24	-.101***	-.592***	-.091***	-.014	.128***	.128***	-.061***	-.481***	-

Note. Source data of SDWorx Belgium, a company with expertise in HR, payroll, and tax and legal activities (financial data from annual reports).

$N = 5{,}892$; #$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed).

Table 2. Standardized Random Effects Estimates of the Effects of Age Variety and Polarization on Labor Productivity and the Moderating Effects of Firm Size and Job Security

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Constant[A]	-.037*	-.035*	-.033#	-.032#	-.056**	-.062***	-.063***	-.034#	-.033#	-.031#
Firm size	-.032#	-.055*	-.072***	-.074***	-.069**	-.091#	-.094	-.056**	-.072***	-.075***
Capital intensity	.286***	.284***	.284***	.284***	.284***	.283***	.283***	.283***	.284***	.282***
White collar (%)	.292***	.301***	.295***	.297***	.306***	.301***	.303***	.302***	.295***	.297***
Average age	.679***	.538**	.770***	.735***	.536**	.730***	.706***	.593**	.767***	.805***
Age²	-.572***	-.437*	-.652***	-.620**	-.432*	-.611***	-.588**	-.490**	-.650***	-.686***
Job security	.084***	.084***	.080***	.081***	.085***	.082***	.082***	.090*	.081*	.087**
Age variety		.040*		.008	.058#		.008	.040		.008*
Age polarization			-.063***	-.060***		-.085*	-.081*		-.064	-.060*
Var*Size					.037**		.004			
Pol*Size						-.050***	-.047**			
Var*Job security								.022*		.025**
Pol*Job security									-.003	.007
Industry dummies	X	X	X	X	X	X	X	X	X	X
Year dummies	X	X	X	X	X	X	X	X	X	X
Chi²	2,532.11***	2,570.57***	2,526.10***	2,536.47***	2,560.15***	2,527.04***	2,535.60***	2,528.92***	2,539.21***	2,497.04***
LR test (model compared to)		6.50* (1)	20.15*** (1)	20.33*** (1) 13.83*** (2) 0.19 (3)	7.07** (2)	13.75*** (3)	20.47*** (5) 0.15 (6)	4.58* (2)	0.06 (3)	14.49*** (8) 5.38# (9)

Note. Dependent variable: logarithm of labor productivity. Source data of SDWorx Belgium, a company with expertise in HR, payroll, and tax and legal activities (financial data from annual reports). Z-values based on regressions with unstandardized coefficients) are in parentheses. $N = 5,892$; #$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). $N = 5,892$; #$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed).

[A] Even though we reported standardized regression coefficients, an intercept coefficient (constant) is still reported. This is due to a slight rounding error in STATA, implying that the mean of each standardized variable will be rarely exactly zero, but very close to zero (for instance, the mean of the standardized value of our dependent variable, labor productivity, is 0.0000000000517). This does not affect our regression results.

In Models 2 to 4, we tested for the main effects of age variety and age polarization on labor productivity. The coefficient of age variety was positive and significant ($B = 0.040$, $p <$ .05; see Model 2), supporting our proposition that age variety increases labor productivity (Hypothesis 1). The LR test indicated a better model fit (6.50, $p <$ .01), signifying that age variety significantly contributes to the explanation of labor productivity. The impact of age variety was much smaller compared to the impact of other controls such as capital intensity ($B = 0.284$) and the share of white-collar workers ($B = 0.301$). However, this is not surprising since these controls account for major between-industry and between-firm structural and economic fundamentals.

To further investigate the practical significance of the age-variety effect, we calculated its precise effect size. An increase in age variety of one standard deviation (SD) was associated with a 0.040 increase in the SD of the (unstandardized) log transformed productivity variable, which equals 0.62. This means that a one-SD increase in age variety increased labor productivity by 2.51% (i.e., $\exp^\wedge(0.040*0.62) = 1.0251$). Taking into account that this is a net effect after controlling for year, industry, and firm-level differences, such an effect size is of practical significance. Hence, Hypothesis 1 is supported.

Hypothesis 2 is also supported, as Model 3 revealed a negative significant impact of age polarization on labor productivity ($B = -0.063$, $p <$ .001). Again, the LR test confirmed that adding age polarization as a predictor improved the model fit as compared to the model including control variables only (20.15, $p <$ .001). We calculated that an increase in age polarization of one SD decreased productivity by 3.83% (i.e., $\exp^\wedge(-0.063*0.62) = 0.9617$), which is a sizeable drop in firm productivity.

When we tested for both effects jointly (Model 4), the coefficient of age polarization remained unchanged, but the effect of age variety disappeared. This seems to indicate that the negative effect of age polarization is stronger and, therefore, overrules the positive effect of age

variety. This assumption is supported by the LR test, which demonstrated that the model including both the effects of age variety and age polarization (Model 4) did not have a better fit than the model that only included age polarization (Model 3), but did have a better fit than the model including age variety only (Model 2).

Models 5 to 7 tested for the moderating impact of firm size. Hypothesis 3a proposed that the positive impact of age variety on labor productivity would be stronger in large as opposed to small organizations, which was supported by the positive and significant interaction effect of age variety and size ($B = 0.037$, $p < .01$; Model 5) and the significant associated LR test (7.07, $p < .01$). To evaluate the effect sizes, we calculated the impact of age variety on labor productivity for small (mean size minus one SD) and large (mean size plus one SD) firms separately by using the estimated coefficients of the constant and both the direct effects and interaction effect of firm size and age variety. A one-SD increase in age variety increased labor productivity by 1.31% in small firms, but by 6.07% in large firms. Figure 3a illustrates this moderation, clearly showing that the rise in labor productivity with higher age variety is more pronounced in large than in small firms, supporting Hypothesis 3a.

We also found support for Hypothesis 3b, predicting that the negative effect of age polarization would be stronger in large as opposed to small firms, as the interaction effect of age polarization and firm size was significantly negative ($B = -0.050$, p < .001; Model 6) and the LR test suggested a better model fit when including the interaction effect (13.75, $p < .001$). We found that a one-SD increase in age polarization decreased labor productivity by as much as 8.03% in large firms (mean size plus one SD), but only by 2.15% in small firms (mean size minus one SD). Figure 3b illustrates this interaction effect. When testing both interactions jointly, only the interaction effect of age polarization and firm size remained significant (see Model 7).

Figure 3a. The Moderating Impact of Firm Size on the Marginal Effect of Age Variety on (log) Labor Productivity
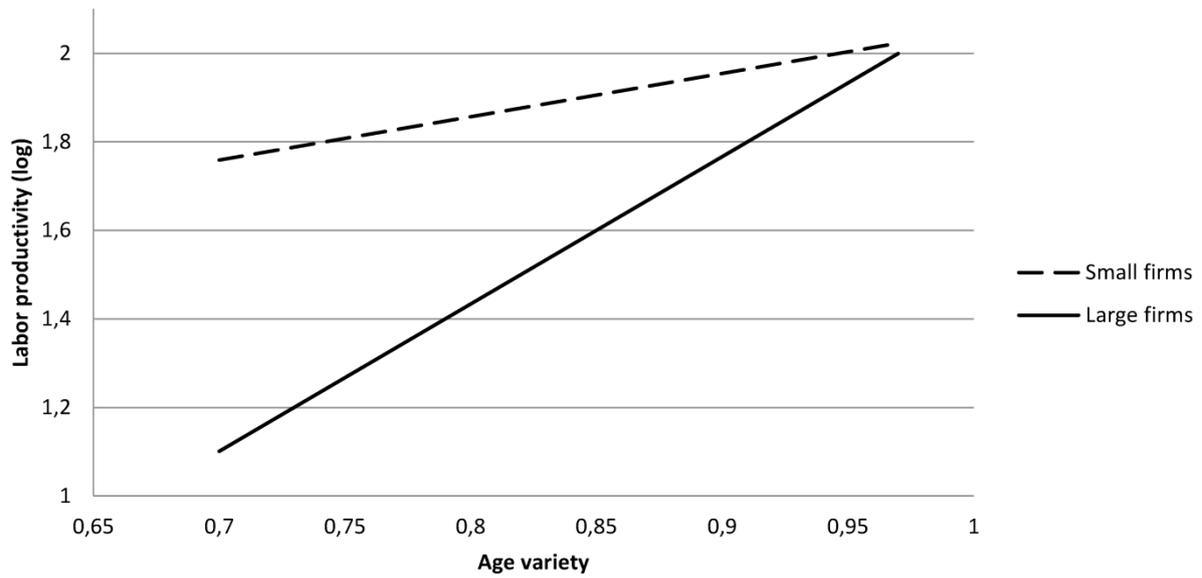
Note. Figure based on unstandardized regression coefficients.

Figure 3b. The Moderating Impact of Firm Size on the Marginal Effect of Age Polarization on (log) Labor Productivity
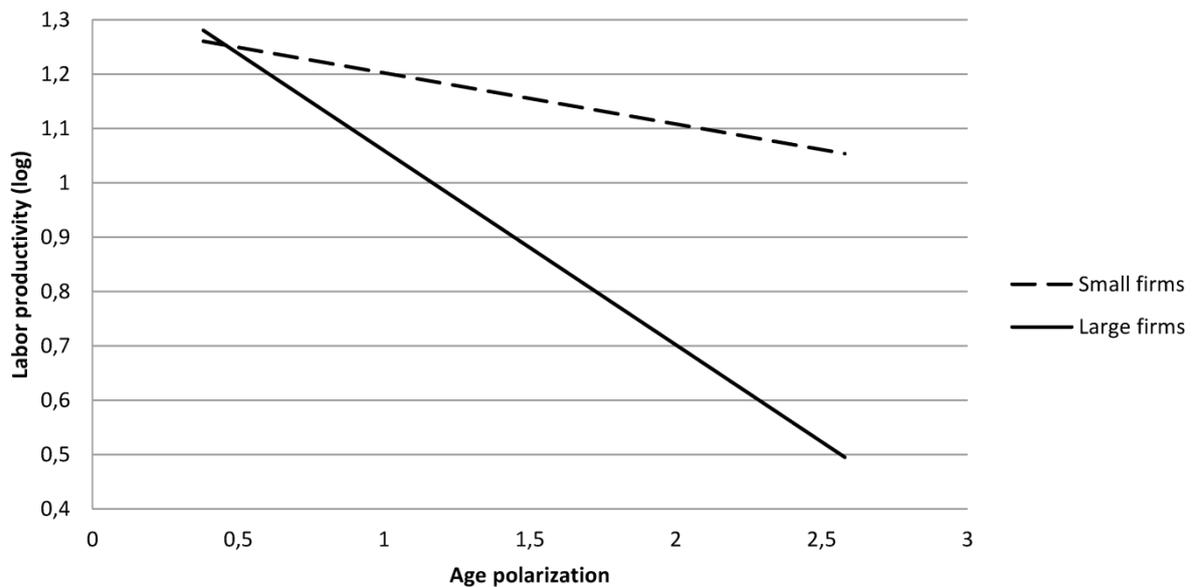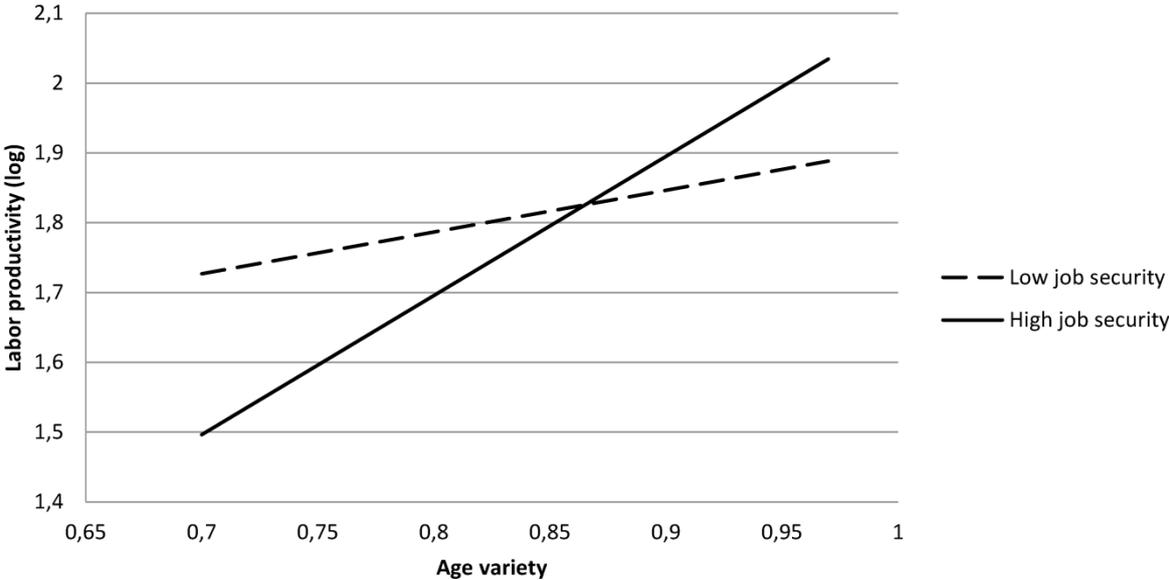

Note. Figure based on unstandardized regression coefficients.

The moderating impact of job security was tested in Models 8 to 10. Hypothesis 4a,

which proposed that job security facilitates the realization of a positive synergetic effect of age variety, was supported by the significantly positive coefficient for the interaction of job security and age variety in Model 8 ($B = 0.022$, $p < .05$). Again, the LR test indicated better model fit when including this interaction (4.58, $p < .05$). Our calculations reveal that a one-SD increase in age variety increased labor productivity by 3.92% in firms with a high degree of job security (mean job security plus one SD), but only by 1.12% in firms with a low degree of job security (mean job security minus one SD). Figure 4 illustrates this moderation. Hypothesis 4b states that job security will mitigate the negative effect of age polarization. Because the coefficient for the interaction of polarization with job security ($B = -0.003$; Model 9) and the LR test for model fit were not significant, this hypothesis is not supported. Model 10 tested for the interactions of job security with age variety and polarization simultaneously, resulting in no substantive changes.

Figure 4. The Moderating Impact of Job Security on the Marginal Effect of Age Variety on (log) Labor Productivity

Note. Figure based on unstandardized regression coefficients.

DISCUSSION

This paper explored the impact of two different types of age diversity (variety and polarization) on labor productivity. We investigated both the direct effects of these two types of age diversity and the moderating impact of firm size and job security by using a unique dataset of 5,892 observations from 1,983 Belgian firms (between 2008 and 2011). The results revealed that age diversity can bring both benefits and disadvantages to organizations, depending on its type: age variety increases labor productivity, but age polarization has a negative effect. These findings support our proposition that age variety increases the richness of age-specific knowledge differences that can create synergies—through the sharing, combination, and integration of these knowledge sources—but that age polarization makes value differences manifest, provoking categorization processes that hamper communication and cooperation among employees, negatively affecting labor productivity.

We found that both the positive effect of age variety and the negative impact of age polarization on labor productivity were stronger for large (versus small) firms. Our findings, as expected, revealed that differences in age will become more germane when a higher number of employees is involved. This underscores the crucial role of internal labor markets in large firms in unleashing the benefits of age variety. At the same time, however, the substantial size and power of age subgroups in large polarized organizations exacerbates the negative impact of age polarization.

We also found partial support for the anticipated moderation effect of job security, since it reinforced the positive effect of age variety on productivity. The negative impact of age polarization, however, appeared to be too strong to be mitigated by job security. Apparently, stimulating employees to act as "good organizational agents" (Leana & Van Buren, 1999; Sun et al., 2007) through job security is not sufficient to overcome value discrepancies between polarized age groups. An alternative explanation for this non-finding is that job security might

have a two-sided effect on the relationship between age polarization and productivity. Apart from the positive moderation effect we described above, job security might also be expected to intensify the negative effects of age polarization by making employees less concerned about losing their jobs (Davy et al., 1997), stimulating them to speak up and express their criticism towards other organization members. This, in turn, might increase the level of conflict and decrease the level of cooperation between value-based subgroups, aggravating the harmful effects of age polarization.

Contribution

The aging of populations in developed countries has major implications for the composition of an organization's workforce. Given that theory predicts that organizational demography matters to a large extent for the functioning of organizations (Harrison & Carroll, 2006; Pfeffer, 1983), it is remarkable that there are so few studies that have investigated the consequences of increasing age diversity on organizational performance (Grund & Westergaard-Nielsen, 2008a; and Kunze et al., 2011 are notable exceptions). The answer to this question is, however, not straightforward, as competing predictions have been made based on different theoretical accounts. Because age diversity is a double-edged sword, we argued that research needs to go beyond testing for main effects by theorizing about *when* age diversity will have a positive or a negative effect on organizational performance. We extend the age demography literature by specifying the boundary conditions for the competing consequences of age diversity and by testing new predictions derived from this exercise by means of a uniquely large dataset.

Our findings clearly underscore the validity of our approach and contribute to the age diversity literature in at least two ways. First, we present, to the best of our knowledge, one of the first studies that empirically unravels the implications of Harrison and Klein's (2007) theory. We extend prior work by showing that age diversity is not a unitary construct as its

effect on firm productivity depends on the particular shape of the age distribution. We found that age variety increases labor productivity—as suggested by the information/decision-making perspective—while age polarization decreases productivity—as proposed by the social categorization argument. By showing that different age distributions actually have opposite implications, our study provides one reason for why prior findings on the impact of age diversity are not conclusive. These findings suggest that future work on diversity in general might do well to pay more attention to Harrison and Klein's (2007) seminal work and the specific distribution of the relevant demographic attributes in predicting potential effects.

In our effort to unravel the effect of different age distributions we discovered that carefully designed operationalizations of both age variety and polarization are primordial. In both Grund and Westergaard-Nielsen's (2008a) and Kunze et al.'s (2011) studies, the standard deviation (SD) of employees' ages was used: in the former study to implicitly account for age variety, in the latter to measure age polarization. The problem with SD is that it simultaneously captures aspects of both variety and polarization, and cannot be compared across organizations with different age ranges (Harrison & Klein, 2007). Thus, the differences in findings reported by Grund and Westergaard-Nielsen (2008a) and Kunze et al. (2011) might be partly the result of using SD, which confounds two fundamentally different features of age distribution. By introducing the polarization index—which is well-established in the economics literature—as an alternative measure for age polarization, we were able to separate polarization from variety—as measured by the conventional Blau index—more distinctly.

Second, we further extend prior research by showing that the context in which the organization's demography is embedded is highly relevant to the relationship between age diversity and firm productivity. In this study, we focused on two basic features of the context, that is, the organization's size and job security. The finding that size reinforces the impact of age diversity on productivity underscores the need for a more structural view in studies of

organizational demography. This is because the size of organizations affects how employees—with their specific demographic characteristics—are distributed over jobs and functions, and how they interact with each other. The type of contracts that are offered to employees and the extent to which they provide job security is sometimes put forward by organizations as a mechanism to enhance employee loyalty and thereby increase cooperation among employees. Our study demonstrates that job security can indeed reinforce the positive impact of age variety, but that it does not mitigate the negative effect of age polarization on firm productivity. These findings and other recent research on work group diversity, including age diversity (e.g., Boehm et al., 2014; Carton & Cummings, 2012; Hogg & Terry, 2000; Kunze et al., 2011), reveal that mapping the context in which employees operate holds much promise for reconciling the different perspectives and findings in the literature.

Limitations and Future Research

Although our paper has several strengths—including the reliability of our findings given the uniquely large, longitudinal dataset and the multiple robustness checks—it also has some limitations, thus pointing to avenues for further research. First, although our hypotheses are grounded on solid theories, arguments, and findings from prior research, we did not provide a direct test for the assumed underlying mechanisms accounting for the relationship between age diversity and labor productivity because our focus was on trying to specify *when* age diversity is beneficial as opposed to harmful to firm performance (and not so much *why*). It would be interesting in future research to also theorize about and empirically test the different ways in which diversity might affect firm performance. Important mediating mechanisms that would be worthwhile to study include knowledge sharing, employee commitment, extrarole behavior, and (value) conflict. The degree to which employees *perceive* the presence of age diversity and age-based discrimination should also be incorporated, as these perceptions appear to mediate

the impact of age diversity as well (Harrison & Klein, 2007; Kunze et al., 2011).

Second, in this study we mainly focused on "horizontal" differences that are related to age, that is, knowledge and values, largely ignoring the fact that age differences might also be related to the distinctive possession of highly valued resources reflecting status or power (Harrison & Klein, 2007). As a result, we did not study the impact of "age inequality", a third type of age distribution introduced by Harrison and Klein alongside variety and polarization (2007). Although we touch upon age-related status differences when discussing the link between organizational size and adherence to age-related status norms, we currently lack a strong theory and data to systematically link age-based status differences and age inequality to labor productivity. It might, however, be interesting in future research to investigate age differences in relation to formal indicators of status or power such as income. In this respect, faultline theory and methods could be a source of inspiration (Lau & Murnighan, 1998).

Third, as employees are the main source of the creation of added value in firms, our focus on a productivity measure based on added value to study age-composition effects seems warranted. In addition, labor productivity is a widely used indicator of organizational performance in prior research on the impact of demographic diversity in general (e.g., Richard et al., 2004) and age diversity in particular (e.g., Grund & Westergaard-Nielsen, 2008a; Kunze et al., 2011). However, further research might consider also taking into account other dimensions of performance, such as absenteeism, turnover and, ultimately, second-order outcomes such as financial performance (Combs, Crook, & Shook, 2005; Sacco & Schmitt, 2005; Sørensen, 2000).

Fourth, because the main goal and key contribution of this study was to examine the effects of age diversity on the organizational level, we took a macro-approach by building and testing theory on *organizational* age diversity only, leaving aside the work structure of these organizations in teams, work groups, and departments. Based on the structural effects of firm-

level age diversity we found in this study, we conclude that the age structure of the organizational workforce as a whole has unique effects on firm performance, aside from the potential influence of smaller work groups. We do, however, acknowledge that organizational age diversity may have different effects depending on the extent to which the level and the type of firm-level age diversity is also reflected in smaller work groups. Future multilevel research may, therefore, help to gain a more comprehensive view of the implications of workforce age diversity.

Finally, our sample comprises organizations from one country only, Belgium. However, the demographic transition of the aging population and the consequent increase in the degree of age diversity in organizations is a widespread contemporary phenomenon in developed societies, which is relevant to organizations far beyond the Belgian setting. In addition, our sample covers a very broad spectrum of almost 2,000 organizations, ranging from low-tech to high-tech organizations, from manufacturing to service organizations, from relatively small to large organizations, etc. For these reasons, we assume that our findings might be of relevance to non-Belgian organizations as well. Nevertheless, we acknowledge that country differences can play an important role. For instance, age-based status norms might be valued more in some countries or cultures (e.g., Belgium, other European countries, China), than in others (e.g., the US). For this reason, the generalizability of our findings might be questioned, and we encourage future research to investigate the impact of age diversity in other countries too.

Practical Implications

In addition to our contribution to the academic literature, our study also has some practical implications. First, by carefully calculating the effect sizes of our estimates we showed that the impact of age diversity is not negligible, and under certain conditions even quite substantial. For instance, in relatively large organizations, a one-SD increase in age variety increased labor

productivity by 6.07%, while a one-SD increase in age polarization decreased labor productivity by 8.03%. Similarly, in organizations with relatively high job security productivity went up by 3.92% when age variety increased by one SD. Taking into account that these estimates were obtained after controlling for several other major determinants of productivity that are not under direct control of management (such as year, industry, and capital intensity), such effect sizes reveal that it is important for firm leaders to pay attention to the implications of the age composition of their firms.

In addition, our study only focused, as a first step, on the baseline effect of age diversity, without paying attention to the HR policies that these organizations have with respect to managing age diversity. Obviously, the benefits of age diversity might be larger in firms with explicit HR policies that are specifically aimed at diversity management or high-commitment management HR practices, such as the provision of training, opportunities for flexible work, participation programs, high extra-legal benefits, and relatively high wages compared to competitors (Arthur, 1994; Batt & Colvin, 2011). Further research into this issue would be highly relevant.

In a similar vein, the present paper revealed that job security per se does not suffice to diminish the negative effect of age polarization on productivity. Perhaps alternative HR practices, such as the ones mentioned above, might be more successful in countering the negative effects of value-based polarization. In this respect, the growing stream of literature on the inclusion of dissimilar employees could be inspiring (Nishii, 2013; Shore, Randel, Chung, Dean, Ehrhart, & Singh, 2011). Employee participation in decision-making, information-sharing, supervisor–worker interaction, a culture of openness, and a clear mission statement by the organization have been introduced as possible inclusion practices (Nishii, 2013; Shore et al., 2011) that might restore harmony within an age-polarized workforce. However, to date no empirical study of the effectiveness of these practices in relation to age polarization has been

conducted, leaving many future research opportunities in this field.

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