

## **2 Good for business: Age diversity in the workplace and productivity**

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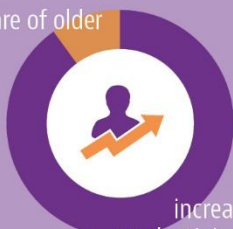
Rapid population ageing is pushing companies towards greater diversification of the age profile of their employees. This raises questions about the effects of increased age diversity on business performance. The chapter provides new international evidence that a greater inclusion of older workers is likely to be good for firm productivity (i.e. to raise the value added per worker of the firm). A key advantage of a multigenerational workforce is that it enables effective synergies between experienced and less experienced staff to the benefit of employers and employees. Reaping these benefits will require putting in place tailored support at all ages and strengthening collaboration between generations.

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## Infographic 2.1. Key facts: Age diversity: Good for business productivity

### Older workers can boost productivity

+10% share of older workers



increases productivity by 1.1%

A firm with more older workers than the average firm is more productive.

### Positive spillover effects

The experience of older workers helps younger workers perform better, thereby boosting firm productivity directly and indirectly.

0.6% direct effect

0.5% through spillovers

1.1%  
Productivity increase

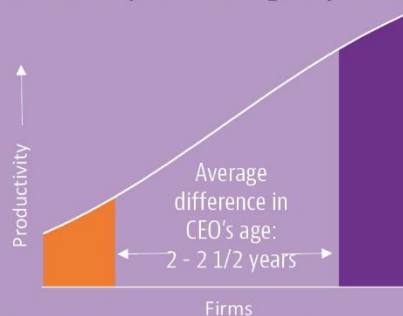
### Lower turnover

Turnover is 4% lower at firms that have a 10% higher share of workers aged 50 and over.



Lowering turnover from a high level can promote firm stability and productivity.

### CEOs: more experience, higher productivity



CEOs and other managers are 2-2½ years older in the 20% most productive firms compared with the 20% least productive firms.

### Better management of age diversity is needed

Unbiased recruiting processes are used by only 6% of employers.



Most businesses are yet to take action to reap the benefits of an age-diverse workforce



report that they would likely implement or at least explore multigenerational workforce policies.

## Introduction

Population ageing is pushing businesses towards a greater diversification of the age profile of their staff (see Chapter 1). The obvious way to counter the impending decline in employment is to unleash the underutilised labour market potential of older workers. However, the effects of extending working lives and employing a more age-diverse workforce than in the past go far beyond mobilising additional labour supply. They matter for the adaptability and resilience of businesses.

If it is well-managed, age diversity in the workplace can bring about several business benefits. For a start, an age-diverse workforce can offer a larger set of skills and may thereby play a key role for sustainability and profitability. Age diversity can also reduce the risk for the employer that a large part of the workforce stops working at the same time due to common life events for certain age groups – like the birth of a child – or other health events or risks. Multigenerational workforces may therefore be more stable and resilient to shocks, such as that induced by COVID-19; yet, the association of diversity with resilience has been largely unexplored (Duchek, Raetze and Scheuch, 2019<sup>[1]</sup>). An age-inclusive work culture also serves strategic management purposes, since some firms use the reputation of being an age-inclusive employer as a marketing tool to attract talent. Moreover, an age-diverse workforce may lead to better business-to-consumer and business-to-business relationships, as representing the age groups of the firm's clients in the own workforce makes it easier to know what customers need. In fact, human resource professionals stress that enhanced customer service is one of the key benefits of age-diverse teams (CIPD, 2014<sup>[2]</sup>). For these benefits to materialise, and for age diversity not to be a bane for companies, the right policies need to be put in place (see Chapters 3, 4 and 5).

Many aspects at the interface between age diversity and firm adaptability and resilience are connected to the question of productivity: how can more or the same output be produced with the same or fewer labour inputs? It has long been debated how productivity differs across age groups and whether employing more older workers is beneficial or not for companies' revenues. Some employers have concerns about business performance when it comes to greater age diversity, fearing a possible trade-off with productivity. On the one hand, some older workers may have less up-to-date knowledge of the latest technologies. On the other hand, older workers can bring greater experience, management skills and corporate know-how. These considerations are of particular importance given the backdrop of productivity growth in many advanced economies falling to unprecedented lows in the 2000s (OECD, 2016<sup>[3]</sup>). This chapter presents new international evidence on the business benefits of age diversity and on how multigenerational workforces affect productivity.<sup>1</sup>

## Age diversity and productivity: How are they connected?

In analysing the links between age diversity and productivity, it is important to be clear on the definitions of age diversity and productivity and on the ways in which they are connected. Age diversity of a company's workforce rises when the company employs more older or younger workers or both, so that the spread of ages within the company increases.

### ***Productivity as a measure of business performance***

Productivity growth is the engine of economic and social progress. It means that people work smarter, not necessarily harder. The general concept is labour productivity which is output per unit of labour input (typically output per worker or hour worked). Higher productivity is often a win-win situation for employers and employees. For companies, it can bring improved profitability, the possibility to sell products at more competitive prices, a greater chance to raise market shares, increased scope to invest and a potential boost to their attractiveness as an employer. For employees, the most tangible benefit of higher productivity is that it usually comes with higher wages (Box 2.1).

### Box 2.1. Higher productivity: Why it is good for businesses and employees

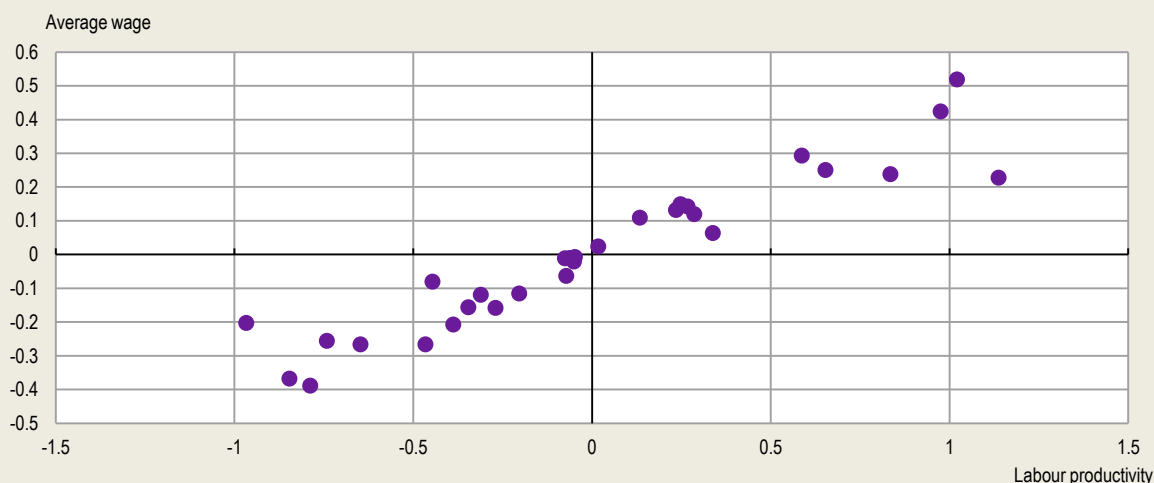
A firm that is more productive can produce more output with the same labour input or, equivalently, the same output with less labour. Conceptually, higher (labour) productivity can be achieved in two ways: by raising the physical and human capital (e.g. machines, equipment, computers, buildings and skills) available to employees when they work, or by improving the efficiency with which the firm uses labour and capital inputs for production (e.g. new production processes and better management techniques).

Economists distinguish between two types of productivity: labour productivity and multifactor (or total factor) productivity. Labour productivity is the more general concept and is defined as output per unit of labour input (usually output per worker or hour worked). Multifactor productivity is defined in a more restricted sense as it aims to isolate efficiency or innovation (i.e. the second part of labour productivity). It has the downside that it is not directly observed and needs to be inferred, while measuring labour productivity is straightforward.

Higher productivity is good for the firm and its workers. For the firm, it can bring key advantages, such as improved profitability and the possibility to offer its products and services at more competitive prices. For the employees, it typically comes with higher labour incomes. Wages are higher in countries where productivity is higher; and firms that are more productive can afford to pay higher wages. The data for Costa Rica, Finland, Germany, Hungary, Japan and Portugal, that this chapter uses, bear out strongly the positive relationship between firm productivity and worker pay (Figure 2.1). Similar evidence has been obtained for a wider set of countries (Berlingieri, Calligaris and Criscuolo, 2018<sup>[4]</sup>).


### Figure 2.1. More productive companies pay higher wages

The relationship between firm productivity and employees' pay in Costa Rica, Finland, Germany, Hungary, Japan and Portugal



Note: The figure depicts five data points for each country, one for every labour productivity quintile. Labour productivity and average wage are calculated for each industry and then averaged across industries. For each country, both variables are demeaned by the average over the five quintiles. Labour productivity is log output per worker, and average wage is the definition (log wage per hour, day, week, month or year worked) available in the dataset. The data refer to 2017 for Costa Rica, Finland and Portugal, 2016 for Germany, 2013 for Japan and 2010 for Hungary.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Hungary, Japan and Portugal.

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The question of how age diversity influences productivity is therefore important for companies given that, with rapid population ageing and longer working lives, the workforce of most companies will increasingly span a wider range of ages.

### ***The two ways in which age diversity affects firm productivity: The worker's own effort and co-worker complementarities***

The productivity of an employee, who collaborates with other team members at work, is determined by two components: firstly, by the worker's own individual contribution (i.e. effort and skill); and secondly, by the collective contribution that results from the interactions with the other team members. Similarly, the effect of age diversity (or age composition) on productivity is determined by these two components as well: the individual productivity of each worker and how well workers of different ages collaborate, share knowledge and support each other in complementary ways.

Previous work has used various types of data – at the country, firm and worker level – to shed light on the overall age-productivity profile.<sup>2</sup> As Box 2.2 details, a common finding of research on worker productivity is that productivity increases in the earlier years of one's career. It is less clear what happens beyond prime age: the majority of existing studies find that productivity peaks when workers are in their 40s or 50s, and that it then plateaus or declines as people grow older, while a few studies also indicate that productivity continues to increase up to retirement. Hence, an overall takeaway of the evidence available prior to this report is that workers start their working life with comparatively low productivity and that middle-aged and older workers appear to have broadly similar high levels of productivity.

### ***The age diversity-productivity relationship depends on the source of age diversity***

These changes in productivity over people's lifetime matter for the relationship between age diversity and firm productivity, because differences in age diversity (i.e. in the age composition of a firm's workforce) mean differences in the productivity of the average worker. These changes in productivity over people's lifetime make also clear that the age diversity-productivity link depends on the source of differences in age diversity. For instance, the productivity of firms increases when greater age diversity reflects mainly more older workers (as in the context of population ageing) whose productivity tends to exceed that of younger workers and new entrants in the labour market. In cases where greater age diversity stems from a larger number of younger workers, productivity is likely to decline, reflecting their lower work experience.

A number of studies have looked at the relationship of age diversity with productivity (Box 2.2). However, these studies do not pay attention to the source of the differences in age diversity (i.e. more younger or more older workers or both), because they use, for example, the standard deviation for measuring age diversity. This is an important drawback, given the generally lower productivity of younger workers, and is likely to explain why very different results have been obtained. Moreover, the estimates in these studies on the relationship between age diversity and productivity mix the individual productivity effect with the co-worker complementarities effect. To date, no study on age diversity seems to have been designed with the objective in mind to allow for an explicit distinction between these two effects. It appears plausible that more numerous older workers make younger workers more productive, as the younger workers benefit from the experience and knowledge of their older colleagues.

The new evidence in this chapter brings the two strands of work – on the relationships between age and productivity and between age diversity and productivity – together. It highlights that the link between age diversity and productivity depends on whether diversity rises thanks to a larger number of young or older workers. It also shows that the effects of age diversity go beyond changes to individual productivities, as greater age diversity comes with greater complementarities of skills, knowledge and experience of workers of different ages. These complementarities create important spillovers and benefits, so that with an age-diverse workforce a firm's productivity is greater than the sum of the workers' individual productivities.

## Box 2.2. The overall link between age diversity and productivity: What we know so far

This box surveys what is known from studies that combine firm- and worker-level micro-data (which is what this chapter does as well) to estimate the role of the age of employees and of age diversity for firm performance. A few analyses have instead used macro-data to compare trends in age composition and productivity across countries, finding that higher shares of those who are less than 40 or more than 50 years old are correlated with lower productivity growth, as workers in their 40s are the most productive (Aiyar, Ebeke and Shao, 2016<sup>[5]</sup>; Feyrer, 2007<sup>[6]</sup>). These aggregate data may, however, mask other factors potentially at play and do not allow investigating how age diversity affects the individual firm.

### People tend to become increasingly productive over the first half of their working life

The majority of studies find that young workers are less productive than prime-age workers. This is the result of national studies for Austria, Canada, France, Israel, Japan, the Netherlands, Portugal and the United Kingdom (Aubert and Crépon, 2003<sup>[7]</sup>; Bryson et al., forthcoming<sup>[8]</sup>; Cardoso, Guimarães and Varejão, 2011<sup>[9]</sup>; Dostie, 2011<sup>[10]</sup>; Fukao et al., 2006<sup>[11]</sup>; Hellerstein and Neumark, 1995<sup>[12]</sup>; Mahlberg et al., 2013<sup>[13]</sup>; van Ours and Stoeldraijer, 2011<sup>[14]</sup>). For the United States, one study has obtained the same result that young workers are less productive, while another one suggests that young workers are as productive as prime-age workers (Haltiwanger, Lane and Spletzer, 1999<sup>[15]</sup>; Hellerstein, Neumark and Troske, 1999<sup>[16]</sup>). In Germany, young and prime-age workers also appear to be equally productive (Göbel and Zwick, 2012<sup>[17]</sup>). Only one study, on Belgium, finds that young workers are more productive than prime-age workers (Lallemand and Rycx, 2009<sup>[18]</sup>).

### How productivity develops from prime working age to retirement is still being debated

Research is less conclusive on what happens to worker productivity from prime age until retirement. In Israel, firms with a higher share of older workers seem to be more productive (Hellerstein and Neumark, 1995<sup>[12]</sup>). Studies for Belgium, Canada and the United Kingdom suggest that they are less productive (Bryson et al., forthcoming<sup>[8]</sup>; Dostie, 2011<sup>[10]</sup>; Lallemand and Rycx, 2009<sup>[18]</sup>). Older workers in Austria, France, Germany, Japan, the Netherlands and Portugal appear to be as productive as prime-age workers (Aubert and Crépon, 2003<sup>[7]</sup>; Cardoso, Guimarães and Varejão, 2011<sup>[9]</sup>; Fukao et al., 2006<sup>[11]</sup>; Göbel and Zwick, 2012<sup>[17]</sup>; Mahlberg et al., 2013<sup>[13]</sup>; van Ours and Stoeldraijer, 2011<sup>[14]</sup>). An analysis of a German truck assembly plant suggests that productivity rises until age 65, as teams with older workers make fewer mistakes (Börsch-Supan and Weiss, 2016<sup>[19]</sup>). Studies for the United States indicate that older workers are equally productive as prime-age workers or less productive (Haltiwanger, Lane and Spletzer, 1999<sup>[15]</sup>; Hellerstein, Neumark and Troske, 1999<sup>[16]</sup>). There are likely several explanations for the differences in results, including differences in datasets, estimations and settings as well as, possibly, small average differences in productivity between middle-aged and older workers.

### The existing literature on age diversity and productivity is inconclusive

In Belgium and Germany, age diversity in the company appears to reduce productivity (Backes-Gellner and Veen, 2012<sup>[20]</sup>; Garnero, Kampelmann and Rycx, 2014<sup>[21]</sup>), while in Denmark it does not seem to matter for productivity (Parrotta, Pozzoli and Pytlikova, 2014<sup>[22]</sup>). For Finland, higher age diversity has been found to be linked with a higher productivity of industrial plants (Ilmakunnas and Ilmakunnas, 2011<sup>[23]</sup>). Other studies have gone further in their argument. One on Belgium points out that the role of age diversity for company performance may be more nuanced than often thought, finding that age variety – with many workers of different ages – is good for productivity, while age polarisation – with many young and many old workers – is bad for productivity (De Meulenaere, Boone and Buyl, 2016<sup>[24]</sup>). Two studies argue that age diversity raises productivity, but only up to a point, beyond which the relationship turns negative (Grund and Westergaard-Nielsen, 2008<sup>[25]</sup>; Zelity, 2019<sup>[26]</sup>). Based on this research, advanced economies are on the negative side of the hump.

## New international evidence on the overall link of age diversity with productivity

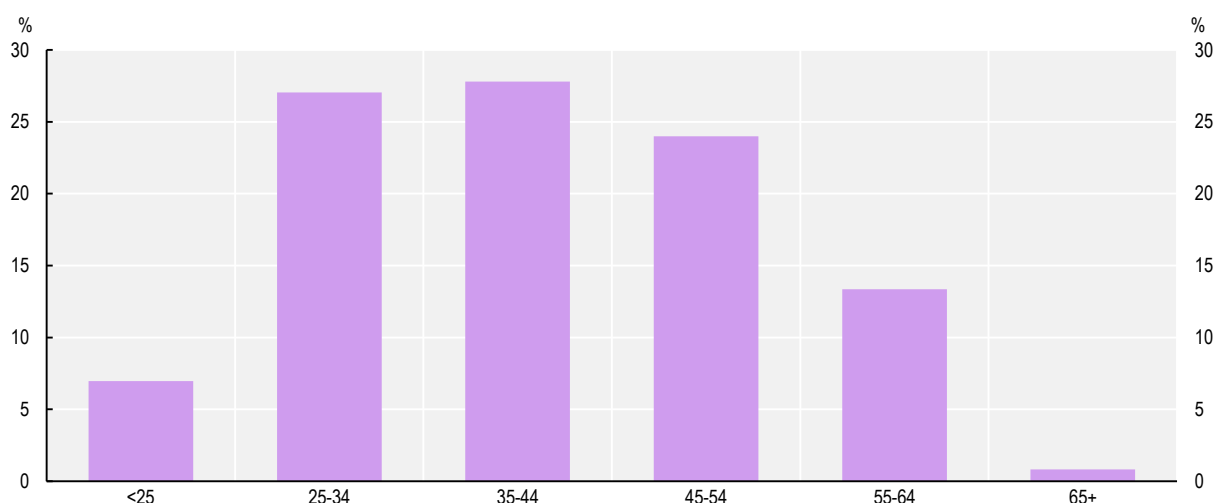
This section presents new international evidence on the overall link of age diversity with firm productivity, using linked employer-employee data. These data bring together firm-level information on productivity with worker-level information including on age. They tend to cover all firms and workers; results are therefore general and of high quality (Criscuolo et al., 2020<sup>[27]</sup>). The period considered is 2002-17, depending on the country. In contrast to previous studies, the analysis has the advantage that it pools data from six countries: Costa Rica, Finland, Germany, Hungary, Japan and Portugal.<sup>3</sup> Labour productivity is measured as value added per worker or, if value added is not available, as gross output per worker (Portugal). The focus of this section is on the overall link between age diversity and productivity taking account of both the individual productivity effect and the co-worker complementarities effect.

### ***Considerable scope exists for increasing age diversity, particularly by employing more older workers***

While young and older workers are an important part of the workforce in each of these six countries, there is considerable scope for greater age diversity, both at lower and higher ages (Figure 2.2). The gap in the employment rates of young and older workers relative to the rate for prime-age men is substantial, which is a phenomenon that goes beyond the six countries in this dataset (OECD, 2018<sup>[28]</sup>). On average across the 37 OECD countries, the employment gap is 32% for persons aged 55-64 and 9% for ages 15-29 (when excluding those in full-time education or training). The larger employment gap for older workers together with population ageing and rising labour force participation among older workers means that greater age diversity is likely to occur as a result of firms employing greater numbers of older workers relative to young workers.

**Figure 2.2. The low employment rates of young and old leave much opportunity for greater age diversity**

Average employment share of each age group in Costa Rica, Finland, Germany, Hungary, Japan and Portugal



Note: The figure depicts the unweighted average of employment shares across the six countries. The data refer to 2017 for Costa Rica, Finland and Portugal, 2016 for Germany, 2013 for Japan and 2010 for Hungary.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Hungary, Japan and Portugal.

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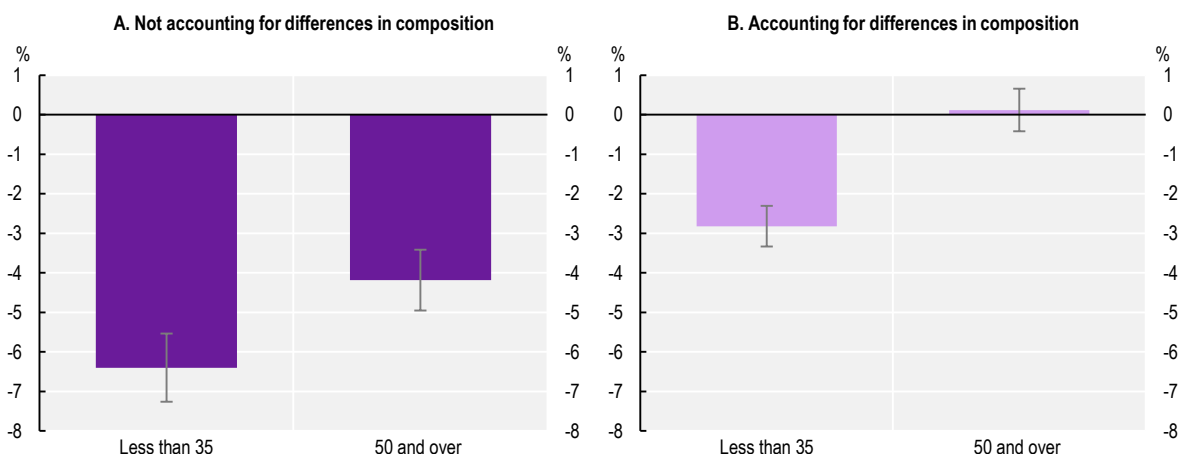
### Empirical results show that older workers are as productive as prime-age workers

Linear regression analysis is used to model the association between age diversity, i.e. greater shares of young and older workers, and productivity.<sup>4</sup> The details of the results from this and other regressions in this chapter are in Annex 2.A. Age diversity at first sight appears to be correlated with lower productivity, as shown in Figure 2.3, Panel A. However, this may be an artefact of differences in the composition of workers and firms. Younger and older workers may have certain characteristics that are associated with lower productivity. They may also be employed in firms with certain characteristics that are associated with lower productivity. They could, for example, be less well educated or work in smaller firms, which tend to have lower productivity. In this case, age would not be the explanatory factor for the lower productivity of younger and older workers, but reflect other factors that happen to be correlated with it.

When accounting for these differences in factors other than age between firms and workers, it becomes clear that a higher proportion of younger and older workers among lower-productivity firms reflects to an important extent differences in the characteristics of younger and older workers and the firms for which they work rather than the role of age per se. As shown in Figure 2.3, Panel B, the estimates for the links between productivity and the shares of younger and older workers increase (i.e. become less negative). The estimate for workers aged 50 and over turns positive, although its small size and statistical insignificance indicate that older workers are similarly productive as prime-age workers.

### Figure 2.3. Prime-age and older workers are more productive than younger workers

Change in firm productivity when the share of employees in the age group increases by 10%, with a corresponding decline in employees aged 35-49, for Costa Rica, Finland, Germany, Japan and Portugal



Note: The estimations regress log labour productivity on the two age shares, interacted country-year fixed effects and interacted country-industry fixed effects. Panel B adjusts for differences between firms other than age by adding education shares, the share of women and firm size shares. Firm age is not available in the data. The data average values for each decile by industry for the countries and years available in the dataset. Standard errors are clustered at the decile-industry-country level. The error bars indicate the 90% confidence interval. Annex 2.A provides further details on the regression results. The bars displayed multiply the regression coefficients by 2.2 which is 10% of the average shares of persons aged less than 35 and those 50 and over.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Japan and Portugal.

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Overall, these results corroborate earlier ones in the literature that young workers are the least productive and that the productivity of older workers is not too different to that of prime-age workers. Hence, if greater age diversity involves a larger share of both younger and older workers, firm productivity will be lower. If,



as is likely the case in the context of rapid population ageing, it involves only a larger share of older workers, with fewer young and prime-age workers, firm productivity will be higher.

Despite these positive findings, analysis over time (which re-ranks firms by their productivity level in each year) shows that age diversity – when measured as the combined share of persons aged less than 35 and those 50 and over – has not increased in the most productive firms. In the most productive firms, the decline in workers who are less than 35 years old has fully offset the increase in the share of workers aged 50 and over. By contrast, age diversity has risen the most in the least productive firms, where the increase in the share of workers aged 50 and over has been around 50% larger than in the most productive firms. The disproportionate increase in the employment of older workers at lower-productivity firms could reflect ageism and raises the concern that some older workers continue to face major barriers to find good-quality jobs despite their high productivity. Box 2.3 provides further insights on the factors that may stand behind the rising concentration of older workers in low-productivity firms.

## Age diversity and complementarities between workers of different ages

The benefit of age diversity is that it enables workers of different ages to collaborate, share knowledge and support each other in complementary ways. Age diversity has the potential to make a firm's productivity greater than what the sum of its workers' individual productivities would suggest. Such complementarities tend to be particularly strong between young and older workers. Where young and older employees work together, young workers often benefit from the advice of their older colleagues, who can draw on their long experience, from the guidance that they receive from their managers, who may be older than they are, and from the transfer of firm-specific knowledge, accumulated over years, that age-diverse teams can ensure.

These benefits notwithstanding, greater age diversity in the workplace can also face certain challenges, for example more potential sources of conflict, when younger workers manage older colleagues, and the lower job mobility of older workers, which makes it more difficult to hire them (IFF Research, 2017<sup>[29]</sup>). In how far these challenges play a role depends much on the extent to which governments and businesses confront them. With the right policies, as discussed in the following policy chapters, employers can reap the benefits of an age-inclusive workforce.

The analysis in this section provides evidence of the advantages that complementarities between old and young bring to companies with multigenerational workforces. It documents empirically three ways in which older workers benefit other workers and the firm:

- their lower worker turnover
- their greater management experience
- their greater general work experience

Lower worker turnover helps avoid excessive levels of staff fluctuation and fosters employment stability. Management practices are an important determinant of the performance of businesses (Bloom and Van Reenen, 2010<sup>[30]</sup>). General work experience promotes knowledge and information spillovers from older, more experienced employees to their younger colleagues. Research on these kinds of co-worker complementarities between workers of different ages has been scarce, even though human resource professionals and workers themselves name knowledge sharing and having different perspectives the key benefits of age-diverse teams (CIPD, 2014<sup>[2]</sup>).

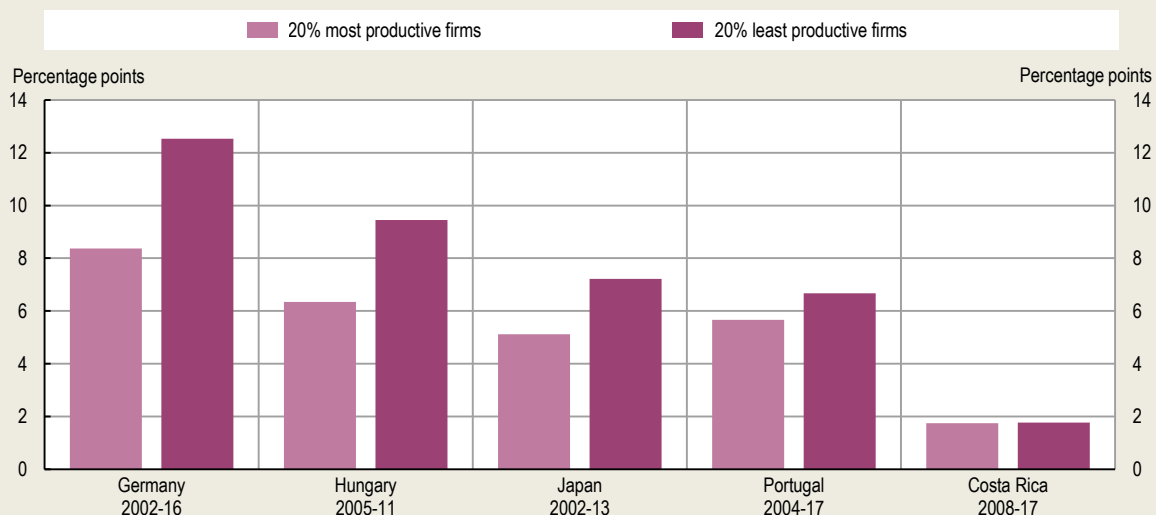
A key takeaway is that workers are more productive when they work with others who are of a different age, thanks to the complementarities between them. Therefore, if you have colleagues who are of a different generation to you, they make you perform better, and this is good for the company because its productivity becomes higher. This is one area, however, in which the COVID-19 crisis and increased teleworking in its wake pose challenges to companies, as they can make it harder for employees to interact and in particular for young workers to benefit from the guidance and knowledge of their older, more experienced colleagues.

### Box 2.3. There is opportunity for high-performing firms to employ more of the increasing number of older workers

Many advanced countries experienced significant rises in the labour force participation of older workers over recent decades. However, a lot of the increasing number of older workers are employed in low-productivity firms: low-productivity firms exhibit larger increases in the share of older workers than high-productivity firms (Figure 2.4). Today, older workers are more likely to be in low-productivity than in high-productivity firms, whereas they were equally likely to work in low- and high-productivity firms at the start of the 2000s. The policy concern is that older workers end up in low-skilled jobs, in part due to negative stereotyping, age discrimination and a lack of investment in skills (i.e. lifelong learning).


### Figure 2.4. An increasing share of older workers is employed in low-productivity and low-pay firms

Change in the share of employed aged 55 and over



Note: Labour productivity and share of persons aged 55 and over are calculated for each firm. For each quintile, they are then averaged first across firms within each industry and then across industries.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Germany, Hungary, Japan and Portugal.

StatLink  <https://stat.link/bx8u9d>

A relative decline in the skills of employed older workers is likely to have been a key factor behind the increased labour force participation of older workers in low-productivity firms. For instance, Germany introduced wage subsidies for older workers taking up a low-pay job, curtailed early retirement options and relaxed restrictions to fixed-term contracts for older workers as part of the Hartz reforms in the early 2000s. This and similar reforms elsewhere may have pushed low-skilled older workers in particular to continue working for low-productivity, low-pay firms.

The rising concentration of older workers may also reflect a growing skills mismatch, which could arise as a result of the wage-setting policies of firms. In many countries, wages rise with seniority and possibly exceed the employee's productivity at the later stages of the working life. Rather than adjusting wages through the renegotiation of employment contracts, these older workers may be dismissed and forced to accept a job in lower-productivity firms that pay lower wages. Population ageing may reinforce these dynamics by widening the gap between wages and productivity for older workers, especially in wage-setting systems based on deferred wage payments such as in Japan (Fukao et al., 2006<sup>[11]</sup>).

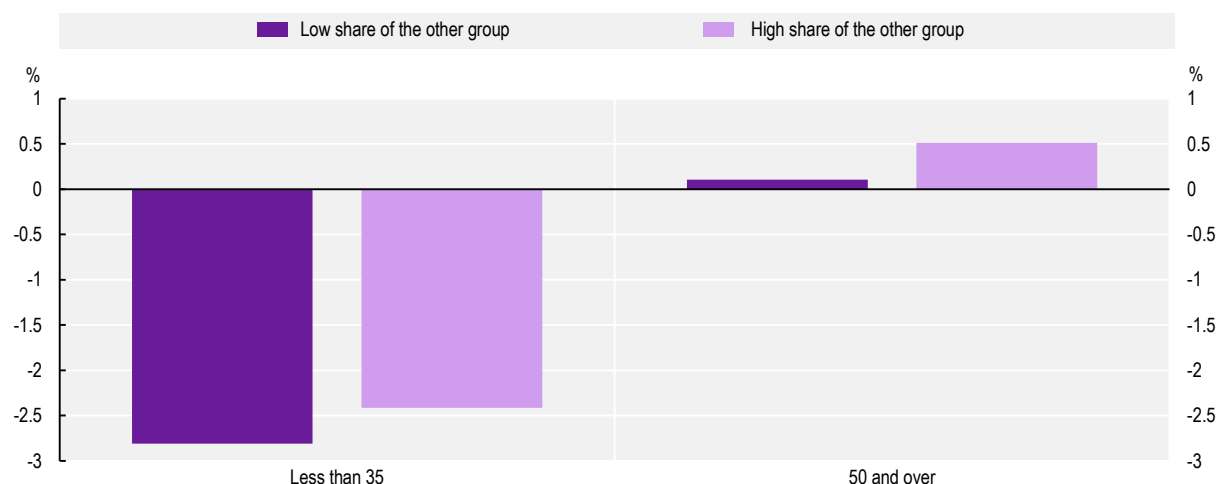
## Complementarity in productivity and pay of young and older workers

The regression analysis in the previous section estimated the overall link of age diversity with productivity, taking account of both the individual productivity and the co-worker complementarities effect. The analysis can be adapted to help disentangle the co-worker complementarities effect. This can be done by allowing the coefficients on the share of young and older workers to differ according to the share of the other group. In practice, this can be achieved by adding an interaction term between the age shares of persons less than 35 years old and 50 and over. A positive coefficient on the interaction term signals beneficial spillovers from one age group to the other. While this setup does not allow establishing the direction of the spillovers (from old to young or young to old), the analysis at the end of the section (which has a more narrow focus) shows that more older workers are more beneficial for firm productivity, in part because this allows more younger co-workers to benefit from the experience of their older colleagues.

Younger and older workers are more productive when a larger number of colleagues of the other age group are in their firm (Figure 2.5). Persons aged less than 35 are generally the least productive, but they are more productive when they work with more older workers. Hence, while a larger number of young workers reduces productivity overall because of their lower productivity, it nevertheless creates beneficial spillovers between young and old. Persons aged 50 and over have similar productivity levels as those aged 35-49 and are more productive when there are more younger workers. The result of complementarity between young and older workers is stronger in services than in manufacturing industries.<sup>5</sup>

### Figure 2.5. Employees are more productive when they work with others who are of a different age

Change in firm productivity when the share of employees in the age group increases by 10%, with a corresponding decline in employees aged 35-49, for Costa Rica, Finland, Germany, Japan and Portugal



Note: The estimations regress log labour productivity on the two age shares, an interaction term between the two age shares, education shares, the share of women and firm size shares, interacted country-year fixed effects and interacted country-industry fixed effects. Firm age is not available in the data. Low and high share of the other group take the values at the 25<sup>th</sup> and 75<sup>th</sup> percentiles in the sample. The data average values for each decile by industry for the countries and years available in the dataset. Annex 2.A provides further details on the regression results, including statistical significance.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Japan and Portugal.

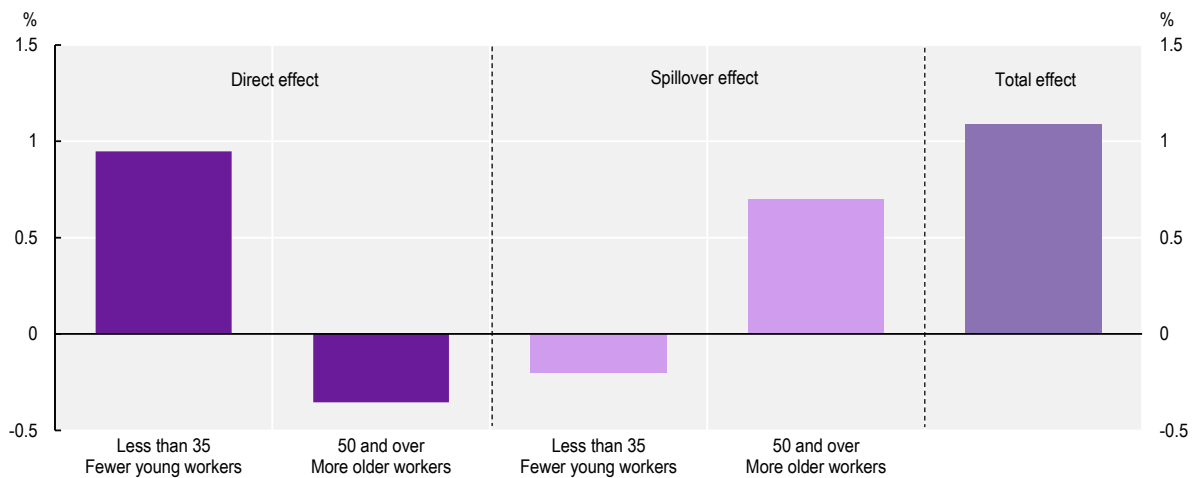
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Quantitatively, a firm that has a 10% higher share of workers aged 50 and over than the average firm (i.e. 24% instead of 22%) is 1.1% more productive (Figure 2.6).<sup>6</sup> This calculation assumes that the shares of persons aged less than 35 and those 35-49 decline by an amount that is proportional to their average

size. Half of the increase in productivity (0.6%, the “direct effect”) is due to the smaller number of younger workers, who are the least productive. The other half (0.5%, the “spillover effect”) is primarily explained by the more numerous older workers, who enable further productivity-enhancing complementarities between younger and older workers.<sup>7</sup> The overall increase in productivity of 1.1% is sizeable: it exceeds the average annual productivity growth rate among OECD countries as well as G7 countries over the period 2000-18 (equal to 0.9%). Raising the share of older workers by 10% would therefore generate a one-off gain that is worth a bit more than one year of growth.

**Figure 2.6. A higher share of older workers can boost productivity directly and indirectly**

Change in firm productivity when the share of employees aged 50 and over increases by 10%, for Costa Rica, Finland, Germany, Japan and Portugal



Note: The figure depicts the association with firm productivity when the share of employees aged 50 and over increases by 10% (which equals 2.2% of all employees in the dataset), while the shares of employees aged less than 35 and those 35-49 decrease by 0.6 and 1.6 percentage points respectively, reflecting their relative shares. Persons aged 35-49 are the most productive themselves, which is why fewer younger workers increase firm productivity and more older workers decrease it via the “direct effect”. The positive complementarity between younger and older employees means that fewer younger workers decrease firm productivity and more older workers increase it via the “spillover effect”. Annex 2.A provides further details on the regression results, including statistical significance.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Japan and Portugal.

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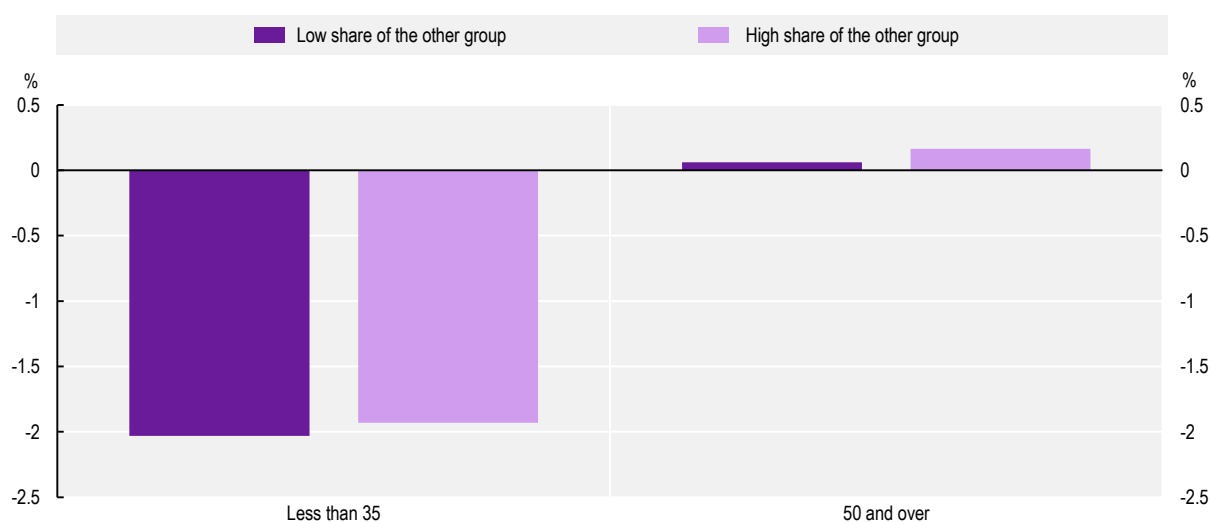
The estimates bring home the message that the relationship of age diversity with productivity depends on the precise nature of age diversity. When increased age diversity reflects a higher share of older workers and a lower share of prime-age workers, with no increase in the share of younger workers, age diversity increases productivity. This argument requires, however, that the skill composition of the additional older workers is similar to that of those already participating in the labour market. This may not have been the case in the context of the greater inclusion of older workers over the past two decades, with many of the additional workers being employed in low-productivity firms (see Box 2.3). When increased age diversity reflects similar increases in the shares of young and older workers, age diversity decreases productivity, since the negative individual productivity effect dominates the positive co-worker complementarities effect.

The complementarity between the skills of employees of different generations benefits employers, because it raises the productivity of the firm. Their employees benefit as well, as they are rewarded for the increased productivity with higher wages. Regressions that use as the outcome variable the average wage at the firm instead of firm productivity show that wages are higher for younger and older workers when the number of workers in the other age group is larger (Figure 2.7). The regressions also show that younger workers earn

a lower wage in general and that the pay of prime-age and older workers is similar. As is a usual finding in such studies, wages increase less than one-for-one with productivity. The wage results echo the estimates for productivity of workers of different ages and are further evidence of the strong correlation of wages with productivity. What overall comes out of the evidence is that multigenerational workforces create important positive synergies that are good both for the employer and for the employees.


### Figure 2.7. Employees are rewarded with higher wages when they work with others of a different age

Change in the average wage at the firm when the share of employees in the age group increases by 10%, with a corresponding decline in employees aged 35-49, for Costa Rica, Finland, Germany, Japan and Portugal



Note: The estimations regress the log wage on the two age shares, an interaction term between the two age shares, education shares, the share of women and firm size shares, interacted country-year fixed effects and interacted country-industry fixed effects. Firm age is not available in the data. Low and high share of the other group take the values at the 25<sup>th</sup> and 75<sup>th</sup> percentiles in the sample. The data average values for each decile by industry for the countries and years available in the dataset. Annex 2.A provides further details on the regression results, including statistical significance.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Japan and Portugal.

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### ***The benefits of the lower turnover of older workers for employment stability at the firm***

Older workers are often seen to be more loyal and to provide continuity and stability to the firm. Their lower turnover can have various reasons, some more worrying, others less. The longer career of older workers may have enabled more of them to find the job and firm that is the best match for them. Their opportunity cost of staying with the same company is lower, as the expected return from switching jobs is limited given that they have fewer years left to work. Older workers are also more likely to have their own property and deeper social networks where they live, which reduces the willingness to change jobs when it involves changing residence. Pension regulations, seniority wages and hiring discrimination can play a role as well (see Chapter 3).

Employee turnover is a necessary ingredient of a dynamic and innovative economy. Some firms, however, face the opposite problem, namely that of an undesirably high and costly level of worker turnover (Boushey and Glynn, 2012<sub>[31]</sub>). In this context, older workers may increase employment stability at the firm since, by being less likely to leave the firm themselves, they can contribute to creating a firm culture that is no longer one where people come and go, but rather becomes one where employees want to stay. This can have

the benefit of raising incentives for staff to invest in firm-specific knowledge and take decisions that are of long-term benefit for the company (OECD, 2018<sup>[28]</sup>). Based on data for several individual companies, an ongoing project by the Mercer Workforce Sciences Institute finds evidence that supports the view that older workers stabilise work units by lowering excessive rates of job turnover.

Worker turnover is lower for older workers than for prime-age and for younger workers and the presence of older workers makes fewer young colleagues leave as well in the dataset of this chapter. These results are obtained when in the analysis of the previous section worker turnover replaces productivity.<sup>8</sup> Employee turnover is 4% lower at a firm that has a 10% higher share of older workers than the average firm.<sup>9</sup> Larger dismissal costs for longer-tenured, older workers are likely to contribute to the result, but cannot explain it in full. Hence, reducing high levels of turnover is one factor that may stand behind the positive synergies between younger and older workers for firm productivity. As was the case for productivity, age diversity is not unambiguously linked with lower employee turnover: in instances where more young workers increase age diversity, employee turnover goes up, due to the high fluctuation among younger staff.

### ***The benefits of greater management experience of older workers for their co-workers***

Management practices are an important determinant of business performance and hence the performance of each worker in the business. Companies with better management practices are more productive, larger and provide better jobs. They also grow faster and have higher rates of survival. Managers have therefore a key role and better managers, who may be able to draw on a greater experience, can make every worker in their team, or the entire firm in the case of senior managers, more productive.

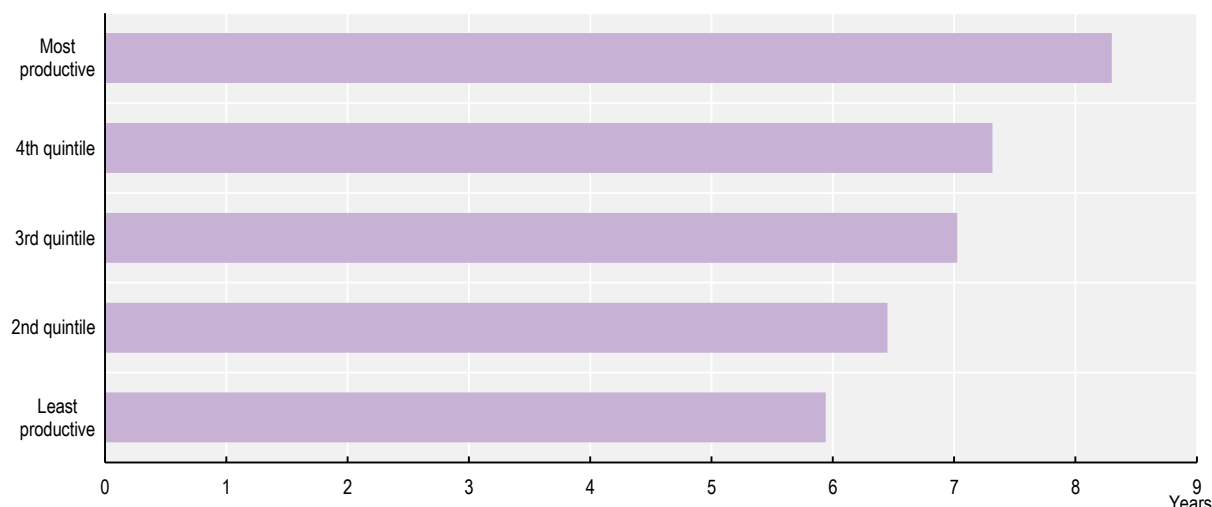
The most senior manager in many firms is the chief executive officer (CEO). As the CEO runs the company and takes key strategic decisions, the CEO's function has the potential to generate positive productivity spillovers for all other workers in the company. The dataset does not identify the CEO; however, the age of the person with the top wage at the company can be used as a proxy to obtain the age of the CEO. This is compared with the median age at the company, which gives a measure of age diversity between top management and the rest of the company's workforce.

Two insights stand out (Figure 2.8). Firstly, in firms at all productivity levels, the age of the CEO is higher than the median age of the employees at the company. Although this will not be a surprising result to many, it is important: companies view older workers to be better suited for top management jobs than young and prime-age workers. Secondly, this age gap between CEOs and the rest of the employees is greater by 2-2½ years in the 20% highest-productivity firms than in the 20% lowest-productivity firms. These two insights hold qualitatively in each of the four countries. They suggest that CEOs who are more experienced than other workers at their company make the company and its workers more productive.

The same insights hold for managers more generally, not only the CEO (Figure 2.9). Two of the countries in the data, Costa Rica and Germany, have information on managers based on occupational classification codes. Non-managerial workers are of a similar age in the 10% most productive firms and the 10% least productive firms. Managers, however, are older than other workers in the company for frontier and laggard firms. They are a further three years older in the most productive firms compared with the least productive ones. These results indicate overall that older workers are in managerial roles not just because of greater seniority, but also because they are able to use their experience and skills to improve the performance of the business and the staff.

**Figure 2.8. The CEOs of higher-productivity firms are older relative to the other employees**

Age difference between the CEO and the median employee at the firm for Costa Rica, Finland, Hungary and Japan



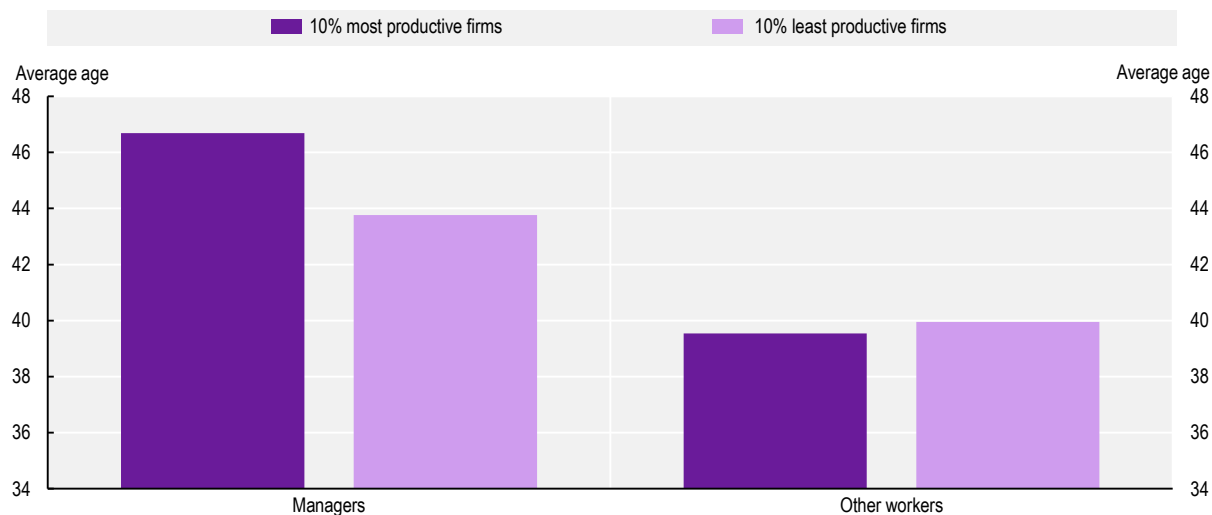
Note: Labour productivity as well as the age of the CEO and of the median employee are calculated for each firm. For each quintile, they are averaged first across firms within each industry, then across industries and finally across countries. The data refer to 2017 for Costa Rica and Finland, 2013 for Japan and 2010 for Hungary.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Hungary and Japan.

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**Figure 2.9. Older managers seem more successful at achieving high levels of productivity**

Average age in high- versus low-performing firms in Costa Rica and Germany



Note: Labour productivity as well as the age of managers and of other workers are calculated for each firm. For each quintile, they are averaged first across firms within each industry, then across industries and finally across countries. The data refer to 2017 for Costa Rica and 2016 for Germany.

Source: OECD calculations using linked employer-employee datasets for Costa Rica and Germany.

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### ***The benefits of greater general work experience of older workers for their co-workers***

The sharing of general work experience is the other channel, besides lower worker turnover and stronger management expertise, through which productivity spillovers from older workers to young co-workers can create mutually beneficial synergies that lift the performance of firms in which young and old work together. This finding emerges from estimations of the effect on the productivity of incumbent workers, as reflected in their wage, following the recruitment of an older worker to their team. The analysis is conducted at the worker level and regresses the wage change of incumbent workers on the share of persons aged 50 and over who have been newly hired, while controlling for standard observable characteristics.<sup>10</sup> In contrast to the regressions above, which established generally positive synergies between young and older workers (but were not suited to determine the direction of the spillovers), this setup focuses on spillovers from older to young workers. Using wages as a proxy for the (unobserved) productivity of the individual worker is a common assumption. As this section and Box 2.1 have shown, wages and productivity are highly positively correlated, and complementarities between young and older workers are reflected in greater productivity and higher wages.

Productivity, as reflected in the wage, of incumbent workers rises more strongly for a team that hires older workers. The analysis focuses on the three years following the move. The effect of recruiting older workers is positive for all three age groups, and it is strongest for younger co-workers, indicating that they receive valuable spillovers from newly hired, experienced staff (Figure 2.10). The estimated effect is relatively small: hiring a 50+ worker to a team of nine workers raises the productivity of young co-workers that is reflected in a wage boost of approximately 1% of their annual wage in total over the three years following the hiring. This result underlines the complementarity of skills and knowledge between workers of different ages and benefits of being in a team with colleagues who have greater general work experience. It holds on average across countries and firms, while there can be country- and sector-specific circumstances in which older workers weaken the performance of younger workers – see a study on US state supreme court judges (Ash and MacLeod, 2020<sup>[32]</sup>).

### **Tailoring support for workers of different ages and strengthening collaboration between generations**

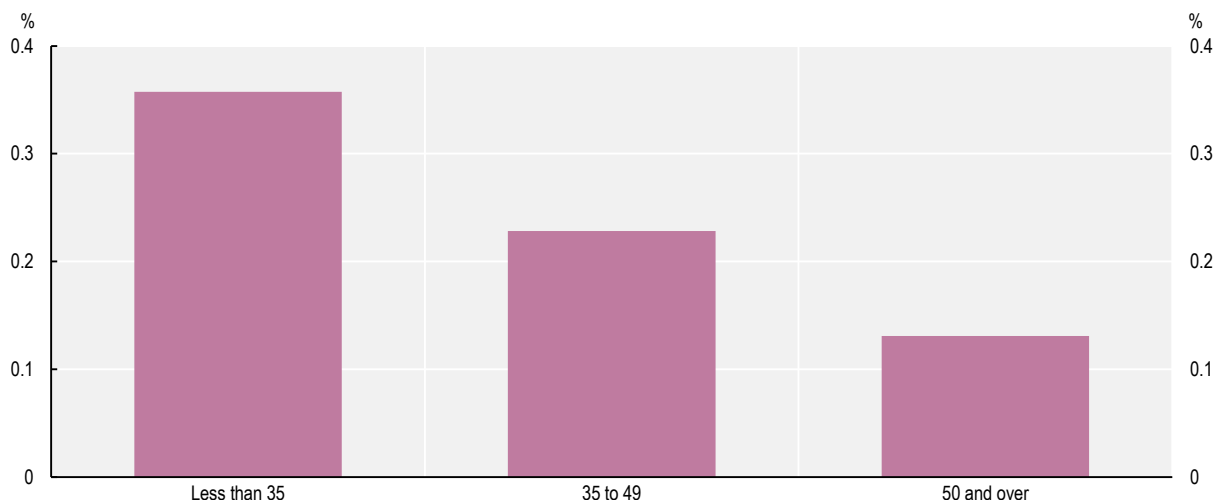
The analysis in this chapter has shown that greater age diversity is not detrimental to firm performance. It has also shown that there are a number of pathways by which greater age diversity can increase productivity. Reaping these benefits requires putting in place the right support for strengthening collaboration between generations.

Businesses are increasingly aware of the positive potential that an age-diverse workforce has for firm performance. According to the AARP Global Employer Survey 2020, 83% of employers state that it would be very or at least somewhat valuable to their organisation's success and growth to create a more multigenerational workforce. Executives in large global companies recognise that their organisation would need to undertake more efforts to maximise the full potential that an age-diverse workforce offers, listing age, besides disability, as the area of diversity management that requires most improvement (Forbes Insights, 2011<sup>[33]</sup>).

Understanding the attitudes and needs of workers at different ages who collaborate in the workplace is the basis for putting the right policies in place to harvest the business benefits of a multigenerational workforce.

**Figure 2.10. Having a 50+ worker in the team is associated with increased productivity of co-workers**

Percentage change in incumbent workers' wage when 10% of the team are made up of newly hired 50+ workers for Austria, Estonia, Italy, Portugal and Spain



Note: The estimations regress the log difference in the wage for the three years following the move on the hiring rate of 50+ workers, the lagged log difference in the wage, standard observable characteristics for the worker and firm (including employment growth to control for the positive correlation between employment growth and productivity growth), worker fixed effects and interacted industry-year fixed effects. Regressions are run for each country and year separately and results are then averaged across countries and years. Team refers to the whole firm for firms with up to 100 employees and all workers in the same occupational group for firms with more than 100 employees. Annex 2.A provides further details on the regression results, including statistical significance.

Source: OECD calculations using linked employer-employee datasets for Austria, Estonia, Italy, Portugal and Spain.

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### ***Understanding the attitudes and needs of a multigenerational workforce***

People at different stages of their working life have different needs. Young workers need to build up a diverse set of work experience to develop work-related skills. Parents with young children and people with frail family members are in need of flexible working times to accommodate work with family responsibilities. People re-joining the workforce after a long period of absence may need to update their skills set, while those close to retirement may wish to work part-time to phase into retirement.

Several studies in the management literature claim that there are generational differences in work attitudes and needs (Lyons et al., 2015<sup>[34]</sup>). For example, based on employee data from Australia, China, Germany, Singapore and the United States, Cagin (2012<sup>[35]</sup>) finds significant differences in work attitudes between generations, even after controlling for differences in life stage. The most important work value is “hard work” for Traditionalists and Baby Boomers, “asceticism” for Generation X and “leisure” for Generation Y. These apparent differences in work attitudes and needs are often reflected in generational stereotyping of the kind summarised in Table 2.1. They could be a source of tension at work, as a result of conflicting work-related values, feelings of unequal treatment by management, unfulfilled career expectations, obstacles to collaboration and reduced knowledge transfer.

**Table 2.1. Stereotypes on differences in work attitudes and needs between generations**

Generation	Time frame	Characterised as
Traditionalists	Born before 1945	Conservative, dedicated, team-workers, collaborative
Baby Boomers	Born between 1946-1964	Workaholics, loyal, competitive, materialistic
Generation X	Born between 1965-1980	Looking for good work-life balance, question authority, flexible, job hoppers
Generation Y / Millennials	Born between 1981-2000	Technology-savvy, team players, multi-taskers, “work hard, play hard” mentality
Generation Z	Born between 2001-2020	Technology-centric, individualists, creative, diversity focused, risk-averse

Note: The indicated time frame is suggestive and may vary across countries as, for example, the baby boom period is different by some years from one country to the other.

Source: Adapted from Gaidhani, Arora and Sharma (2019<sup>[36]</sup>), “Understanding the attitude of Generation Z towards workplace”, Singh (2014<sup>[37]</sup>), “‘We are not phobic but selective’: The older generation’s attitude towards using technology in workplace communications”, <http://dx.doi.org/10.1108/dlo-10-2013-0082> and Tolbize (2008<sup>[38]</sup>), *Generational differences in the workplace*.

However, the evidence on substantial differences in work attitudes between generations is thin. In a meta-study on three workplace-related outcomes (organisational commitment, turnover intention and job satisfaction), Costanza et al. (2012<sup>[39]</sup>) find few, if any, differences between workers from different cohorts, which leads them to conclude that there are no systematic, substantive differences among generations. Similarly, Becton, Walker and Jones-Farmer (2014<sup>[40]</sup>) find that a person’s generation has a limited effect on workplace behaviour and that stereotypes are overstated.

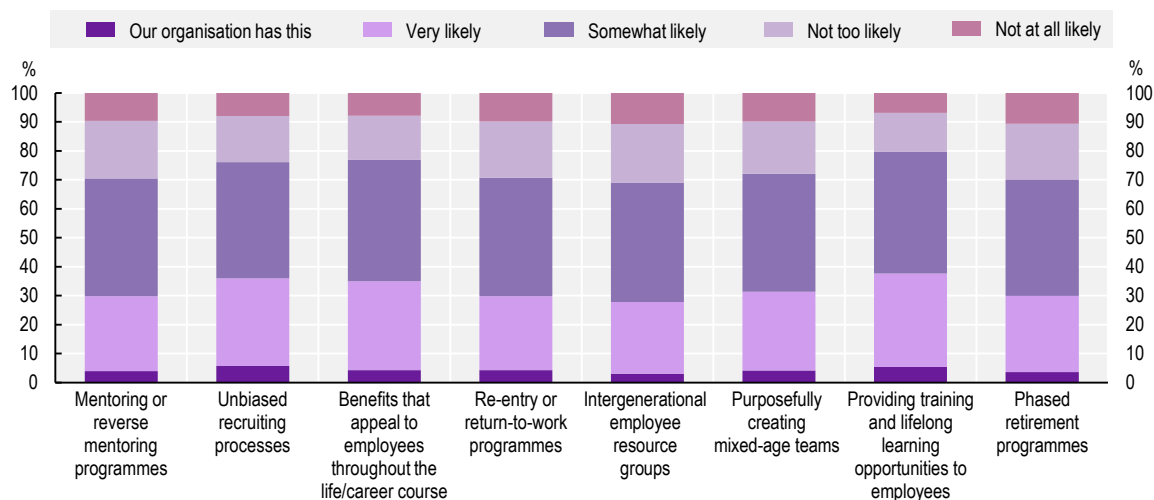
Setting generation-specific policies may therefore not be the best way to design policies (Costanza and Finkelstein, 2015<sup>[41]</sup>). Instead, it is the life stage of each individual employee that determines the needs and is the more useful construct when considering how to best manage employees (Smeaton and Parry, 2018<sup>[42]</sup>). The differences in needs of employees at different life stages would seem to suggest tailoring employment practices and policies to certain age groups. Yet, age is an imperfect indicator for life stage or individual needs, as work-life patterns are becoming more fluid. Rising longevity in particular pushes all generations from a three-stage life of distinct periods of education, work and retirement to a multi-stage, non-linear life in which key events occur more frequently across one’s life. It will therefore be necessary to define policies in an age-inclusive way, so that people at different stages of their life (whatever their age) can contribute their full potential at the workplace for maximum business success.

### ***How ready are employers to embrace a multigenerational workforce?***

There is much that employers can do to foster collaboration between different generations to achieve positive business outcomes and good working relationships among employees (see Chapters 3, 4 and 5). Currently, however, few employers have policies in place that support a multigenerational workforce. This applies in all policy dimensions: from supporting mobilisation and management of a multigenerational workforce to making jobs attractive at all life stages and keeping skills up-to-date for a long and productive career. According to the AARP Global Employer Survey 2020, in no policy area have more than 6% of employers implemented policies that are targeted at supporting a multigenerational workforce, such as unbiased recruiting processes and return-to-work or phased retirement programmes (Figure 2.11).

**Figure 2.11. Employers have few policies in place to support multigenerational workforces but they aim for more**

Share of employers that have or would be very, somewhat, not too or not at all likely to implement or explore implementing a specific policy if provided with examples of promising practices



Note: The question asked was: "If provided with examples of promising practices and 'how-to' guides on a multigenerational workforce, how likely are you to implement or explore implementing programmes or strategies in each of the following areas?" Respondents were about 5 900 employers from all OECD countries with the exception of Colombia.

Source: AARP Global Employer Survey 2020.

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One area in which progress has been lacking so far are human resource performance systems. These need to better capture the collective impact of an age-diverse and -inclusive workforce. As this chapter has shown, much of the benefits of age diversity comes from spillovers or the mix of ages, with employees collaborating and complementing and learning from each other. Yet, current human resource systems fall short in two ways: they tend to incentivise individual contributions rather than capturing the productivity and collective impact of an age-diverse workforce; and they might even stifle productivity by discouraging collaboration, while encouraging internal competition.

The good news is that many companies are willing to do more. At least two-thirds of employers indicate that they would be very or at least somewhat likely to implement or explore implementing specific multigenerational workforce policies if they were provided with examples of promising practices (Perron, 2020<sup>[43]</sup>). This highlights the still large gap between intentions and reality when it comes to age-inclusive policies. The following chapters review employer policies and best practices to support building, managing and benefiting from a multigenerational workforce.

## Key takeaways

- Understanding the effects of ageing and age diversity for business performance is important, especially in the context where in the 2000s productivity growth of many countries has declined to unprecedented lows.
- The existing empirical literature has several limitations. Studies have either been conducted at a very aggregate level, without investigating how age diversity affects the individual firm, or only focused on a single country. They have also left mutually beneficial synergies between workers of different ages mostly unexplored.
- This chapter has the unique advantage that it uses high-quality linked employer-employee micro-data for ten different countries. These internationally comparable data bring together firm-level information on productivity with worker-level information on age. They tend to cover all firms and workers which, together with the multi-country coverage, ensures that results are general.
- The new analysis suggests that, when compositional differences between firms are taken into account, older workers do not drag down overall firm productivity. The productivity of the average worker increases from labour market entry to prime age and is then stable until retirement.
- Older workers are shown to be particularly valuable to their firm because they generate spillover effects that improve the productivity of their younger co-workers and therefore of the firm. These spillover effects have their roots in older workers' lower job turnover, their greater management experience and their greater general work experience.
- Firms are starting to recognise the potentially positive effects of greater age diversity, as ageing increasingly challenges traditional human resource practices. But, to be ahead of the curve, they need to do more to reap these benefits, beginning with rejecting simple stereotypical views about the unique attitudes and expectations about work that each generation is said to have.

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## Annex 2.A. Detailed regression results

**Annex Table 2.A.1. Age diversity and productivity: Main regression results**

Change in the outcome variable for Costa Rica, Finland, Germany, Japan and Portugal

Outcome variable	(1) Figure 2.3 (Panel A) Productivity Change (%)	(2) Figure 2.3 (Panel B) Productivity Change (%)	(3) Figure 2.5 Productivity Change (%)	(4) Figure 2.6 Average wage Change (%)	(5) Firm stability results Employee turnover Change (% points)
<i>Key variables:</i>					
Share of <35 (%)	-2.853*** (0.193)	-1.258*** (0.090)	-1.469*** (0.121)	-0.960*** (0.040)	0.149*** (0.013)
Share of 50+ (%)	-1.874*** (0.111)	0.052 (0.082)	-0.159 (0.124)	-0.025 (0.046)	0.035*** (0.005)
Share of <35 (%) × Share of 50+ (%)	-	-	0.014*** (0.004)	0.004* (0.002)	-0.005*** (0.001)
<i>Control variables:</i>					
Share of low education (%)	-	-2.914*** (0.131)	-2.918*** (0.131)	-1.060*** (0.029)	0.086*** (0.009)
Share of high education (%)	-	1.106*** (0.067)	1.107*** (0.067)	0.654*** (0.021)	0.013*** (0.003)
Share of women (%)	-	-1.140*** (0.050)	-1.135*** (0.050)	-0.825*** (0.023)	-0.003 (0.002)
Share of firms with <50 employees (%)	-	-0.939*** (0.026)	-0.938*** (0.026)	-0.189*** (0.010)	-0.004*** (0.001)
Share of firms with 250+ employees (%)	-	0.261*** (0.017)	0.263*** (0.017)	0.195*** (0.007)	-0.011*** (0.002)
Country-industry fixed effects	Yes	Yes	Yes	Yes	Yes
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes
No. of observations	26 613	26 612	26 612	26 612	16 717
No. of clusters	630	630	630	630	510
R <sup>2</sup>	0.989	0.995	0.995	0.998	0.961

Note: The omitted categories are: share of 35-49, share of middle education, share of men and share of firms with 50-249 employees. The regressions are estimated using OLS with log values for productivity and average wage. Standard errors, which are shown in brackets, are clustered at the country-industry-decile level. \*\*\* indicates statistical significance at the 1% level, \*\* at the 5% level and \* at the 10% level.

Source: OECD calculations using linked employer-employee datasets for Costa Rica, Finland, Germany, Japan (not (5)) and Portugal.

StatLink  <https://stat.link/a1vqu0>

**Annex Table 2.A.2. Age diversity and productivity: Regression results underlying Figure 2.10**

Change in the wage of incumbent workers for Austria, Estonia, Italy, Portugal and Spain

	(1) Austria Wage change Add. increase (%)	(2) Estonia Wage change Add. increase (%)	(3) Italy Wage change Add. increase (%)	(4) Portugal Wage change Add. increase (%)	(5) Spain Wage change Add. increase (%)
<i>Effect on the &lt;35:</i>					
Hiring rate of 50+ (%) Effect in year 1	2.76*** (0.47)	7.17*** (1.81)	1.24* (0.68)	-0.01 (2.61)	7.69*** (2.72)
Hiring rate of 50+ (%) Cumulative effect in year 2	2.01*** (0.55)	5.84*** (2.22)	-0.90 (0.76)	2.95 (2.71)	8.26*** (3.04)
Hiring rate of 50+ (%) Cumulative effect in year 3	1.28** (0.63)	5.25** (2.50)	-1.04 (1.09)	2.27 (2.86)	8.84** (4.22)
Average over the 3 years	2.02	6.09	-0.23	1.74	8.26
<i>Effect on the 35-49:</i>					
Hiring rate of 50+ (%) Effect in year 1	2.13*** (0.25)	4.93*** (1.06)	-0.27 (0.42)	-1.36 (0.89)	0.18 (1.50)
Hiring rate of 50+ (%) Cumulative effect in year 2	2.01*** (0.30)	4.75*** (1.30)	0.44 (0.47)	0.84 (0.93)	5.13*** (1.69)
Hiring rate of 50+ (%) Cumulative effect in year 3	1.76*** (0.34)	5.20*** (1.47)	0.40 (0.68)	1.74* (0.99)	6.37*** (2.37)
Average over the 3 years	1.97	4.96	0.19	0.41	3.89
<i>Effect on the 50+:</i>					
Hiring rate of 50+ (%) Effect in year 1	1.54*** (0.32)	3.49*** (0.93)	0.36 (0.61)	-1.86 (1.10)	1.85 (1.83)
Hiring rate of 50+ (%) Cumulative effect in year 2	1.70*** (0.37)	3.45*** (1.15)	0.74 (0.68)	0.38 (1.15)	3.55* (2.05)
Hiring rate of 50+ (%) Cumulative effect in year 3	1.10** (0.43)	2.82** (1.30)	-3.27*** (0.98)	-1.04 (1.22)	4.84* (2.87)
Average over the 3 years	1.45	3.25	-0.73	-0.84	3.41
A long list of standard control variables	Yes	Yes	Yes	Yes	Yes
Worker fixed effects	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes
No. of observations	7 295 310	1 276 252	7 635 305	5 497 957	1 523 877

Note: The regressions are estimated using OLS with log values for wage. A single regression is run to estimate the effect for each year jointly for the three incumbent age groups in the team. The estimates display the effect on incumbent workers in the team, when the hiring rate of 50+ increases (theoretically) from 0% to 100%. The values in Figure 2.10 average the estimates across countries for a 10 percentage point increase in the hiring rate. Standard errors, which are shown in brackets, are clustered at the team level. Team refers to the whole firm for firms with up to 100 employees and all workers in the same occupational group for firms with more than 100 employees. \*\*\* indicates statistical significance at the 1% level, \*\* at the 5% level and \* at the 10% level.

Source: OECD calculations using linked employer-employee datasets for Austria, Estonia, Italy, Portugal and Spain.

StatLink  <https://stat.link/nr8f0s>

## Notes

<sup>1</sup> The chapter relies on contributions from Alonso Alfaro Ureña, Catalina Sandoval Alvarado and Evelyn Muñoz (Costa Rica, Central Bank of Costa Rica), Peter Gal and Timo Leidecker (Portugal, OECD), Alfred Garloff (Germany, German Federal Ministry for Economic Affairs and Energy, formerly IAB Nuremberg), Ryo Kambayashi (Japan, Hitotsubashi University), Balázs Muraközy (Hungary, University of Liverpool) and Satu Nurmi (Finland, VATT).

<sup>2</sup> Studies based solely on worker-level data to determine the evolution of productivity over the lifecycle are rare. In very few and specific situations, it is possible to observe the output attributable to one individual worker. This approach also comes with the downside that, by measuring a person's productivity, it neglects the potential positive effects that, for example, experienced workers may have for the productivity of their less experienced co-workers. One finding from such empirical analysis is that physical productivity may peak, and possibly decline, earlier than cognitive abilities (van Ours, 2009<sup>[46]</sup>).

<sup>3</sup> Linked employer-employee data, which also have productivity statistics for firms, are often hard to access for confidentiality reasons, especially when the objective is to access data for several countries at the same time. The OECD has partnerships with collaborators who help assemble such data in a comparative way for the countries for which it is possible.

<sup>4</sup> The regression analysis is based on so-called “semi-aggregated” data, which average values for each decile by industry for the years available in the dataset. The micro-data are not simultaneously available for all countries due to confidentiality. The estimation also includes, for each country, year and industry fixed effects to control for year-to-year fluctuations and industry-to-industry differences in productivity that are common across firms. Hungary is not included in this analysis, as no detailed decile data at the industry level are available.

<sup>5</sup> Additional investigations (not displayed) reveal statistically significant, positive synergies also between middle-aged and older workers, to a somewhat smaller degree than the positive synergies between young and older workers.

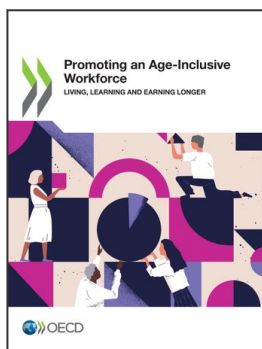
<sup>6</sup> The hypothesised 10% increase in the share of older workers serves as an illustrative example. It is not to be viewed as a target or aspiration. The estimate is linear so that, for instance, it would double for a 20% increase in the share of older workers.

<sup>7</sup> The average shares of persons aged less than 35 and those 50 and over are 22.4% and 22.3%. A 10% increase in the share of persons aged 50 and over is 2.23%. With the assumption that the shares of people aged less than 35 and those 35-49 decline by an amount proportional to their average size, the share of persons aged less than 35 declines by 0.64%. The estimate due to older workers being more productive than other employees on average is then  $0.6\% = (-0.64\%) \times (-1.469) + 2.23\% \times (-0.159)$ . The estimate stemming from productivity-enhancing complementarities between young and older employees is  $0.5\% = (-0.64\%) \times 22.3\% \times 0.014 + 2.23\% \times 22.4\% \times 0.014$ . These calculations use the regression coefficients in Column 3 of Annex Table 2.A.1 in Annex 2.A.

<sup>8</sup> The analysis measures worker turnover in excess terms, i.e. worker flows that do not result in changes to firm employment (Davis, Haltiwanger and Schuh, 1996<sup>[44]</sup>).

<sup>9</sup> The average shares of persons aged less than 35 and those 50 and over are 22.4% and 22.3%. A 10% increase in the share of persons aged 50 and over is 2.23%. With the assumption that the shares of people aged less than 35 and those 35-49 decline by an amount proportional to their average size, the share of persons aged less than 35 declines by 0.64%. The estimate due to older workers having a lower turnover than other employees on average is then  $-0.02 = (-0.64\%) \times 0.149 + 2.23\% \times 0.035$ . The estimate thanks to complementarities between young and older employees is  $-0.16 = (-0.64\%) \times 22.3\% \times (-0.005) + 2.23\% \times 22.4\% \times (-0.005)$ . Their sum -0.18 is 4% of the average worker turnover of 4.34%. These calculations use the regression coefficients in Column 5 of Annex Table 2.A.1 in Annex 2.A.

<sup>10</sup> The approach follows Cornelissen, Dustmann and Schönberg (2017<sup>[45]</sup>) and Iranzo, Schivardi and Tosetti (2008<sup>[47]</sup>). As it requires data that follow the same worker for several years, the sample of countries (Austria, Estonia, Italy, Portugal and Spain) differs to that in the other sections.



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