The Role of Firms in Wage Inequality

POLICY LESSONS FROM A LARGE SCALE CROSS-COUNTRY STUDY

OECD

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BETTER POLICIES FOR BETTER LIVES

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Foreword

Firms' pay practices play a key role in shaping wages, wage inequality and the gender wage gap, but this has so far only been reflected to a limited extent in the policy debate. The evidence in this report shows that around one-third of overall wage inequality can be explained by gaps in pay between firms rather than differences in the level and returns to workers' skills. Gaps in firm pay, in turn, reflect dispersion in productivity, but also disparities in wage-setting power between them. To tackle rising wage inequality, worker-centred policies (e.g. education, adult learning) need to be complemented with firm-oriented policies. This involves notably: (1) policies that promote the productivity catch-up of lagging firms, which would not only raise aggregate productivity and wages but also reduce wage inequality; (2) policies that reduce wage gaps at given productivity gaps without limiting efficiency-enhancing reallocation, especially the promotion of worker mobility; and (3) policies that reduce the wage-setting power of firms with dominant positions in local labour markets, which would raise wages and reduce wage inequality without adverse effects on employment and output.

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Executive summary

Over the past few decades, policy makers in many OECD countries have been grappling with low productivity growth and rising income inequality. At the same time, gaps in business performance in the form of productivity have widened, with a small number of high-performing businesses thriving while others falling further behind. High-performing firms have also been pulling away in terms of sales and profitability, and industry concentration is on the rise in many countries. The COVID-19 crisis could reinforce these trends, as the digitalisation of business models has accelerated in a way that has favoured large tech-savvy firms. However, while there is growing evidence that widening gaps in business performance contribute to low aggregate productivity growth, little is known about its implications for wage and, ultimately, income inequality.

This volume presents comprehensive new evidence on the links between firm performance, wage-setting practices and wage inequality, and discusses their implications for public policies. It exploits new harmonised linked employer-employee data spanning 20 OECD countries, representing the most ambitious effort to date in this area to make use of administrative data in a cross-country context.

The main finding is that **one-third of overall wage inequality can be explained by gaps in wage-setting practices between firms**, rather than differences in workers' skills. For the typical country covered by this report, high-wage firms pay about twice as much as low-wage ones for comparable workers. When workers cannot easily move from one firm to another, e.g. because of job search and moving costs, wages are not only determined by workers' skills but also by firms' wage-setting practices.

To some extent, wage setting is determined by productivity, with high-productivity firms generally offering higher wages to attract the workers required to grow their businesses. Policies aimed at promoting productivity in low-performing firms – e.g. helping them to adopt new technologies, digital business models and high-performance management practices – would therefore not only promote economic growth by raising productivity and wages, but also reduce wage inequality.

Low job mobility reinforces the link between productivity gaps between firms and pay gaps, since workers facing high barriers to mobility cannot easily quit their jobs in low-paying firms to take advantage of better opportunities in higher-paying ones (even when pay gaps are large). In contrast, high labour market mobility ensures that productivity gaps mainly translate into differences in employment rather than wages, and therefore reduces wage inequality. An increase in the level of job mobility from that of a low-mobility country such as Italy to that of a high-mobility country like Sweden is associated with a 15% drop in overall wage inequality. To put this reduction in perspective, the median increase in wage inequality across countries over the period 1995-2015 was around 10%. The same increase in job mobility would also raise average wages by strengthening competition for workers in low-wage firms and allowing high-wage firms to expand their workforces more easily. Policy options to enhance job mobility include strengthening adult learning and activation policies, reforming labour market regulation and reducing barriers to geographical mobility (e.g. via transport and housing policies).

Gaps in firms' pay practices also reflect disparities in their wage-setting power, which is partly shaped by the degree to which employment is concentrated in a small number of large firms. Approximately 20% of the workforce are employed in markets with high employment concentration and concentration is particularly high for low-qualified workers in manufacturing and rural areas. Estimates suggest that workers in labour markets with high concentration experience a wage penalty of around 6-7%. Labour market concentration has tended to decline over the past two decades in the OECD countries covered in this volume. But negative wage effects from labour market concentration have become stronger, which could reflect the weakening of workers' bargaining position due to the gradual erosion of wage-setting institutions such as minimum wages and collective bargaining in some countries, or increased exposure to domestic and international outsourcing. Excessive concentration in specific labour market segments and for specific groups of workers could be addressed by promoting competition among employers, e.g. by requiring competition authorities to take account of the labour market implications of mergers and combating the excessive use of non-compete and non-poaching agreements. Promoting worker representation in the workplace and collective bargaining could also help counter the disproportionate wage-setting power of some employers.

Firms' wage setting practices also play an important role in determining the gender wage gap. About three-quarters of the wage gap between similarly-skilled women and men reflects pay differences within firms, mainly due to differences in tasks and responsiblities but also, to a lesser extent, due to differences in pay for work of equal value (e.g. bargaining, discrimination). One quarter of the gender wage gap is explained by differences in pay between firms due to higher employment shares of women in low-wage firms. The gender wage gap within and between firms tends to increase over the life-course and particularly during to the initial phase of women's professional careers due to the role of motherhood. This reflects to an important extent gender differences in mobility between and within firms and the effect of career breaks at the age of childbirth on the career progression of women. Consequently, to tackle the gender wage gap, policy makers should take steps to make good jobs more accessible to women (e.g. through measures on childcare, working-time flexibility and parental leave), while ensuring that women are paid the same as men for work of equal value (via anti-discrimination laws, pay transparency measures and social dialogue).

The COVID-19 crisis has lent the policy recommendations in this volume new urgency. The crisis has hit low-qualified workers particularly hard since they tend to be concentrated in sectors that have been most affected by social distancing restrictions and are less likely to be able to work from home, with possible adverse consequences on their wages in the long term. The crisis may also widen gaps in business performance by exacerbating the digital divide between firms and winner-takes-all dynamics. In this context, many of the policies discussed in this volume would not only contribute to reduce wage inequality, but also strengthen the economic recovery by supporting job creation and productivity growth.

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Firms' pay practices play a key role in shaping wages, wage inequality and the gender wage gap, but their contribution has so far not been well reflected in the policy debate. The evidence in this volume shows that around one-third of overall wage inequality can be explained by gaps in pay between firms rather than differences in the level and returns to workers' skills. Gaps in firm pay, in turn, reflect differences in productivity, but also disparities in wage-setting power. To tackle rising income inequality, worker-centred policies (e.g. education, adult learning) need to be complemented with firm-oriented policies. This involves notably: (1) policies that promote the productivity catch-up of lagging firms, which would not only raise aggregate productivity and wages but also reduce wage inequality; (2) policies that reduce wage gaps at given productivity gaps without limiting efficiency-enhancing reallocation, especially the promotion of worker mobility; and (3) policies that reduce the wage-setting power of firms with dominant positions in local labour markets, which would raise wages and reduce wage inequality without adverse effects on employment and output.[1]

In Brief

Key findings

This chapter provides an overview of the role of firms in wage inequality and discusses the policy implications of the new analysis presented in this volume.

The main findings can be summarised as follows:

- On average across the 20 countries covered in this volume, differences in wage-setting practices between firms for similarly-qualified workers account for around one-third of overall wage inequality, both in terms of levels and in term of changes. This suggests that firms have considerable power to set wages independently from their competitors, and that wages are not exclusively determined by skills. The firm where people work matters for their wages.
- Firms use their wage-setting power to align wages with performance as reflected in productivity and/or profitability. Low-productivity firms can afford to pay low wages to workers facing barriers to job mobility while high-productivity firms offer higher wages to attract them. On average across the countries covered by the analysis, around one-sixth of productivity gaps between firms are passed on to gaps in firm wage premia.
- The transmission of between-firm productivity gaps to firm pay gaps is particularly pronounced when job mobility is low because low-pay firms face a lower risk of seeing their workers move to higher-paying ones. An increase in job mobility from the 20th percentile of countries covered by the analysis (corresponding roughly to Italy) to the 80th percentile (corresponding roughly to Sweden), is estimated to lead to a 15% drop in overall wage inequality. To put this reduction in perspective, the median increase in wage inequality across countries over the period 1995-2015 was around 10%.
- On average across the countries covered by the analysis, approximately 20% of the workforce are employed in local markets with high employment concentration (based on conventional guidelines used by competition authorities), with the share being even higher for rural and manufacturing workers. The consequent reduction in workers' job options puts significant downward pressure on wages, especially those of low-qualified workers, thus raising overall wage inequality. However, local labour market concentration has remained broadly flat over the period 2003-17 despite rising sales concentration.
- Significant gender gaps persist even among similarly-qualified women and men. This reflects systematic pay differences between the firms for which they work and systematic gender pay gaps within them. On average across the countries currently covered by the analysis, about one-quarter of the wage gap between similarly-qualified women and men reflects the tendency of women to be concentrated in low-wage firms and about three-quarters reflect systematic pay gaps within firms.

These findings imply that public policies that aim to address wage inequality need to complement worker-centred skills policies with policies centred on firms' wage-setting practices.

- The fact that differences in wage-settting practices between firms account for one-third of overall wage inequality and are directly related to differences in productivity suggests that policies that narrow productivity gaps between firms could significantly reduce overall wage inequality. This

could be achieved by fostering capabilities in low-performing firms to adopt new technologies, digital business models and high-performance management practices.

- Reducing policy-induced barriers to job mobility would narrow wage gaps between firms by reducing the extent to which gaps in productivity are transmitted to gaps in wages. Job mobility could be enhanced by strengthening adult learning and activation policies, reforming labour market regulation, as well as supporting geographical mobility (e.g. via transport and housing policies) and telework.
- Excessive wage-setting power of employers in specific labour market segments and for specific groups of workers could be remedied by rigorously promoting a more competition-friendly structure of the labour market, including by accounting for the labour market implications of mergers and combating the excessive use of non-compete and non-poaching agreements.
- Differences in pay between similarly-qualified women and men can be reduced through policies that narrow differences in opportunities for upward mobility between and within firms, as well as policies promoting equal pay for equal work. Upward mobility could be promoted by family policies that foster an equal distribution of household responsibilities, as well as policies combating gender stereotypes. Equal-pay-for-equal work measures include policies that raise competition, promote pay transparency and raise wage floors where they are currently low.

1.1. Introduction

Many OECD countries have been grappling with low productivity growth and rising income inequality over the past few decades. Meanwhile, gaps in business performance have widened, with a small number of high-performing businesses continuing to achieve high productivity growth while others have been increasingly falling behind. Moreover, high-performing firms are also pulling away in terms of sales and profitability, and industry concentration is growing in many countries. The COVID-19 crisis risks reinforcing these trends, as some unprofitable businesses have been kept afloat and the digitalisation of business models has accelerated. An emerging body of evidence suggests that growing productivity gaps across businesses can at least partly account for low aggregate productivity growth, but evidence about their implications for wage inequality is still limited. While some degree of wage inequality may be desirable to promote incentives for work, skill acquisition and job mobility, excessively high levels can become an obstacle to social cohesion by raising overall income inequality and undermining equality of opportunities.

Until recently, a large part of research into the causes of wage inequality focused on differences in skills between workers in an analytical framework that disregarded differences between firms. In the standard skill demand and supply framework, increases in wage inequality can to a large extent be explained by increases in the demand for skills, which are in turn driven by technological progress, including automation and digitalisation, and globalisation. Labour markets are assumed to be perfectly competitive and wages of high-skilled workers are bid up irrespective of the firm in which they work. Consistent with this framework, policy has mainly focused on ensuring that workers have the skills that are demanded by employers through investments in education and adult learning. However, the standard framework cannot account for a number of empirical facts. First, there is large wage inequality even within narrowly defined skill categories, including between similarly qualified men and women. Second, there are large cross-firm differences in average pay for workers with similar characteristics. Third, workers' mobility decisions are fairly unresponsive to wages, allowing employers to bid them down, especially in labour markets with a high degree of employer concentration or for groups of workers with few job options, including women.

This volume places the firm at the centre of the analysis into the causes of wage inequality by explicitly taking account of differences in firms' wage-setting practices. The analytical framework departs from the

assumption of perfectly competitive labour markets and typical firms, by explicitly taking labour market frictions and firm heterogeneity into consideration. In this framework, firms benefit from some degree of wage-setting power in the sense that wage differences between them are not immediately neutralised by competition between firms hiring perfectly mobile workers. The implication is that between-firm differences in product market performance and specific features of the labour market, such as employer concentration and differences in mobility between specific groups, including between men and women, can lead to wage differences between workers with similar skills. From a policy perspective, placing firms at the centre of the analysis broadens the scope of policies to address wage inequality, coupling worker-centred policies, such as education and adult learning policies, with firm-based policies, including policies to narrow productivity gaps and limit firms' wage-setting power.

The work summarised in this volume makes three key contributions. First, it quantifies the contribution of differences in firm wage-setting practices to wage inequality in a cross-country context using a novel set of harmonised linked employer-employee data that contain information on workers and the firms for which they work. Previous research using such data has typically focused on individual countries. A comparison of results based on single-country studies is unreliable as cross-country differences might reflect variation in data treatment (e.g. data sampling procedures and variable definitions) and empirical methodologies rather than genuine variation in institutional settings and structural conditions across countries. This volume harmonises the data treatment as far as possible and uses a unified empirical methodology in order to allow direct comparability of results across countries. Second, the work summarised in this volume documents the role of firm wage-setting practices for wage inequality, including the gender wage gap, and links firm pay policies to structural and public policy factors, including job mobility, product market competition and labour market concentration, by explicitly taking advantage of the cross-country dimension of the data. Third, the volume draws policy conclusions from the empirical evidence, highlighting the need to complement worker-centred policies with firm-centred measures to achieve high growth that is broadly shared with all workers.

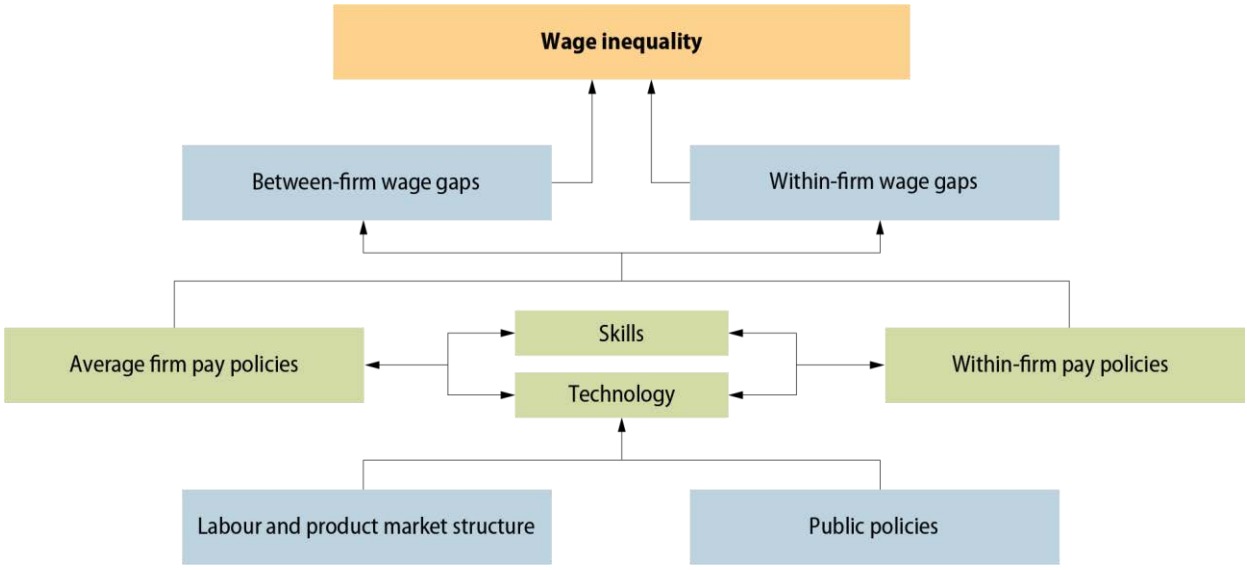
The remainder of this chapter is structured as follows. Section 2 presents the conceptual framework underlying the analysis and outlines the scope of the research covered in this volume. Section 3 summarises the main analytical and policy messages and Section 4 concludes by highlighting some open questions and avenues for further policy-relevant research based on linked employer-employee data.

1.2. Framework and scope of the analysis

1.2.1. Framework

Aggregate wage inequality arises from wage gaps between firms and within them (Figure 1.1). To some extent, wage gaps between firms can be explained by differences in the skill composition of the workforce. For instance, firms employing above-average shares of high-qualified workers generally pay higher wages than the average firm. But wage gaps between firms are also the result of differences in wage-setting practices between them. For instance, higher-productivity firms may offer higher wages than their lower-productivity competitors to attract and retain workers and thus reach their optimal employment levels. Wage gaps within firms largely reflect differences in worker skills, such as education and experience. For instance, lower-qualified workers earn lower wages than their more qualified colleagues. However, even within-firm wage gaps may to some extent be explained by factors unrelated to workers' skills. For instance, firms may pay women and men with similar education and experience different wages, which may be viewed as a discriminatory firm wage-setting practice. This could be due to differences in women's bargaining position relative to men, employers' perceptions of differences in productivity, or employers' conscious and unconscious biases.

Figure 1.1. The role of firms in wage inequality



Differences in firm wage-setting practices can only arise in labour markets where firms benefit from some degree of wage-setting power. In a labour market without frictions – where job search, job mobility and hiring are costless – firms have no wage-setting power. A worker with a given set of characteristics (e.g. formal qualifications, experience, motivation, etc.) would immediately move if they were offered a higher wage by a competing firm. In this case, workers' wages are wholly determined by their specific skill set, with firms bidding up wages until they equal workers' marginal productivity. Firms with high average productivity employ more workers than their lower-productivity competitors but, since marginal productivity tends to decline with employment and equalise across firms, they do not pay higher wages for workers with a given set of skills. Hence, pay differences in the case of a frictionless labour market entirely reflect differences in skill composition. For instance, one firm may mainly employ high-skilled workers at high wage rates, whereas another one may mainly employ low-skilled workers at low wage rates, because they perform different economic activities or use technologies with different skill requirements.

In a labour market where job search, job mobility and hiring are costly (or workers differ in their preferences regarding the non-wage aspects of jobs), firms can set different wages for workers with similar skills without workers immediately quitting lower-paying jobs. In this case, a positive link between wages and productivity arises at the firm level. On the one hand, high-productivity firms need to raise wages significantly to attract the workers needed to enable the firm to grow. On the other hand, it becomes feasible for low-productivity firms to set wages below those of their higher-productivity competitors since they can nonetheless retain some workers. Consequently, in a labour market with frictions, between-firm differences in productivity are reflected in differences in both wages and employment. The wage response relative to the employment response tends to increase with the degree of labour market frictions. Moreover, in a labour market with frictions, it becomes possible for firms to set differentiated wages for similarly qualified groups of workers within the firm if workers' job search and mobility costs differ, as may, for instance, be the case for similarly skilled women and men.

Differences in firm wage-setting practices have an immediate impact on overall wage inequality whereas differences in skill composition between firms have no direct impact on overall wage inequality. For instance, at a given composition of skills, it is irrelevant for overall wage inequality whether high-skilled workers cluster in the same firms (which would lead to high between-firm wage inequality and low within-firm wage inequality) or whether they are evenly distributed across firms (which would lead to low between-firm wage inequality and high within-firm inequality). By contrast, differences in firm wage-setting practices

directly raise overall wage inequality even between workers with similar levels of skills. Differences in firm pay policies may also lead to differences in skill composition having an indirect impact on overall wage inequality if high-wage workers sort into firms setting high wages. This is more likely to be the case when high-productivity firms use technologies that rely heavily on specific skills.

1.2.2. Scope

Given the potentially important, but so far underappreciated, role of firm wage-setting practices in wage inequality for policy makers, this volume examines the implications of complementing the traditional policy focus on skills with a focus on firms. The main measure of wage inequality used in this volume is the dispersion (variance) of wages. Chapter 2 quantifies the contribution of differences in wage-setting practices between firms to wage inequality while Chapter 3 analyses the extent to which they are related to firm productivity. A significant link between firm pay – conditional on workforce composition – and firm-level productivity would suggest that public policies that reduce gaps in productivity between firms could potentially play an important role in addressing wage inequality. Chapter 4 analyses the determinants of firms' wage-setting power, with a particular focus on labour market concentration and potential policy remedies to it. Chapter 5 analyses the contribution of wage-setting practices within and between firms to the gender wage gap among similarly qualified women and men at different points of the life course.

Distinguishing the effect of firm wage-setting practices from the effects of skill composition empirically requires the use of linked employer-employee data. The linked employer-employee data used in this project are drawn from administrative records designed for tax or social security purposes or, in a few cases, mandatory employer surveys. As a result, these data are very comprehensive, often covering the universe of workers and firms in a country, and of high quality, given the financial implications of reporting errors for tax and social security systems. To overcome confidentiality issues that limit direct data access in many countries, the analysis in this volume is partly based on a "distributed microdata" approach that relies on a network of partners based in participating countries who provide relevant aggregations of individual-level data using a harmonised statistical code. Using a combination of direct access and distributed microdata, the analysis in this volume is based on linked employer-employee data for up to 20 OECD countries (see Annex A). Skill composition is taken into account by controlling for the role of potential experience by education and gender in individual worker wages.

The analysis focuses on the relevance of firm wage-setting practices in wage inequality (including the gender wage gap) by looking at some of their main determinants – namely firms' productivity, the degree of job mobility and firms' wage-setting power – which are, in turn, shaped by public policies as well as collective bargaining and social dialogue. The determinants of returns to skills, skill composition and between-firm productivity gaps are outside the scope of this volume but have been analysed extensively in previous work (Box 1.1).

Box 1.1. Public policies influence the drivers of wage inequality beyond firm wage-setting practices

While this volume focuses on the link between public policies and firm wage-setting practices, a large body of work analyses the effect of public policies on returns to skills, skill composition and productivity gaps between firms.

Returns to skills. At a given skill composition of the workforce, within-firm wage inequality reflects the dispersion of returns to skills. For instance, within-firm wage inequality tends to increase when the wage premium associated with a tertiary education degree increases. A large body of work has analysed the structural and policy determinants of returns to skills in the framework of a race between education and technology (Katz and Murphy, 1992[1]; Autor, Goldin and Katz, 2020[2]). The main role of public policies

in this framework is to support the supply of skills to meet increasing demand resulting from technological change. Indeed, the evidence suggests that a more abundant supply of skills relative to demand reduces the skills premium and therefore wage inequality (OECD, 2015[3]). However, the supply and demand framework appears to be less relevant at the extremes of the wage distribution. At the bottom of the wage distribution, policies and institutions may be more important than market forces in setting the wages of low-skilled workers, while at the very top superstar effects may be particularly important (Autor, Goldin and Katz, 2020[2]).

Skill composition. An emerging body of evidence analyses the effect of public policies on firms' skill composition. One strand of work has focused on the increased sorting of workers into firms with similar co-workers which may be linked to domestic outsourcing, including to independent contractors of online platforms (Weil, 2014[4]; Goldschmidt and Schmieder, 2015[5]; OECD, 2021[6]). Firms increasingly resort to specialised firms for the provision of low-skilled labour services, such as cleaning, security and catering. Such worker-to-worker sorting does not have a direct effect on wage inequality, as increased between-firm wage inequality is offset by reduced within-firm wage inequality. But it may weaken lower-qualified workers' bargaining position and upward mobility, and hence increase the persistence of inequality over the life course. Policies to strengthen collective bargaining and training in firms providing outsourced services could reduce the adverse effects of worker-to-worker sorting. Another strand of work has focused on complementarities between workers' skills and technologies, which may lead to the sorting of the highest-skilled workers into the highest-paying firms (Card, Heining and Kline, 2013[7]). Such worker-to-firm sorting may enhance efficiency but directly raises wage inequality.

Productivity gaps. Between-firm productivity gaps have tended to widen in several OECD countries (Andrews, Criscuolo and Gal, 2016[8]; OECD, 2015[9]), which has contributed to widening firm-wage gaps (Berlingieri, Blanchenay and Criscuolo, 2017[10]) and rising wage inequality. Public policies can directly influence the extent of between-firm productivity gaps (see Box 1.2 for details) and the extent of pay gaps at a given level of productivity gaps (see Box 1.3 for details).

1.3. Main messages

1.3.1. Firm wage-setting practices play a key role in shaping wage inequality

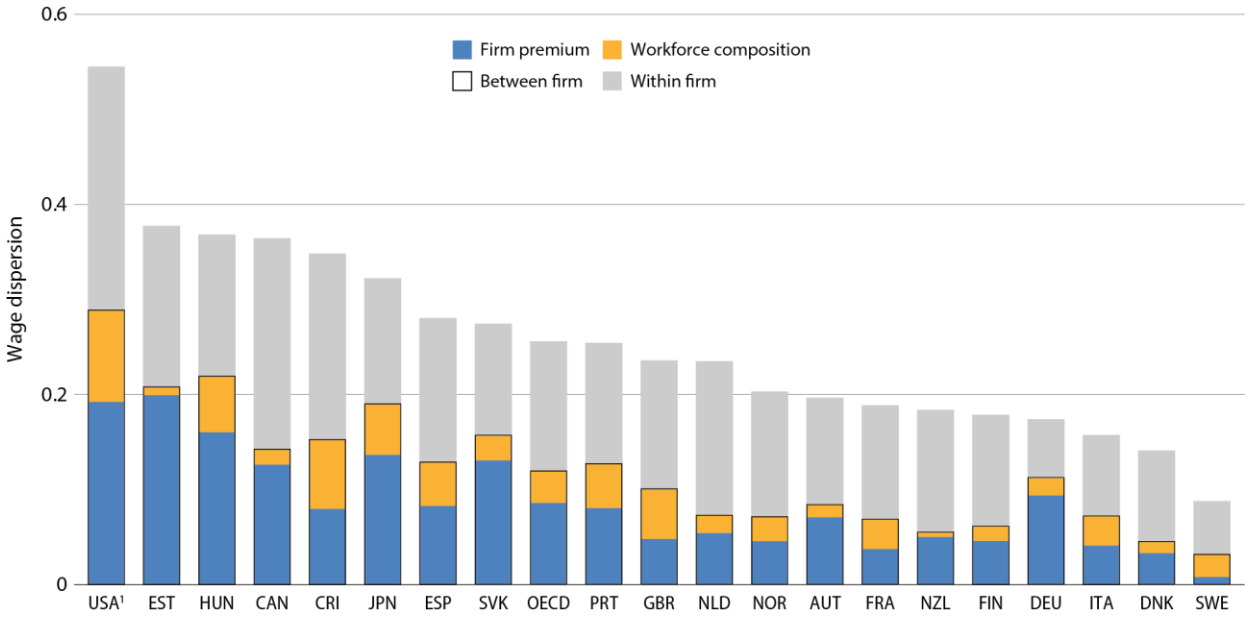
Wage inequality can arise from wage gaps between workers within firms and from gaps in average wages between firms. Between-firm wage inequality, in turn, can be the result of differences in firms' wage-setting practices or the sorting of workers with different skills into different firms. The contribution of each of these components to overall wage inequality is quantified using statistical decomposition techniques (Chapter 2). In this volume, the contribution of differences in firms' wage-setting practices is measured as the dispersion of firm wage premia, i.e. the part of average firm wages that is unrelated to the characteristics of the firm's workforce.[2] The contribution of worker sorting is measured as the dispersion of average firm wages that can be attributed to workforce composition, including differences in average workers' skills across firms. And the contribution of within-firm inequality is measured as the average dispersion of wages within firms, which captures returns to skills and possibly also differences in pay policies between similarly qualified workers within firms (e.g. between women and men).[3]

The results from this decomposition reveal that between-firm wage inequality represents a sizeable component of overall wage inequality and that this predominantly reflects between-firm differences in pay for workers with similar levels of skills rather than differences in the composition of workers (Figure 1.2). On average across the 18 countries covered by this part of the analysis, between-firm wage inequality accounts for about one-half of overall wage inequality. Firm wage premia dispersion in turn accounts for around two-thirds of between-firm wage inequality. The remaining one-third of between-firm wage

inequality is accounted for by differences in workforce composition, i.e. the fact that firms paying higher average wages typically also employ more highly educated and experienced workers.[4] Taken together, they suggest that firms have significant wage-setting power, with firm wage setting practices accounting for around one-third of overall wage inequality. Consequently, identifying and quantifying the key determinants of firm pay policies is crucial for the design of public policies to address wage inequality.

Figure 1.2. Firm wage premia account for about one-third of overall wage inequality

Contributions to overall wage dispersion, latest available year



Note: The height of the bars denotes the level of overall wage inequality in the latest available year (2015-18), with the shaded parts denoting the contributions of firm premia, sorting and within-firm inequality. OECD refers to the average of the 20 countries shown.
1. Figures for the United States are based on Barth et al. (2016[11])" It's Where You Work: Increases in the Dispersion of Earnings across Establishments and Individuals in the United States", https://doi.org/10.1086/684045.

StatLink https://stat.link/cx4eut

1.3.2. Addressing productivity gaps between firms would not only raise growth but also reduce inequality

Differences in wage-setting practices between firms to an important extent reflect differences in firms' productivity performance. Descriptive evidence presented in Chapter 3 suggests that gaps in firm productivity are a key determinant of gaps in firm wage premia and that this is higher in countries with higher productivity dispersion (Figure 1.3). More detailed analysis shows that on average across the covered countries, around one-sixth of productivity gaps between firms are passed on to gaps in firm wage premia. In labour markets with frictions that limit job mobility, high-productivity firms offering high wages only attract a limited number of workers from low-productivity ones. In other words, higher productivity is partly reflected in higher wages rather than being reflected exclusively in higher employment, as would be the case in labour markets where workers are perfectly mobile between jobs. Moreover, the evidence shows that there are significant differences across countries in the extent to which productivity differences

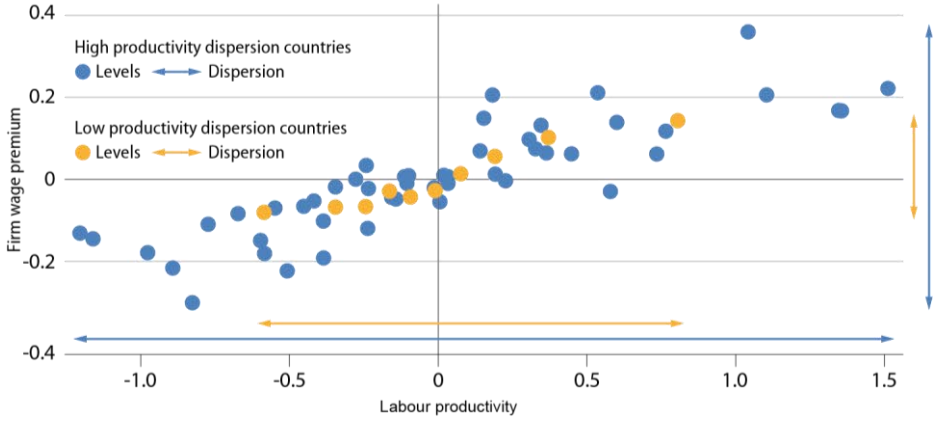
translate into differences in wage premia, with over one-fifth of productivity gaps passed on in some countries but less than one-tenth in others, pointing to a potentially important explanatory role for country-wide characteristics such as policies and institutions.

The new evidence on the transmission of productivity gaps to gaps in firm wage premia in this volume is particularly relevant in the light of previous research showing that productivity dispersion has tended to rise in many OECD countries (Andrews, Criscuolo and Gal, 2016[8]; OECD, 2015[9]). OECD research by Berlingieri et al. (2017[10])already pointed to a relationship between dispersion in productivity and wages, but could not establish whether this is because higher-productivity firms tend to employ higher-skilled workers or because they pay higher wages to all workers. The new evidence in this volume suggests that productivity gaps and gaps in firm pay policies are directly linked, implying that rising productivity gaps between firms contribute to rising wage inequality.

The strong relationship between firm performance and firm pay has important implications for policies that seek to enhance inclusive growth. Before the COVID-19 crisis, increasing productivity gaps between firms mainly reflected stagnating productivity growth among low-productivity firms rather than exceptionally high productivity growth among high-productivity ones. Hence, business-focused initiatives that help lagging firms catch up with leading firms, or leading firms to expand and create new jobs, would support growth of aggregate productivity and wages. Such initiatives may be particularly important in the wake of the COVID-19 crisis, which may have widened productivity gaps between firms with different access to digital technologies and business models. By directly reducing gaps in firm pay policies between firms, such initiatives would also contribute to lower wage inequality (Box 1.2).

Figure 1.3. The dispersion of firm wage premia tends to be higher in countries with high productivity dispersion

By decile of labour productivity, deviation from country-specific means, log points, selected countries



Note: The figure shows average wage premia and average labour productivity by decile of the productivity distribution. Data are reported as deviations from country-specific means to ensure cross-country comparability. Labour productivity is log output per worker. Wage premia are the estimated firm fixed effects from a regression of log monthly earnings on firm fixed effects and observable worker characteristics. Included countries: Costa Rica, Finland, France, Germany, Hungary, and Portugal.

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Box 1.2. Firm-centred policies to contain the dispersion in productivity and pay policies across firms

Firm-centred policies that reduce the productivity gap between lagging and leading firms would not only strengthen aggregate productivity growth, but also contribute to lower wage inequality by reducing pay differences between firms. The COVID-19 crisis has put the importance of these policies into stark relief as firms with digital business models may have pulled away from those with insufficient access to digital technologies and skills. A comprehensive overview of policies aimed at closing gaps in productivity and wages by supporting the digital transformation is provided in OECD (2021[12]). Possible policies include measures to:

- **Support investment in intangible assets** (such as managerial talent, software and R&D) that are complementary to new technologies. Easing financial frictions, accelerating the development of equity markets and providing more generous and targeted support to intangible investment can allow more firms, especially small ones, to increase intangible investment and seize the opportunities offered by the digital transformation (Nicoletti, von Rueden and Andrews, 2020[13]; Bajgar, Criscuolo and Timmis, 2021[14]; Demmou and Franco, 2021[15]). Scaling up public support for innovation, for instance through public procurement, grants, loans and loan guarantees, can disproportionately benefit lagging firms (Berlingieri et al., 2020[16]).
- **Promote framework market conditions for the digital age**. This involves reducing barriers to market entry and post-entry growth, as well as strengthening the enforcement of competition policy to counter widespread declines in business dynamism and increases in market concentration, especially in digital-intensive industries where incentives for digital adoption are key (Nicoletti, von Rueden and Andrews, 2020[13]; Berlingieri et al., 2020[16]). It may also involve levelling the playing field between multinational and domestic firms in terms of tax policies and reducing differences in the scope for tax optimisation across borders (Johansson et al., 2017[17]). Appropriately designed insolvency regimes can facilitate restructuring or the orderly exit of underperforming firms (Adalet McGowan and Andrews, 2018[18]), promoting their catching up or the reallocation of resources from low-performing to high-performing firms (Adalet McGowan and Andrews, 2016[19]).
- **Improve technology access via digital infrastructure.** Digital infrastructure is a necessity for exploiting the opportunities offered by digital technologies and a strong determinant of productivity gains (Gal et al., 2019[20]). However, access to communication networks is still uneven, hampering the take-up of digital technologies and technology diffusion. Fiscal incentives to encourage private investment in underserved areas, direct public investment where private investment is not commercially viable, and ensuring competition in telecommunication markets would improve and widen access to communication networks and support the digital transformation of lagging firms (OECD, 2020[21]).

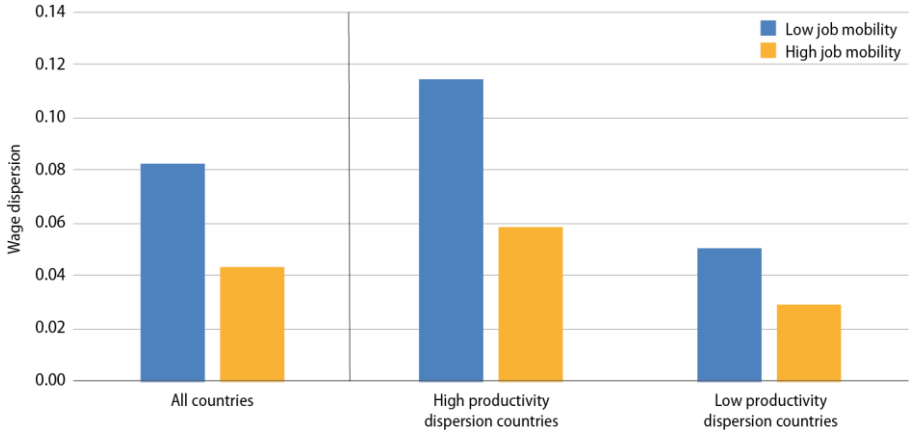
1.3.3. Promoting job mobility can limit wage inequality even in a context of rising productivity gaps

Significant differences in the extent to which productivity gaps translate into differences in wage premia across countries suggest that policies and institutions play an important role in influencing job mobility. The transmission of productivity gaps between firms into wage gaps should in principle be more pronounced in labour markets where frictions reduce the rate of job mobility, as differences in firm pay policies are not immediately competed away by the movement of workers from low-pay to high-pay firms. New analysis presented in Chapter 3 of this volume confirms this conjecture.

High job-to-job mobility – which is mainly voluntary as it excludes layoffs followed by non-employment – dampens the transmission of between-firm productivity gaps to wage gaps (Figure 1.4). As a result, at any given level of productivity dispersion, wage premia dispersion and, hence, overall wage inequality tend to be lower in countries with high levels of job mobility. Moreover, the difference in wage premia dispersion between high-mobility and low-mobility countries tends to be particularly pronounced where productivity dispersion is high. Consequently, raising job mobility can play an important role in reducing wage inequality, especially where productivity dispersion is high (e.g. Germany, Hungary, Portugal). More specifically, the empirical results suggest that raising job mobility from the 20th percentile of countries covered by the analysis (corresponding roughly to Italy) to the 80th percentile (corresponding roughly to Sweden), is associated with a 15% drop in overall wage inequality. To put this reduction in perspective, the median increase in wage inequality across countries over the period 1995-2015 was around 10%. At a given level of job mobility, more centralised collective bargaining (e.g. sector-level bargaining) and higher minimum wages reduce productivity pass-through and wage premia dispersion between firms.

Figure 1.4. The dispersion of firm wage premia is lower in countries with high job mobility

Avarage wage dispersion across countries by degree of job mobility and productivity dispersion, latest available year



Note: Based on 10 OECD countries. Countries are classified according to above/below median productivity dispersion and above/below median job-to-job mobility, resulting in the following country groupings: Germany, Hungary, Portugal (high productivity dispersion, low job mobility); Austria, France (high productivity dispersion, high job mobility); Italy, the Netherlands, Norway (low productivity dispersion, low job mobility); Sweden, Finland (low productivity dispersion, high job mobility). The height of each bar denotes average variance of firm wage premia across countries in each group for the last available year.

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While job mobility is determined by a range of factors, some of which are outside the scope of public policies, these findings nonetheless suggest that policies to promote job mobility (see Box 1.3 for a discussion of such policies) could significantly help in narrowing gaps in firm wage-setting practices, further underlining the importance of job mobility in the recovery from the COVID-19 crisis. By allowing high-productivity firms to expand more easily, such policies would also raise the efficiency of labour allocation and thereby aggregate productivity, employment and wages. However, some barriers to job mobility are likely to remain even after addressing policy distortions. Workers differ in their preferences for jobs in different firms, industries and geographical areas as well as their ability to perform the tasks involved, and firms differ in terms of non-wage working conditions and skill requirements, which creates inherent barriers to job mobility. Hence, mobility-promoting policies should not be seen as a silver bullet but rather as a

complement to policies that aim at narrowing productivity gaps between workers and firms (such as skills and innovation policies) and income gaps between workers (such as wage-setting policies or the tax and benefits system).

In principle, wage-setting institutions in the form of minimum wages and collective bargaining could help to contain the wage-setting power of firms in labour markets with limited job mobility, thereby reducing pay differences between them. Indeed, the dispersion of firm wage premia in countries with centralised collective bargaining arrangements is about half that in countries with decentralised ones. Moreover, the difference in wage premia dispersion between high and low-mobility countries is smaller in countries with centralised collective bargaining systems than in countries with decentralised systems. In areas and occupations where wages are well below workers' productivity, this could even raise employment by raising labour market participation among people who are unwilling to work at current wages. However, there is a risk that wage floors are set at levels in excess of workers' productivity, which would reduce employment. This risk could be reduced by combining centralised collective bargaining with sufficient scope for further negotiation at the firm level, and focusing minimum wage increases on areas and groups for which initial levels of wages are low. OECD research based on a comparison between Norway and the United States suggests that wage compression between firms does not necessarily reduce the efficiency of labour allocation between firms (Hijzen, Zwysen and Lillehagen, 2021[22]). The key to achieving high productivity through an efficient allocation of labour is to complement wage-setting institutions that constrain the ability of firms to pay different wages for similar workers with measures that promote innovation in low productivity firms and strengthen job mobility.

Box 1.3. Policies to promote job mobility and reduce avoidable labour market frictions

Job mobility could be enhanced by strengthening adult learning and activation policies, reforming labour market and housing policies, and supporting telework. Enhancing job mobility will become particularly important in the recovery from the COVID-19 crisis, as employment is reallocated from shrinking or unviable businesses to those with better growth prospects.

- Strengthening **adult learning** and taking a more comprehensive approach to **activation** that goes beyond promoting access to employment would help workers find better jobs in other firms and at the same time reduce productivity gaps between them, yielding double dividends (OECD, 2021[6]). For instance, public employment services in the form of job search assistance, training and career counselling could be made available to workers in jobs that are supported by job retention schemes that were used on a massive scale in most OECD countries during the COVID-19 crisis (OECD, 2020[23]). More generally, public employment services could be made available to all workers who would like to progress in their careers but face significant barriers in moving to better jobs, including people in non-standard forms of work and workers who are currently employed but lack relevant skills or live in lagging regions. This would require additional resources for public employment services and a more active role in advising workers on adult learning opportunities, as well as collecting information on skill requirements of prospective employers.
- **Limiting regulatory barriers to job mobility** in labour and housing markets can foster transitions across firms, occupations and regions. This includes reforming overly restrictive occupational entry regulations (Bambalaite, Nicoletti and von Rueden, 2020[24]); promoting the portability of social benefits and severance pay entitlements (Kettemann, Kramarz and Zweimüller, 2017[25]); limiting non-compete or non-poaching agreements (Krueger and Ashenfelter, 2018[26]; OECD, 2019[27]); and promoting the portability of workers' ratings across digital platforms (OECD, 2021[12]). Mobility across geographical areas could be fostered by reforms of **housing policies**, such as the redesigning of land-use and planning policies that

raise house price differences across locations, reducing transaction taxes on selling and buying a home, and relaxing overly strict rental regulations (Causa and Pichelmann, 2020[28]). Social policies in the form of cash transfers and in-kind expenditure on housing could also support residential mobility by making housing more affordable for low-income households, especially if such expenditure is designed in such a way that benefits are fully portable across geographical areas.

- An expansion of **telework** could partly compensate for limited geographical mobility. A significant fraction of jobs can potentially be conducted remotely – between one-quarter and one-third of all jobs according to some estimates (Dingel and Neiman, 2020[29]; Boeri, Caiumi and Paccagnella, 2020[30]; OECD, 2020[31]) – potentially raising job opportunities for workers and reducing the costs of moving from one job to another. Telework could be promoted by new regulations on the right to request telework and the conditions under which telework arrangements are implemented (OECD, 2021[6]); the strengthening of digital infrastructure to increase network access and speed for all workers as well as digital adoption by firms; the enhancement of workers' ICT skills through training; and improvements in employers' management capabilities through the diffusion of managerial best practices (Nicoletti, von Rueden and Andrews, 2020[13]; OECD, 2020[31]). Notably, the use of teleworking during the pandemic was higher in countries where there was an enforceable right to request teleworking, and highest in countries where this right to access was granted through collective bargaining (OECD, 2021[6]).

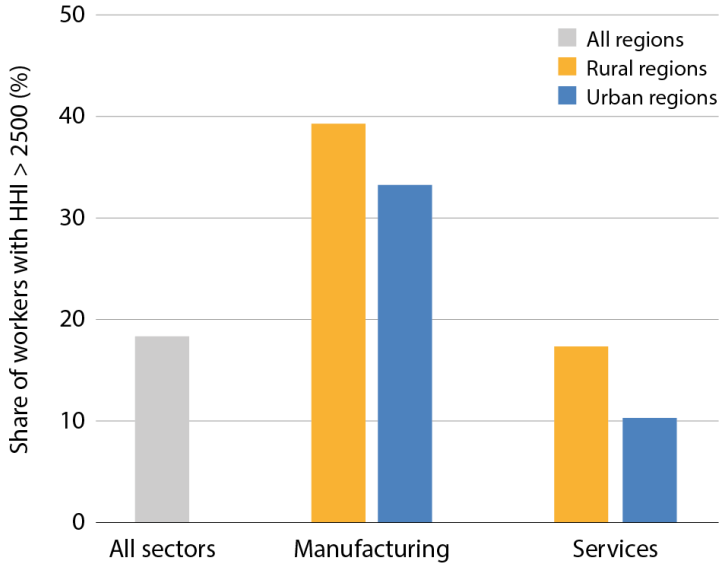
1.3.4. The promotion of job mobility needs to be complemented with measures to limit labour market concentration

The fact that firms with different levels of productivity set different wages, or deviate from the average wage in the market, suggests that firms have some degree of wage-setting power. To provide a more direct picture of the degree of wage-setting power by firms, Chapter 4 provides comprehensive new evidence on labour market concentration. At any given level of job mobility, higher labour market concentration reduces workers' employment options and raises firms' wage-setting power (Azar et al., 2020[32]). Since workers have few alternative job options in a highly concentrated labour market, firms can set lower wages than in a labour market where many potential employers compete for workers.

Across countries, about 20% of workers are employed in highly-concentrated labour markets (Figure 1.5). High concentration is defined by a level of the Herfindahl-Hirschman Index above 2 500, a common threshold in antitrust analysis corresponding to four firms equally sharing the market (OECD, 2019[33]). The share exposed to high labour market concentration is even higher in manufacturing (around 40%) and in rural areas (around 30%).

Figure 1.5. A significant share of workers are exposed to high labour market concentration

Share of workers in highly concentrated labour markets, overall and by region and industry, most recent years



Note: Local labour markets are defined as 3-digit industries within TL3 regions, with the Herfindahl-Hirschman index (HHI) being based on new hires. Urban regions are metropolitan TL3 regions (containing a functional urban area of at least 250 000 people) and rural areas are non-metropolitan TL3 regions, where the definition of metropolitan regions follows Fadic et al. (2019[34]). Services include market and non-market services and construction. Primary and utility sectors are excluded. Country coverage: Austria (2016-18), Costa Rica (2015-17), Finland (2015-17), France (2015-17), the Slovak Republic (2017-19) and Spain (2016-18).

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The empirical evidence in Chapter 4 supports the view that, for given mobility costs, a high degree of labour market concentration puts downward pressure on wages, with wages being systematically lower in highly-concentrated labour markets even after controlling for other local labour market characteristics (e.g. productivity) and worker characteristics (e.g. skills). A worker in a labour market with high concentration (90th percentile) is estimated to experience a wage penalty of around 6-7% relative to a worker in a market with low concentration (10th percentile). Moreover, both exposure to concentration and its negative wage effects appear to be particularly pronounced for low-qualified workers, thus raising wage inequality.

Labour market concentration has remained broadly flat over the past two decades despite increasing sales concentration in many OECD countries. This reflects the fact that the largest firms in terms of sales are not necessarily those with the largest workforces, especially in digital-intensive sectors where sales can be scaled up without scaling up employment. However, the negative wage effect from labour market concentration has tended to become stronger over time, suggesting that firms are increasingly exercising their wage-setting power. To some extent, this could reflect the weakening of workers' bargaining position due to the erosion of wage-setting institutions such as minimum wages and collective bargaining in some countries, or increased exposure to domestic and international outsourcing.

The excessive wage-setting power of employers in specific labour market segments and for specific groups of workers could be remedied by rigorously promoting a more competition-friendly labour market structure, such as requiring competition authorities to take account of the labour market implications of mergers, as well as by promoting worker representation in the workplace and collective bargaining (Box 1.4).

Box 1.4. Policies to enhance labour market competition

A number of policies could address wage-setting power in specific segments of the labour market, which may not only reduce wage inequality but also raise efficiency by enhancing work incentives.

- **Labour market policies** can counterbalance the downward effects of firms' wage-setting power on wages. Reducing the costs of job search and mobility for workers would reduce *effective* labour market concentration at any given level of *measured* concentration by expanding workers' outside job options (see Box 1.3). In principle, wage-setting institutions in the form of minimum wages and collectively negotiated wage floors could help to contain the wage-setting power of firms in labour markets with limited job mobility (OECD, 2019[33]). In areas and occupations where wages are well below workers' productivity, this could even increase employment by raising labour market participation among people who are unwilling to work at current wages. However, there is a risk that wage floors are set at levels in excess of workers' productivity, which would reduce employment. This risk could be reduced by combining centralised collective bargaining with sufficient scope for further negotiation at the firm level, and focusing minimum wage increases on areas and groups for which initial levels of wages are low. Collective bargaining and competition policies need to be articulated in a way that does not prevent certain categories of "false" self-employed workers from collectively bargaining over wages and working conditions, particularly when they are facing situations, in which they have much lower bargaining power than employers. Competition authorities may fruitfully be involved in identifying such situations. In particular, people working for digital platforms may not enjoy full autonomy nor benefit from employees' rights and protections, and may have only very few job options in their local labour market (e.g. in the food delivery and ride-hailing industries). These workers need to be able to collectively bargain without facing the risk of breaking competition policy rules against collusion (OECD, 2019[27]).
- Excessive labour market concentration could be addressed by **explicitly integrating labour market power considerations into merger control regimes**. The rationale is that if merger control authorities focus exclusively on product market developments, this may not be sufficient to limit employers' wage-setting power when the definition of the relevant labour market does not perfectly track the definition of the relevant product market. For instance, a competition authority concluding that a merger between two companies does not constitute a threat to competition because they are operating in separate product markets may fail to detect the fact that two companies are hiring in the same local labour market. Increased merger scrutiny from a labour market perspective could be achieved by presuming that an increase in labour market concentration beyond a specific threshold is likely to increase market power, which would trigger more in-depth analyses of the merger on the competitive environment in the relevant labour market (Marinescu and Hovenkamp, 2019[35]; OECD, 2020[36]).
- Competition authorities could **step up enforcement efforts against anti-competitive agreements** in labour markets, including wage fixing, no-poaching agreements and non-compete covenants (OECD, 2019[27]). Such anti-competitive agreements can lead to high *effective* labour market concentration even if *measured* concentration is low, since workers effectively have fewer job options when employers in the same local labour market collude. One way for employers to collude is to agree on the wages and non-wage benefits of specific groups of workers, which allows them to restrict their pay. Wage fixing may not always involve an explicit agreement but may be achieved via practices facilitating tacit co-ordination, for instance the exchange of information on wages and non-wage benefits with potential competitors. Another way employers may collude is by agreeing to refrain from poaching each other's workers. Again, this allows employers to pay lower wages than if they had to match competing

employers' wage offers to retain their workers. A third form of employer collusion is the use of non-compete covenants in employment contracts that prevent employees from working for their employer's competitors, usually for a limited time or in a specific geographical area. In some cases, such non-compete covenants may be justified from an efficiency perspective to prevent the free-riding of competitors with respect to know-how, training and trade secrets. However, recent evidence suggests that non-compete covenants are often used in contexts where free-riding is unlikely to be an issue, such as for low-qualified and low-wage workers, with such covenants covering almost one-fifth of US workers in 2014 (Lipsitz and Starr, 2021[37]).

1.3.5. Firm pay policies contribute to wage gaps between women and men

A large part of this volume focuses on differences in wage-setting between firms, i.e. differences in average pay between firms for similarly-skilled workers. To the extent that women and men sort into firms with different wage-setting practices, this can also have important implications for the gender wage gap. Additionally, there can also be important differences in pay between similarly-skilled women and men within the same firm. Indeed, recent studies have shown that the bulk of the gender wage gap persists even after controlling for differences in skills (Goldin, 2014[38]). Systematic differences in pay between women and men with similar skills within firms reflect differences in tasks and responsibilities or differences in pay for equal work, which may result, amongst other things, from discrimination by employers or unequal opportunities for career progression more generally.

New evidence in Chapter 5 provides an indication of the role of firm wage-setting practices in the gender wage gap by decomposing the wage gap between similarly-skilled men and women within and between firms (Figure 1.6). About three quarters of the wage gap between similarly skilled women and men reflect pay differences within firms, mainly due to differences in tasks and responsibilities and, to a lesser extent, also differences in pay for work of equal value (e.g. discrimination, bargaining). One quarter of the gender wage gap is accounted for by differences in pay between firms due to higher employment shares of women in low-wage firms. The latter reflects both differences in wage-setting practices between firms within industries and differences in wage-setting practices between industries. The concentration of women in low-wage firms may be the result of discriminatory hiring practices by employers or the preferences of women for firms with flexible working-time arrangements, while their concentration in low-wage industries may in part also reflect the role of past educational choices and gendered socialisation processes earlier in life.

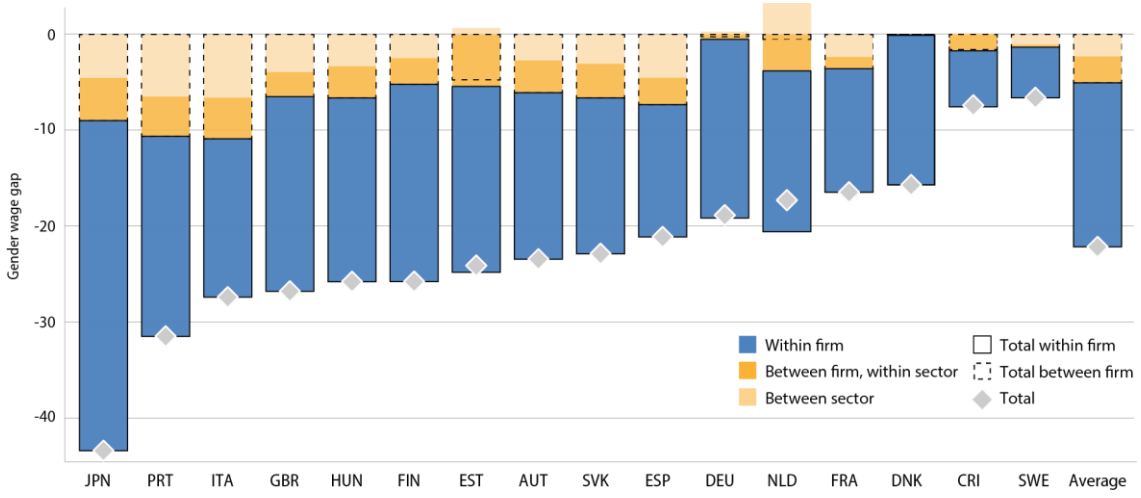
In the majority of countries, the gender wage gap between and within firms increases throughout the working life. This reflects important gender differences in opportunities for career advancement, particularly around the age many women become mothers. Indeed, the bulk of the increase in the gender gap *within* firms can be traced back to gender differences in the probability of being promoted, which in turn, reflects the fact that workers in part-time jobs are less likely to be promoted and women are more likely to work part-time. Similarly, much of the increase in the gender wage gap *between* firms is driven by gender differences in the extent and nature of job mobility across firms. Women are not only less likely to move between firms than men, but when they do, this is less likely to be associated with major wage increases. Career breaks around the age of childbirth are associated with significant wage losses and consequently account for an important fraction of the "motherhood penalty", i.e. the shortfall in wage growth following childbirth.

Tackling the gender wage gap is not straightforward and requires a range of policies (see Box 1.5). To an important extent, the gender wage gap results from differences in gender roles in the household as women continue to take on a larger share of family responsibilities, including during the school closures that were introduced by governments in an effort to stem the spread of COVID-19. This limits the opportunities of women for upward mobility within and between firms, and when coupled with intense work pressures can

undermine productivity at work and increase the risk of work-related stress. Family policies that promote a more equal sharing of parental leave between women and men, provide universal childcare and out-of-school support, and reduce marginal effective tax rates for second earners are key to promoting women's upward mobility. Policies that strengthen competition in product and labour markets, promote pay transparency and raise wage floors where they are currently low also have a role to play. Additional efforts should also be made to encourage women's participation in Science, Technology, Engineering and Mathematics (STEM) education by addressing gender stereotypes.

Figure 1.6. Three quarters of the gender wage gap is concentrated within firms while the remaining quarter reflects the sorting of women in low-wage firms

Difference in wages of women relative to men with similar skills, percentage, early-2000s to mid-2010s



Note: Decomposition of gender wage gap between similarly qualified women and men within firms, between firms within sectors and between sectors. The wage gap between similarly qualified women and men is obtained from a regression of log wages on a gender dummy, education dummies (education is not available for Austria and Estonia) and flexible earnings-experience profiles by gender as well as decade-of-birth dummies to control for cohort effects.

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Box 1.5. Policies to narrow gender wage gaps

Tackling the gender wage gap requires a range of policies to promote the access of women to higher-paying firms and to better jobs in the firms where they work (OECD, 2017[39]).

- **Family policies.** Family policies can contribute to a more equal sharing of household and care responsibilities between men and women and hence enable women to take advantage of opportunities for career progression within their current firms and at other employers. Important family policies include providing more equal parental leave policies for men and women, promoting egalitarian norms in parenting (OECD, 2017[40]); providing universal childcare and out-of-school support; providing universal childcare; and reducing marginal effective tax rates for second earners. While there is strong empirical support for the role of parenthood in the

gender wage gap and the need for a more equal sharing of household responsibilities (Kleven et al., 2019[41]), concerns have been raised about the effectiveness of family policies for reducing the gender wage gap in a context where preferences and social norms are deeply anchored in society (Kleven et al., 2020[42]). This suggests that family policies need to be complemented with other policies that can foster more gender-friendly social norms (e.g. school interventions).

- **Mobility within and between firms**. To make good jobs more accessible to women, the use of flexible work arrangements across occupations and firms, including telework and part-time work, should be supported and offered to all workers – not only parents (OECD, 2019[43]). This would reduce the contribution to the gender wage gap of wage differentials related to women's preference for jobs with flexible working-time arrangements, and the segregation of men and women across firms and jobs with different non-wage characteristics. Voluntary target setting and good management practices that make managers accountable are among the measures that could also help to promote access for women to quality jobs, while at the same time fostering social norms that support gender equality. Voluntary target setting and good management practices that make managers accountable are among the measures that could also help to promote access for women to quality jobs, while at the same time foster social norms that support gender equality. Gender quotas could in principle also help, but need to be used judiciously to avoid the risk that they undermine firm performance, particularly if targets are set too high given the number of suitably-qualified women in the sector/occupation **Invalid source specified.**. Finely targeted quotas such as those related to company boards seem to hold some promise in this regard. Recent evaluations suggest that although such quotas enhance the representation of women in company boards, they have limited spillover effects on the career progression of other women in those firms (Bertrand et al., 2019[44]; Maida and Weber, 2020[45]).
- **Equal-pay-for-equal-work measures.** These include equal pay legislation, pay transparency rules, and social dialogue and collective bargaining in the workplace. About half of OECD countries have recently put in place pay transparency measures (e.g. Austria, France, Germany, Sweden). A key obstacle to reducing gender wage gaps is that employers and employees are often unaware of them. Pay transparency rules raise awareness of discrimination and make it easier to enforce equal pay legislation. Pay transparency rules come in a variety of forms in OECD countries, and can, for example, provide the right to request information on pay levels by gender within firms, require firms to report information on employment and pay by gender, or incentivise firms to undertake gender pay audits. Recent studies have shown that mandatory reporting requirements can help reduce the gender wage gap within firms (Baker et al., 2019[46]; Bennedsen et al., 2019[47]; Blundell, 2020[48]).
- **Investing in STEM.** While in most countries women outperform men in terms of the level of education – women are more likely to hold a tertiary degree – fewer women than men complete Science, Technology, Engineering and Mathematics (STEM) degrees (Mostafa, 2019[49]). To some extent educational choices may reflect the possibility that teenage boys still perform better in STEM subjects than girls, but gender stereotypes also play an important role. The lower likelihood of women choosing STEM subjects is also likely to contribute to sectoral segregation.

1.4. Concluding remarks

This volume provides evidence on the contribution of gaps in firm performance and pay policies to wage inequality in a context where workers are imperfectly mobile and firms have some degree of wage-setting

power. In this context, firms have some scope to set wages independently from their competitors and can set different wages for different groups of similarly skilled workers, including women and men.

From an analytical perspective, the main insight is that, on average across the countries covered by the analysis, gaps in wage-setting practices between firms account for around one-third of overall wage inequality and around one-quarter of the gender wage gap. To some extent, gaps in firm wage-setting practices reflect gaps in productivity that are transmitted to wages when workers cannot easily move between firms. But to some extent they also reflect heterogeneity in the wage-setting power of firms operating in labour markets with different competitive environments.

From a policy perspective, the main insight is that firm-centred policies are a key element of a comprehensive strategy to promote broadly-shared economic growth. Narrowing productivity gaps between firms, promoting worker mobility between them and ensuring that pro-competition policies are vigorously enforced not only in product markets but also in labour markets would reduce gaps in pay policies between firms and overall wage inequality, while probably also raising productivity, wages and employment.

The effects of product and labour market policies on productivity, wages and employment are outside the scope of this volume but represent a promising avenue for future research using the linked employer-employee data explored in this volume. Even before the COVID-19 crisis, low productivity growth, stagnating real wages and high levels of inequality in many OECD countries raised questions about declining business dynamism and the ability of labour markets to support worker transitions from struggling firms to high-performing ones. The COVID-19 crisis has put these questions into stark relief, as many governments have provided unprecedented support to existing businesses based on the existing allocation of resources, while many pre-existing structural trends, such as digitalisation and the shift to the green economy, appear to have accelerated.

The relationship between wage inequality, average wages and the extent and efficiency of reallocation will be the focus of the OECD's next work in this area. The cross-country linked employer-employee data used in this volume would be an ideal tool to analyse the link between worker mobility and reallocation, and by extension aggregate wage and productivity growth. In particular, the data would allow an analysis of the role of policies in influencing the speed and efficiency of reallocation as well as the costs of reallocation for workers and society at large.

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Notes

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[2] This is obtained by regressing worker wages on a firm fixed effect while controlling for flexible earnings-experience profiles by education and gender.

[3] A similar decomposition is conducted in Chapter 5 on the role of firms in the gender wage gap.

[4] Note that these estimates reflect an upper bound on the importance of firm wage premia dispersion for overall wage dispersion because of the role of unobserved differences in worker composition. Controlling for unobserved worker differences reduces the role of wage premia dispersion for overall wage inequality but does not affect the main insight that firms shape wage inequality developments to an important extent (see Chapter 2 for details).

2 Worker skills or firm wage-setting practices? Decomposing wage inequality across 20 OECD countries

In many OECD countries, low productivity growth has coincided with rising wage inequality. Widening wage and productivity gaps between firms may have contributed to both developments. This chapter uses harmonised linked employer-employee data for 20 OECD countries to analyse the role of firms in wage inequality. The main finding is that, on average across countries, differences in average wages between firms explain about one-half of overall wage inequality. Two-thirds of between-firm wage inequality (i.e. about a third of overall wage inequality) reflect firms' wage-setting practices or wage premia, i.e. the part of wages that is determined by the firm rather than the characteristics of its workers. The remaining third (i.e. a sixth of overall wage inequality) can be attributed to differences in workforce composition across firms. The contribution of differences in wage premia to wage inequality tends to be larger in countries with decentralised collective bargaining systems and lower levels of job mobility. Overall, these results suggest that firms play an important role in explaining wage inequality, as wages are to a notable extent determined by firm wage-setting practices rather than being exclusively by workers' skills.[1]

In Brief

In many OECD countries, low productivity growth has coincided with rising income inequality. Widening wage and productivity gaps between firms may have contributed to both developments, as a significant share of firms has increasingly fallen behind the best performers. This paper presents comprehensive new evidence on the role of firms in the evolution of wage inequality from the mid-1990s to the mid-2010s based on harmonised linked employer-employee data for 20 OECD countries.

- On average across countries, changes in between-firm wage inequality (differences in average pay between firms) explain about one-half of the changes in overall wage inequality.
- Changes in between-firm wage inequality reflect changes in the dispersion of firm wage-setting practices ("firm wage premia") and skills-based sorting of workers across firms.
- Two-thirds (65%) of changes in between-firm wage inequality are accounted for by changes in firm wage premia, i.e. differences in average pay between firms that are unrelated to skills and other worker characteristics.
- The remaining one-third (35%) of changes in between-firm wage inequality can be attributed to changes in the sorting of workers across firms based on their skills, possibly related to increased specialisation along the value chain (e.g. outsourcing).
  - About 15% of changes in between-firm wage inequality reflect the sorting of workers across firms based on firm wage premia (the sorting of high-skilled workers into firms that pay high wages to all workers).
  - About 20% reflect changes in the sorting of workers into firms with similar co-workers (the clustering of similarly-skilled workers at given firm wage premia), which does not affect overall inequality as larger wage differences between firms are offset by narrower differences within firms.
- Differences in wage premia between firms tend to be more pronounced in countries with decentralised collective bargaining systems and lower levels of voluntary job mobility.

These results suggest that firms play a crucial role in explaining aggregate wage inequality. Rather than being fully determined by workers' skills, wages appear to partly reflect firms' wage-setting practices, which depend on their productivity as well as their wage-setting power. In addition to worker-centred policies, such as education and training, that may narrow the skill premium (which is estimated to have risen over the sample period), firm-centred policies that promote productivity in low-wage firms, increase competition for workers (e.g. by lowering barriers to voluntary job mobility) and limit the wage-setting power of firms (e.g. by collectively-agreed wage floors) are key to address concerns around inequality.

2.1. Introduction

At a time when many OECD countries are grappling with low productivity growth and rising inequality, gaps in business performance have also widened. While a small fraction of high-performing businesses continue to achieve high productivity and wage growth, the remaining ones are increasingly falling behind (Andrews, Criscuolo and Gal, 2016[1]; Berlingieri, Blanchenay and Criscuolo, 2017[2]). This raises the question whether growing performance gaps across businesses can at least partly account for aggregate productivity and inequality developments.

Designing better public policies for broadly shared productivity growth requires an understanding of the mechanisms through which firms affect both aggregate productivity and inequality. Firms may not only determine the distribution of market income between capital and labour, but also drive the distribution of labour income between workers, i.e. wage inequality.[2] In particular, addressing concerns about rising inequality may not only require policies to support workers, such as in the areas of skills and wage-setting, but also business-focused initiatives that allow lagging firms to catch up or exit the market.

Uncovering the mechanisms linking growing performance gaps between businesses and wage inequality requires granular information on the characteristics of both workers and their employers. Previous cross-country studies relying on firm-level information have provided evidence of a close link between trends in productivity dispersion and trends in wage inequality (Berlingieri et al., 2019[3]). But quantifying the extent to which this correlation is due to worker composition as opposed to firm wage setting practices requires information on workers and the firms for which they work (i.e. linked employer-employee data). Such information allows quantifying the contributions to wage inequality of wage dispersion between *(i)* different workers within firms and *(ii)* similar workers across different firms. It also helps understanding the extent to which such differences are explained by workforce composition, differential technology adoption, or differences in market power between firms, which may in turn be driven by technology, domestic and international value chains, as well as policy.

In an effort to enhance the understanding of the role of firms in wage inequality across a large set of countries, this chapter makes use of a novel harmonised linked employer-employee dataset covering 20 OECD countries based on a strict data protocol that ensures cross-country comparability to decompose overall wage inequality within and between firms. The analysis covers a broad range of countries exhibiting widely different inequality dynamics and institutional settings. The chapter assesses for the first time the extent to which differences in the between-firm component of wage inequality reflect differences in firm wage-setting practices rather than differences in worker skills in a cross-country context.

The linked employer-employee data used in this chapter are based on administrative records designed for tax or social security purposes or, in a few cases, mandatory employer surveys. These data have the major advantage of being very comprehensive (covering the entire population of workers and firms in most countries) and of very high quality, notably with respect to information on wages, given the potentially important financial or legal implications of reporting errors and extensive administrative procedures for quality control. While such data are increasingly used for research on single countries, their use in a cross-country context remains rare.[3]

The analysis covers a broad range of countries that differ significantly in terms of their exposure to global trends related to globalisation and technology and the nature of policies and institutions, resulting in widely diverging inequality dynamics (Austria, Canada, Costa Rica, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, the Slovak Republic, Spain, Sweden, United Kingdom and the United States). The sample encompasses low-inequality countries (e.g. Sweden) as well as high-inequality ones (e.g. United States), and countries with large increases in wage inequality (e.g. Germany) as well as countries with pronounced declines (e.g. Estonia).

The decomposition of wage inequality between and within firms proceeds in three steps. First, to provide an indication of the role of firms in inequality, it starts with a raw decomposition of wage inequality into a part related to inequality in average wages between firms and a part related to inequality between workers' individual wages within firms, similar to Tomaskovic-Devey et al. (2020[4]). Second, the decomposition is augmented with controls for the observable characteristics of workers following Barth et al. (2016[5]; 2018[6]). This allows decomposing the between-firm component into a part related to the wage-setting practices of firms (e.g. wage premia), and a part related to the skill and demographic composition of the workforce. Third, for countries for which this is possible, the decomposition is repeated controlling for both the observable and unobservable characteristics of workers following Abowd et al. (1999[7]) and Song et al. (2019[8]).

The main finding of this chapter is that firm wage-setting practices play an important role in explaining aggregate wage inequality. This suggests that concerns about high or rising inequality may not only require policies to support low-wage workers, such as in the areas of skills and wage-setting, but also business-focused initiatives that allow lagging firms to catch up or leading firms to create new jobs. As shown in Chapter 3 such policies would not only help to strengthen aggregate productivity growth, but also contribute to smaller wage inequality between firms as reduced productivity dispersion results in reduced wage-premia dispersion between firms.

The challenge for policy makers is to simultaneously promote productivity gains from the adoption of new and possibly skill-biased technologies and the corresponding efficiency-enhancing sorting of workers across firms, while ensuring a broader sharing of these gains. Policies that promote the adoption of productivity-enhancing technologies in low-wage firms are likely to be key, as they promote increased access to adequate skill upgrading for all workers, providing them with pathways to climb the job ladder. More generally, worker-centred policies, such as education and training, may need to be complemented with firm-centred policies that promote productivity in low-wage firms to effectively address concerns around high inequality and low productivity growth.

The remainder of the chapter is organised as follows. Section 2.2 describes the analytical framework that links technological change, globalisation and public policies to within and between-firm wage inequality. Section 2.3 outlines the construction of a harmonised cross-country linked employer-employee dataset and compares the resulting measures of wage inequality with other available data sources. Section 2.4 uses this dataset to provide a statistical decomposition of wage inequality into within- and between-firm parts for a range of OECD countries. Section 2.5 provides evidence on the role of worker sorting across firms and differences in firm wage premia in between-firm wage inequality. Section 2.6 concludes.

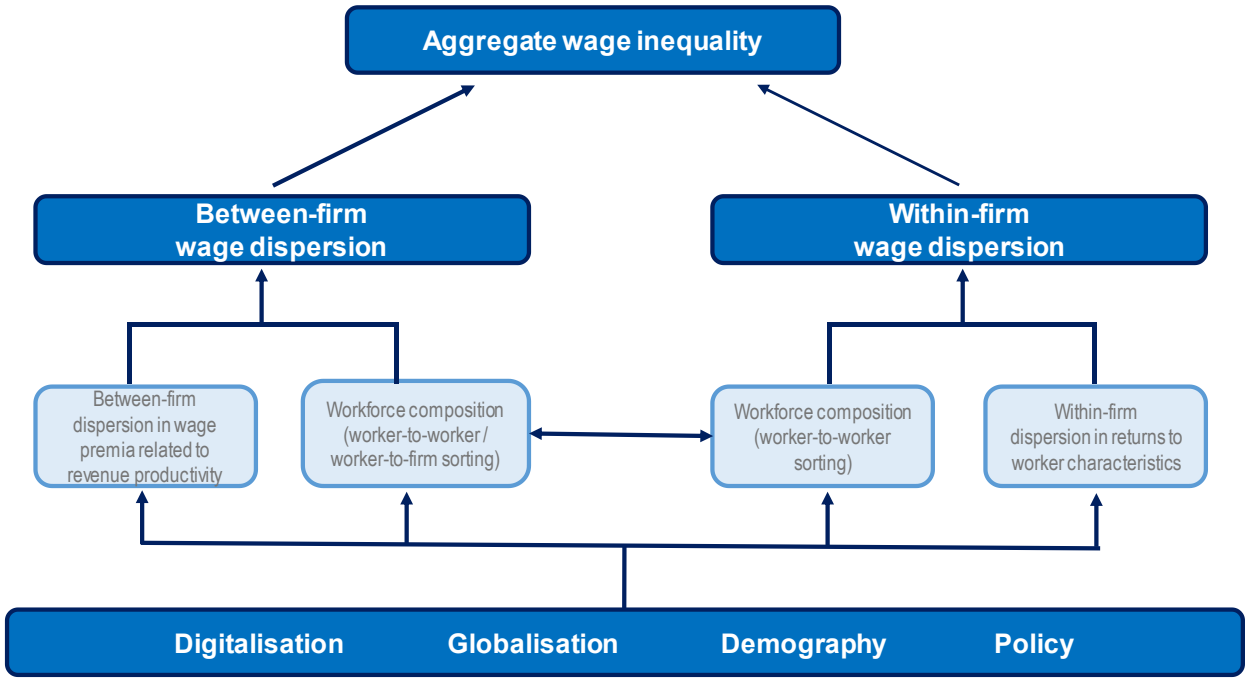
2.2. A framework for dissecting the role of firms in wage inequality

2.2.1. Conceptual framework

Aggregate wage inequality can be decomposed into wage dispersion between firms and within firms (Figure 2.1). Wage dispersion between firms may reflect differences in workforce composition or differences in revenue-based productivity at given workforce composition due to technology or market power, and the extent to which market rents are shared with workers. Wage dispersion within firms reflects worker heterogeneity in terms of a range of earnings characteristics – including education, experience and gender – and returns to these characteristics. The digital transformation, trade integration and demographic change, as well as public policies affect aggregate wage inequality through these channels.

In a perfectly-competitive labour market without frictions, where firms pay workers according to their marginal productivity (e.g. skills, unobserved ability, motivation etc.), pay differences between firms entirely reflect differences in workforce composition. For instance, one firm may mainly employ high-skilled workers at high wage rates, whereas another one may mainly employ low-skilled workers at low wage rates, because they perform different economic activities or use technologies with different skill requirements. Put differently, in a perfectly-competitive labour market, such worker-to-worker sorting fully explains wage differences between firms. However, since workers' wages are fully determined by their own skills worker-to-worker sorting has no impact on aggregate wage inequality: higher between-firm wage inequality due to higher skill dispersion between firms is fully offset by lower within-firm wage inequality due to more homogeneous workforces within firms.

Figure 2.1. Conceptual framework



In an imperfectly-competitive labour market with frictions, firms and workers bargain over market rents (Pissarides, 2000[9]; Mortensen, 2003[10]). In this case, average pay between firms may differ even when they employ identically-skilled workers because of differences in firm wage premia due to differences in firms' revenue productivity and/or in the sharing of market rents with workers. For instance, one firm may adopt more advanced technologies than another one employing identically-skilled workers, because it benefits from better access to finance or has reached the minimum scale to cover the fixed cost of adopting advanced technologies. Revenue productivity may also differ between firms with identically-skilled workers because of differences in product market power, which allows some firms to charge higher prices at given technology and may partly reflect product innovation but also barriers to competition due to sunk costs or the policy environment. The scope for firms to align wages with productivity in an imperfectly competitive labour markets may depend on the presence of wage-setting institutions which impose minimum wage floors but in some cases also limit wage growth through coordinated wage bargaining (OECD, 2019[11]).

In reality, pay differences between firms are likely to be explained by both differences in workforce composition and differences in firm wage premia, with worker sorting across firms not only reflecting the clustering of similarly-skilled workers in the same firms (worker-to-worker sorting), but also the concentration of high-skilled workers in the best-performing firms (and of low-skilled workers in low-productivity firms, i.e. worker-to-firm sorting). Worker-to-worker sorting represents specialisation based on the preferences and skills of workers or the technology-based skill requirements of firms. This type of sorting is not driven by differences in pay between firms and does not generate changes in the distribution of productivity-related rents across workers. By contrast, worker-to-firm sorting may result from the presence of firm wage premia, based on complementarities between workers' skills and firms' production technology or labour market frictions. Firms may also aim at limiting the sharing of productivity-related rents with low-skilled workers, for instance by outsourcing the least skill-intensive production stages.

Evidence for Germany and the United States suggests that domestic outsourcing of supporting service activities, such as cleaning, security and catering, has contributed to increased worker-to-worker and worker-to-firm sorting (Dorn, Schmieder and Spletzer, 2018[12]; Goldschmidt and Schmieder, 2017[13]). Moreover, improved access to imported inputs and services offshoring have allowed firms to replace tasks

previously conducted in-house by imports, making worker skills within firms more homogeneous (Autor, Dorn and Hanson, 2015[14]; Bloom, Draca and Van Reenen, 2016[15]; Carluccio, Fougère and Gautier, 2015[16]; Weil, 2014[17]).

This framework allows for the possibility that rather than being fully determined by workers' marginal productivity, wages may at least partly be driven by firms' productivity-related rents. Such rents may affect wage inequality both directly by affecting the dispersion of average wages between firms and indirectly by affecting workers' incentives to sort across firms with different wage premia. Therefore, worker-centred policies that have traditionally focused on addressing the gap between skill demand and supply may fall short of fully addressing the drivers of wage inequality. Instead, worker-centred policies may need to be complemented with firm-centred policies that address differences in productivity-related rents between firms while supporting overall productivity growth.

2.2.2. Empirical implementation

The analysis of the separate channels underlying aggregate wage inequality is implemented empirically as follows. Wage inequality is measured as the total variance of logarithmic wages, which is additively decomposable, scale independent and provides a more comprehensive measure of inequality compared to partial measures, such as the $90^{th}/10^{th}$ percentile ratio. In a first step, the total variance of wages is decomposed into the variance of average wages between firms and the variance of individual wages within firms. The results from this analysis are presented in Section 2.4 below.

In a second step, the estimation of a traditional human-capital earnings equation augmented with firm-fixed effects allows further decomposing between- and within-firm wage inequality into the four parts highlighted by the analytical framework in Figure 2.1 (Box 2.1):[4]

- *(i)* the variance of wages at given observable workforce composition (dispersion of firm wage premia);
- *(ii)* the covariance between the predicted wages of workers based on their observable earnings characteristics and firm-specific wage premia (worker-to-firm sorting);
- *(iii)* the covariance between the predicted wages of workers based on their observable earnings characteristics and the firm-level average of predicted wages (worker-to-worker sorting);
- *(iv)* the variance of wages related to workers' observed and unobserved earnings characteristics and the returns to these characteristics.

The results from this analysis are presented in Section 2.5 below.

Box 2.1. Using a traditional human capital earnings equation to decompose wage inequality

Isolating the contribution of sorting of workers across firms to between- and within-firm wage inequality involves estimating a traditional human capital earnings equation augmented with firm fixed effects (Barth et al., 2016[5]):

$$\ln w_{ij} = x_i\beta + \gamma_j + \varepsilon_{ij} \qquad \text{Equation 2.1}$$

where w_{ij} denotes the wage of worker *i* in firm *j*; x_i denotes a vector of observable worker characteristics; β denotes the estimated return to these characteristics; γ_j denotes estimated firm fixed effects; and ε_{ij} denotes the error term. The observable earnings characteristics included in the empirical model generally include education and/or occupation, age, gender, indicators for part-time work and interaction terms between these variables.

Based on Equation 2.1, denoting estimated coefficients and variables with superscript ^ and defining $\hat{s} \equiv x_i\hat{\beta}$ (workers' predicted wages based on observable earnings characteristics) the total variance of $\ln w_{ij}$ can be written as follows:

$$V^{total} = V(\hat{s}) + V(\hat{\gamma}) + 2cov(\hat{s},\hat{\gamma}) + V(\hat{\varepsilon}) \qquad \text{Equation 2.2}$$

where $V(\hat{s})$ is the variance of predicted wages based on observable earnings characteristics; $V(\hat{\gamma})$ is the variance of firm-specific wage premia; $cov(\hat{s},\hat{\gamma})$ is the covariance of predicted wages with firm-specific wage premia and $V(\hat{\varepsilon})$ is the variance of residual wages.

Defining $\rho_\gamma \equiv \frac{cov(\hat{s},\hat{\gamma})}{V(\hat{s})}$ and $\rho \equiv \frac{cov(\hat{s},\hat{S})}{V(\hat{s})}$, where $\hat{S}$ is the average of all individual workers' $\hat{s}$ in the firm, the total variance of $\ln w_{ij}$ can be re-written as:

$$V^{total} = \left[V(\hat{s})\rho + 2V(\hat{s})\rho_\gamma + V(\hat{\gamma})\right] + \left[V(\hat{s}) + V(\hat{\varepsilon}) - V(\hat{s})\rho\right] \qquad \text{Equation 2.3}$$

$$= \quad V^{between} \quad + \quad V^{within}$$

where ρ_γ is the correlation of workers' predicted wages based on observable earnings characteristics with the estimated firm-fixed effects (a measure of worker-to-firm sorting) and ρ is the correlation of workers' predicted wages with the average predicted wage in their firm (a measure of worker-to-worker sorting).

The between-firm variance can thus be decomposed into contributions from worker-to-worker sorting $V(\hat{s})\rho$, worker-to-firm sorting $2V(\hat{s})\rho_\gamma$ and the variance of firm-specific wage premia $V(\hat{\gamma})$. The within-firm variance can be decomposed into contributions from the returns to observed and unobserved earnings characteristics $V(\hat{s}) + V(\hat{\varepsilon})$ and worker-to-worker sorting $-V(\hat{s})\rho$.

The positive contribution of worker-to-worker sorting to overall wage inequality through between-firm wage inequality $V(\hat{s})\rho$ is exactly offset by the negative contribution through within-firm wage inequality $-V(\hat{s})\rho$. This reflects the fact that increased worker-to-worker sorting raises the dispersion of workforce composition between firms but makes workforce composition within firms more homogeneous, with no net effect on overall wage inequality.

The variance of firm-wage premia to overall wage inequality in the above framework represents an upper-bound estimate of its true contribution due to the role of unobservable worker characteristics (as

shown in Box 2.4 following Abowd et al. (1999[7]), while it represents a lower bound estimate of the contribution of worker-to-firm sorting due to the presence of sorting on unobservable ability. This issue is particularly pronounced in countries where information on neither occupation nor education are available (Austria, Canada, Estonia and New Zealand).

2.3. Constructing a cross-country dataset based on employer-employee data

In order to empirically quantify the contributions of each of the elements of the above framework to levels and changes in wage inequality and the scope for firm-centred policies, data are needed that map workers to the firms that employ them. The linked employer-employee data used in this project are drawn from administrative records designed for tax or social security purposes or, in a few cases, mandatory employer surveys.[5] In most countries, the project takes a distributed micro-data approach that relies on partners based in participating countries to provide relevant aggregations of individual-level data using a harmonised statistical code. In order to develop and test the statistical code, as well as to develop an in-house data infrastructure, the project has also gained direct access to a number of anonymised individual-level data sets.[6]

Linked employer-employee data have the major advantage of being very comprehensive and, in some cases, covering the entire population of workers and firms in a country. The information is generally also of very high quality, given the potentially important financial or legal implications of reporting errors and extensive administrative procedures for quality control. Since tax and social security systems differ in their administrative requirements across countries, with potentially important implications for their comparability across countries, considerable effort has been made to harmonise the data (see Annex on Data and Disclaimers for on overview of the data used for each country). The analysis is restricted to the private sector and excludes the self-employed, where possible, and own-account workers everywhere by focusing on firms with two employees or more. Including the self-employed and public sector firms would increase the importance of between-firm wage inequality at the expense of the within component, since the self-employed constitute overwhelmingly single-worker firms and the distribution of public sector wages is typically highly compressed. When information on public status is unavailable the “public government and defence” and “education” sectors are excluded. Information on self-employment is not always available, but a large fraction of self-employed workers is excluded by restricting the analysis to firms with at least 2 employees.

The main analysis focuses on total monthly earnings since information on working time is not available in several countries. In an attempt to exclude part-timers, all workers with earnings below 90% of monthly earnings of a full-time worker at minimum wage are dropped and in the absence of a minimum wage, those below 45% of the monthly median wage for a full-time worker. Using hourly wages for the subset of countries where this is possible does not change the main results of this chapter. Earnings information is reported in gross terms, i.e. total labour cost minus employer social security contributions and based on all taxable earnings, including overtime and other bonuses. To deal with the issue of top coding at the contribution threshold in social security data, censored wages are imputed based on regression analysis using the predicted wage and the distribution of estimated error terms based on methods developed by Dustmann et al. (2009[18]) and Card et al. (2013[19]).

The definition of an employer differs across countries. While some datasets link workers to their establishments, others link them to their firms (which may encompass several establishments) or to an administrative reporting unit somewhere between the firm and the establishment (Vilhuber, 2009[20]). Although this could matter for decomposing wage dispersion into between and within-employer components, empirical work suggests that in practice the unit of observation may only have a limited impact on such decompositions. This may partly reflect the fact that most firms have only a single establishment.[7]

Where both definitions are available, the analysis focuses on firms rather than establishments, which is typically the level at which wages are set.

While the administrative data typically cover the universe of workers and their employers, the data made available for analytical purposes are in some countries based on a representative sample of workers or firms. Worker-based samples only cover a fraction of workers in a firm, introducing measurement error in average firm wages. This tends to bias within-firm wage dispersion down relative to between-firm wage dispersion. The analysis corrects for sampling error in worker-based samples which tends to bias down within-firm wage dispersion relative to between-firm wage dispersion using the correction proposed by (Håkanson, Lindqvist and Vlachos, 2015[21]).

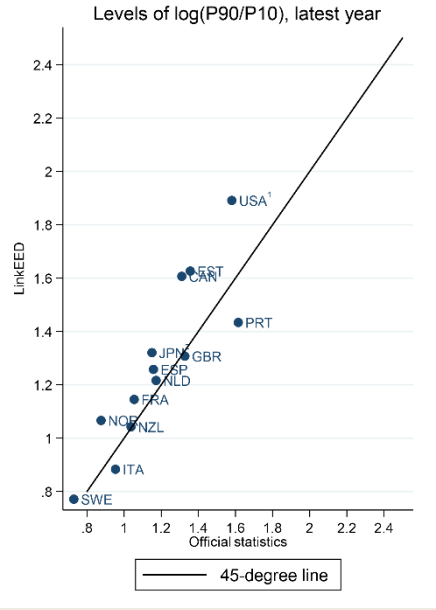
The resulting dataset generally covers the past two decades and is broadly consistent with other national and cross-country data sources in terms of levels and changes in overall wage inequality (Box 2.2).[8] Deviations in terms of levels of the $90^{th}/10^{th}$ percentile ratio are generally very small, but there are significant deviations in terms of changes for a number of countries, which may reflect differences in samples or definitions of wages across the two data sources.

Box 2.2. Comparison of wage inequality measures based on LinkEED and official sources

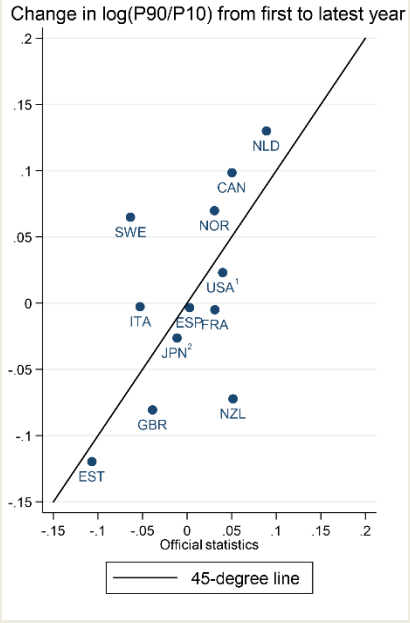
This box assesses the extent to which the patterns in overall wage inequality based on the new linked employer-employee dataset (LinkEED) correspond to those reported by official sources from national agencies or international organisations. Since the variance of wages – the preferred measure of wage inequality used in this chapter – is generally not available from official sources, this is done by comparing the 90th/10th percentile ratio for the latest available year and the change in this ratio between the first and the last available year in both sources (Figure 2.2). Deviations in terms of levels of wage inequality are generally very small, with the correlation between the two data sources being around 0.9. The correlation is somewhat lower in terms of changes (around 0.6), which mainly reflects significant deviations for New Zealand and Sweden. Such deviations could signal differences in samples or wage definitions between the two data sources rather than fundamental disagreement on wage inequality developments. For instance, the European Union Structure of Earnings Survey that underlies the official statistics for European countries in Figure 2.2 only covers a relatively small sample of workers (generally around 5-10%) as opposed to the universe of workers for most countries covered by LinkEED. Moreover, the European Union Structure of Earnings Survey excludes firms with less than 10 employees as opposed to firms with less than 2 employees in LinkEED.

Figure 2.2. Comparison of LinkEED with official statistics

Panel A: Level of log(P90/P10), latest year



Panel B: Change in log(P90/P10), from first to latest year



Note: The sample period for the data comparison between LinkEED and official data sources does not necessarily match the sample period in the remainder of the chapter, since official data on the 90th/10th percentile ratio are often only available for a shorter sample period. The data comparison could not be conducted for Germany since the 90th/10th percentile ratio was not computed by the German partners of the LinkEED project. The data comparison in changes is not conducted for Portugal, because 2006 is the only common year in the LinkEED and official data. First available year is 1997 for Canada; 2002 for Netherlands, Spain, Sweden, United Kingdom and the United States; 2006 for Estonia, France, Italy, Germany and Norway; and 2008 for Japan. Latest available year is 2006 for Portugal; 2007 for the United

States; 2014 for the Estonia, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, and United Kingdom; 2016 for Canada and Spain; 2017 for New Zealand.

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[1] For the United States, LinkEED is based on Barth et al. (2016[5]).
[2] For Japan, both LinkEED and official statistics are based on full-time workers only.
Source: OECD calculations and official statistics: Federal Reserve Bank of St. Louis (2019[22]; 2019[23]); Statistics Bureau of Japan (2019[24]); OECD Earnings Distribution Database (2019[25]) for Canada and New Zealand; Eurostat Structure of Earnings Survey (2017[26]) for all remaining countries.

2.4. Key stylised facts on wage inequality between and within firms

A number of stylised facts emerge by decomposing aggregate wage inequality developments according to the analytical framework in Figure 2.1 using the harmonised linked employer-employee data.

2.4.1. Inequality between firms accounts for a sizeable share of the levels and changes in overall wage inequality

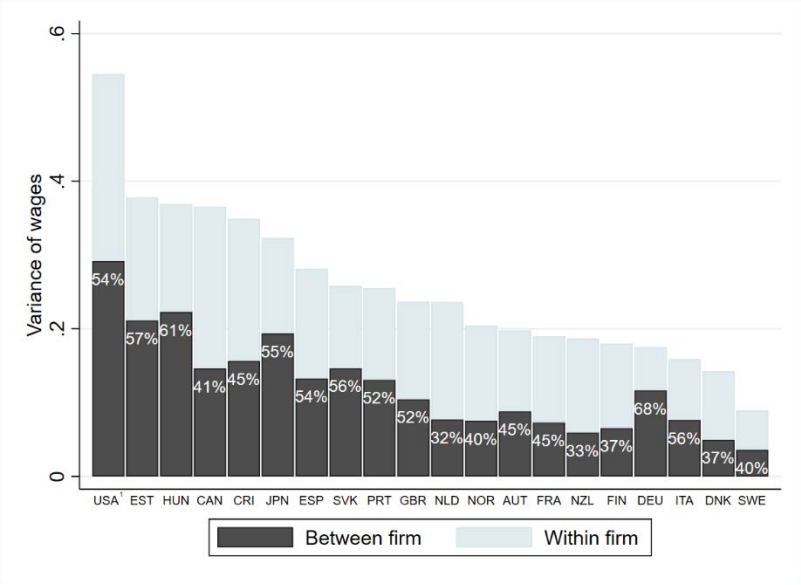
On average across countries, the dispersion of average wages between firms accounts for about half of the overall dispersion of wages (Figure 2.3). While the share of between-firm inequality in overall wage inequality in no country falls below 30%, it approaches 70% in some, suggesting that there may be large cross-country differences in terms of worker sorting and the dispersion of firm wage premia.[9] These may partly reflect cross-country differences in productivity dispersion between firms, but also the extent to which labour market institutions such as collective bargaining influence the sharing of productivity-related rents with workers.

The orders of magnitude are broadly in line with those of previous studies, which found that wage dispersion between firms accounts for up to 60% of overall wage inequality. Recent research using cross-country data for European countries estimates that wage dispersion between establishments explains around 60% of aggregate wage inequality (International Labour Organization, 2016[27]). A previous cross-country study covering European countries and the United States found that wage dispersion between firms accounts for around 20-40% of aggregate wage inequality (Lazear and Shaw, 2009[28]).[10]

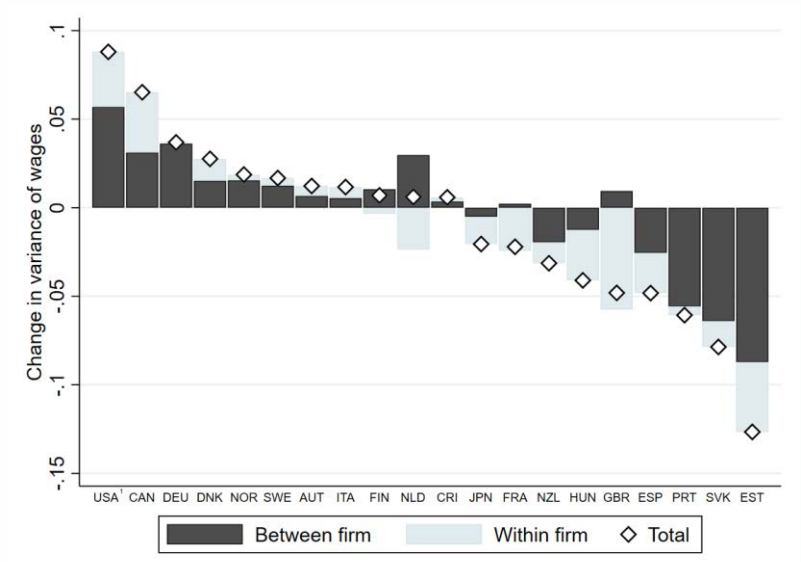
Changes in the dispersion of average wages between firms also account for around half of *changes* in overall wage inequality (Figure 2.3, Panel B).[11] Except for the United Kingdom, where between-firm inequality has increased despite declining overall wage inequality, in most countries changes in between-firm wage inequality have contributed significantly to overall wage inequality developments, highlighting the crucial of role of firms in aggregate wage inequality developments. Large cross-country differences in absolute changes in wage inequality partly reflect large differences in initial levels, with overall wage inequality typically changing by 10-20% over the sample period (Annex Figure 2.A.1). However, the fact that the direction of changes differs across countries suggests that changes in between-firm wage inequality most likely also reflect differences in the extent to which policies and institutions shape the impact of global trends, such as globalisation and technological change, on worker sorting and inequality in firm-level productivity and wages.

Figure 2.3. A significant share of overall wage inequality is between firms

Panel A. *Level* of (log) wage variance, latest available year



Panel B. Change in (log) wage variance, latest year – first year



Note: The total height of the bars in Panel A shows the total variance of log wages, with the percentages on top of the dark-shaded bars denoting the ratio of the between-firm component to the total variance (i.e. $V^{between}/V^{total}$ in Equation 2.3). The bars in Panel B show the change in the total variance of log wages, with the dark-shaded component showing the change in the between-firm variance and the light-shaded bar showing the within-firm variance change. First year: 1992 for the United States; 1995 for Canada, Germany and Italy; 1996 for Spain; 1998 for the United Kingdom; 1999 for Sweden; 2000 for Austria, Finland and New Zealand; 2001 for Denmark and Netherlands; 2002 for Estonia,France and Portugal; 2003 for Hungary; 2004 for Norway; 2005 for Japan; 2006 for Costa Rica; 2014 for Slovakia. Latest year: 2007 for the United States; 2011 for Hungary; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Canada, Germany, Netherlands and Spain; 2017 for Costa Rica, Denmark, Finland, Portugal, New Zealand; 2018 for Austria, Estonia, Slovakia and the United Kingdom.

1. Values for the United States are based on Barth et al. (2016[5]).

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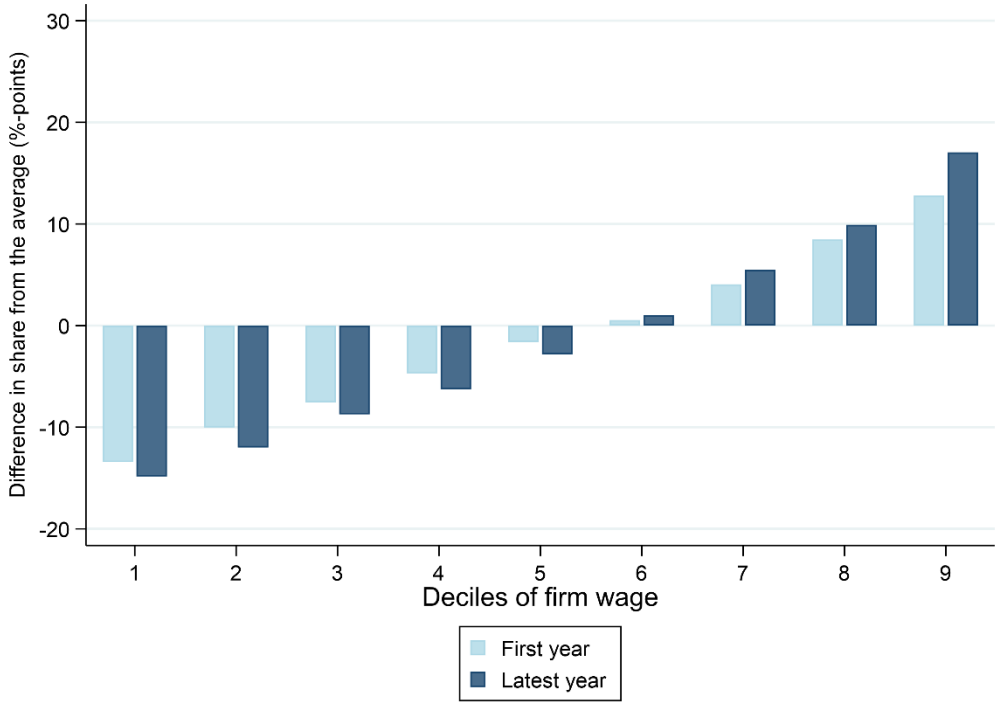
2.4.2. Between-firm inequality partly reflects differences in workforce composition

Dispersion in average wages between firms partly reflects differences in workforce composition. For instance, high-skilled workers earning high wages may predominantly work in firms that employ other high-skilled workers or pay high wage premia. Defining high-skilled workers based on education or occupation, the evidence suggests that the share of high-skilled workers in high-wage firms is higher than in firms at the bottom of the firm wage distribution (Figure 2.4). On average across countries, in the last year of the sample, the share of high-skilled workers in firms at the top decile of the firm wage distribution was about 32 percentage points higher than in firms at the bottom decile. Moreover, the difference between the top and the bottom decile was about 8 percentage points higher than in the first year of the sample, suggesting that high-skilled workers increasingly cluster in the same firms as firms get more specialised or better-performing firms pay higher wages to attract better workers. Dispersion in average wages between firms partly also reflects the fact that women tend to work in low-wage firms, although this is less the case than about two decades ago (Box 2.3).

Figure 2.4. Skill dispersion across firms is large and increasing

Deviations of shares of high skilled employees from average across firm-wage deciles, in %-points



Note: The figure shows the deviations of the share of high-skilled workers from the average share over all deciles in the first and last available years, with high-skilled workers defined based on occupational category or education. For instance, in the last available year, the share of high-skilled workers in the top decile was 17 percentage points above the average, while in the bottom decile it was 15 percentage points below the average. First year: 1991 for Italy; 1995 for Portugal; 1996 for Spain; 1998 for the United Kingdom; 1999 for Sweden; 2001 for Netherlands; 2002 for France, 2004 for Norway; 2005 for Japan. Latest available year: 2009 for Portugal; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Netherlands and Spain; 2018 for the United Kingdom.

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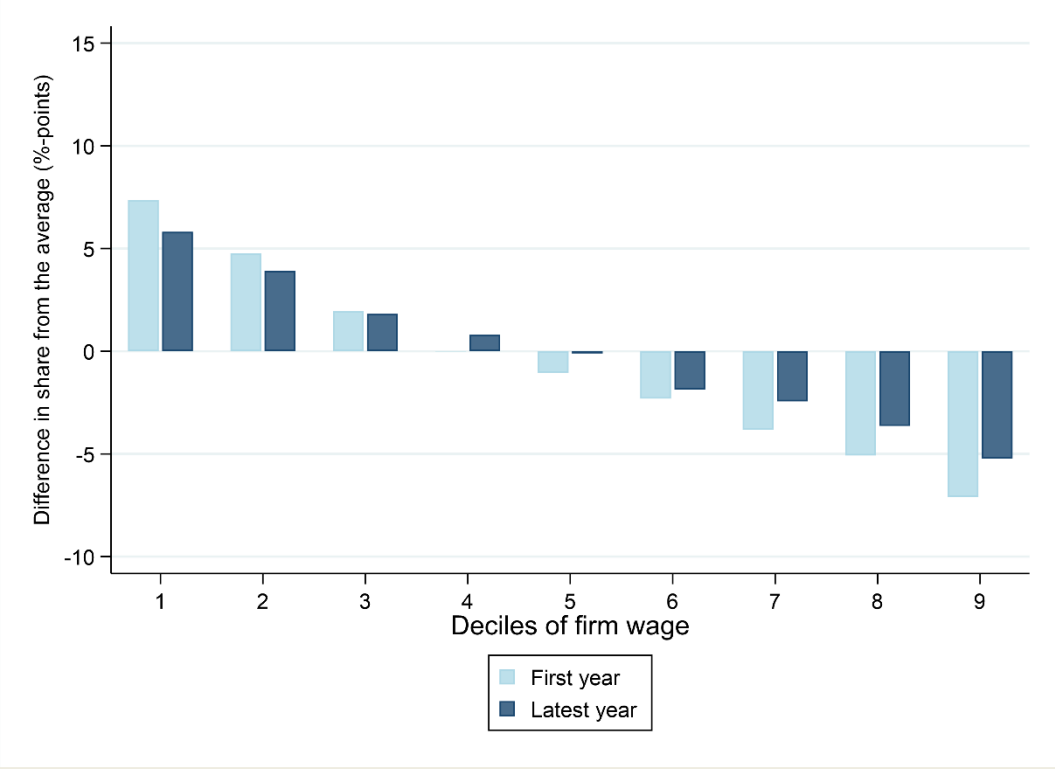
Box 2.3. Women are increasingly working in high-wage firms

Traditionally, women are much more likely to work in low-wage firms than men (Figure 2.5). About two decades ago, the share of women in the highest-paying firms (top decile of average wages) was about 15 percentage points lower than in the lowest-paying firms (bottom decile), but the difference has shrunk to about 11 percentage points. This likely reflects rising labour market skills among women, the changing nature of high-pay occupations (e.g. manufacturing versus services), a more supportive institutional environment (e.g. working time flexibility, childcare) and reduced gender discrimination as a result of changing social norms, which has increasingly allowed women to find jobs in higher-paying firms. This issue is discussed in more detail in Chapter 5 of this Volume.

Figure 2.5. Women increasingly work in high-wage firms

Deviations of shares of women from average across firm-wage deciles, in %-points



Note: The figure shows the deviations of the share of women from the average share over all deciles in the first and last available years. For instance, in the last available year, the share of women in the top decile was 5 percentage points below the average while in the bottom decile it was 6 percentage points above. First year: 1991 for Italy; 1995 for Portugal; 1996 for Spain; 1998 for the United Kingdom; 1999 for Sweden; 2001 for Netherlands; 2002 for France; 2004 for Norway; 2005 for Japan. Latest available year: 2009 for Portugal; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Netherlands and Spain; 2018 for the United Kingdom.

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2.5. Decomposition results

2.5.1. Distinguishing between firm-wage premia and worker sorting

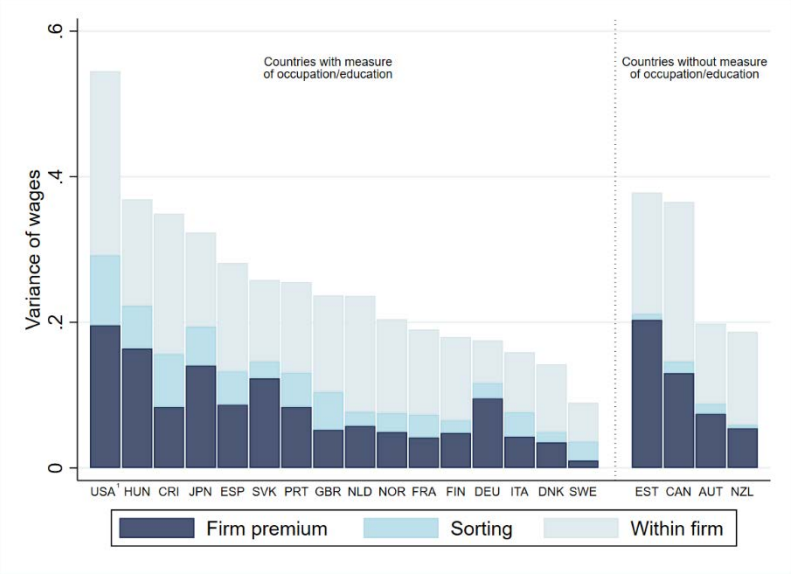
The between-firm component of wage inequality can be further decomposed into differences in firm-specific wage premia (due to productivity-related rents) and the sorting of workers into firms paying different average wages.

On average across countries, the dispersion of firm wage premia accounts for around two thirds of the *level* of between-firm wage inequality while worker sorting across firms accounts for around one third (Figure 2.6). The contribution to *changes* in between-firm wage inequality over the past 20 years has been similar, suggesting that there has been no major break in the role of firm wage premia over the period.The contribution of firm wage premia to between-firm wage inequality varies substantially across those countries, ranging from about 10% in Sweden to more than 50% in Germany. In Austria, Canada, Estonia and New Zealand, where only information on age and gender is available the estimated contribution of firm wage premia tends to be larger, as differences in occupational or educational composition of workers are incorporated into the estimated firm wage premia.

Accounting for differences in workforce composition between firms related to unobservable earnings characteristics slightly reduces the contribution of firm-wage premia to the overall *level* of wage dispersion, but has no systematic impact on their contribution to *changes* in overall wage dispersion (Box 2.4). These results strongly suggest that inequality in average wages between firms does not just reflect differences in workforce composition, but mainly differences in productivity-related rents or the extent to which such rents are shared with workers.

Figure 2.6. Distinguishing between firm-wage premia and worker sorting

Panel A. Contributions to the level of wage dispersion, latest available year



Panel B. Contribution to changes in wage dispersion, latest year – first year

Note: Based onEquation 2.3. The bars in Panel A denote the level of overall wage inequality in the latest available year, with the shaded parts denoting the contributions of firm premia, sorting and within firm inequality. Panel B shows the changes in overall wage inequality and its components from the first to the latest available year. First year: 1992 for the United States; 1995 for Canada, Germany and Italy; 1996 for Spain; 1998 for the United Kingdom; 1999 for Sweden; 2000 for Austria, Finland and New Zealand; 2001 for Denmark and Netherlands; 2002 for Estonia,France and Portugal; 2003 for Hungary; 2004 for Norway; 2005 for Japan; 2006 for Costa Rica; 2014 for Slovakia. Last year: 2007 for the United States; 2011 for Hungary; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Canada, Germany, Netherlands and Spain; 2017 for Costa Rica, Denmark, Finland, Portugal, New Zealand; 2018 for Austria, Estonia, Slovakia and the United Kingdom.

1. Figures for the United States are based on Barth et al. (2016[5]).

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Box 2.4. Accounting for unobservable earnings characteristics

Compositional differences between firms may not only relate to workers' observable earnings characteristics (e.g. age, gender, education and/or occupation) but also unobservable ones (e.g. innate ability or motivation). As a result, the component of wage dispersion associated with firm fixed effects may not just reflect differences in firm wage premia, but also unobservable differences in workforce composition. This is likely to be particularly important for countries with limited information on the skills of workers such as Austria, Canada, Estonia and New Zealand. This box analyses the extent to which accounting for unobserved earnings characteristics affects the estimated contribution of firm-wage premia to the level and change in wage inequality in selected countries.

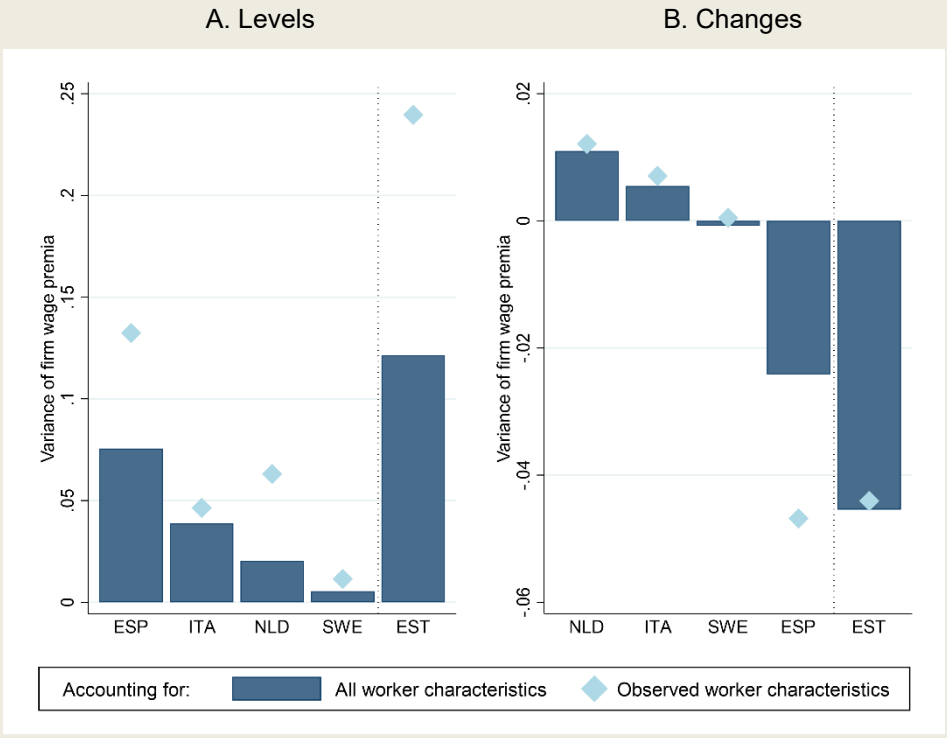
Accounting for the role of unobservable earnings characteristics for the variance of wages, involves augmenting the human capital earnings equation in Box 2.1 with a person fixed effect using the method developed by Abowd et al. (1999[7]) (henceforth AKM):

$$\ln w_{ijt} = x_{it}\beta + \pi_i + \varphi_j + \theta_t + \varepsilon_{ijt} \qquad \text{Equation 2.4}$$

where w_{ijt} denotes the wage of worker *i* in firm *j* at time *t*; x_{it} is a vector of observable worker characteristics and β the estimated return to these characteristics; π_i, φ_j and θ_t are person-, firm- and year-fixed effects, respectively; and ε_{ij} is the error term. Since the person fixed effects are identified from worker mobility across firms, Equation 2.4 is estimated over periods of at least five years. The decomposition of the between-firm variance into the components associated with firm-wage premia and sorting is analogous to that described in Box 2.1.

Accounting for unobservable workforce differences between firms typically reduces the contribution of firm-wage premia to the overall *level* of wage dispersion, but has no systematic impact on the contribution to *changes* in overall wage dispersion (Figure 2.7). On average, across the countries covered by this analysis, the contribution of firm-wage premia to the level of between-firm wage variance declines by about one-third relative to the baseline model. However, the contribution of changes in firm-wage premia dispersion to changes in overall wage dispersion is typically similar whether or not we account for unobservable worker differences between firms, even in countries with very limited information on observable worker characteristics such as Estonia. The results with respect to worker-to-firm sorting remain broadly unchanged when compared with those obtained by applying the method proposed by Borovičková and Shimer (2017[29]). In sum, these results suggest that sorting of workers across firms based on unobservable characteristics matters significantly for the *level* of between-firm wage inequality but only marginally for *changes* in between-firm wage inequality.

Figure 2.7. Contribution of firm-wage premia to variance of wages



Note: The figure shows the contribution of firm-wage premia to overall wage dispersion controlling for observed worker characteristics (baseline) and unobserved worker characteristics (AKM). The left panel focuses on wage dispersion in levels using data for the entire period (1990- 2017 for Spain; 2001-2018 for Estonia; 1990-2017 for Italy; 2001-2017 for the Netherlands; 2000-2017 for Sweden), whereas the right panel focuses on changes in wage dispersion between the first and the latest period (1990-1994 and 2011-2017 for Spain; 2001-2005 and 2011-2018 for Estonia; 2001-1990-1995 and 2011-2017 for Italy; 2001-2005 and 2011-2017 for the Netherlands; 2000-2005 and 2011-2017 for Sweden).

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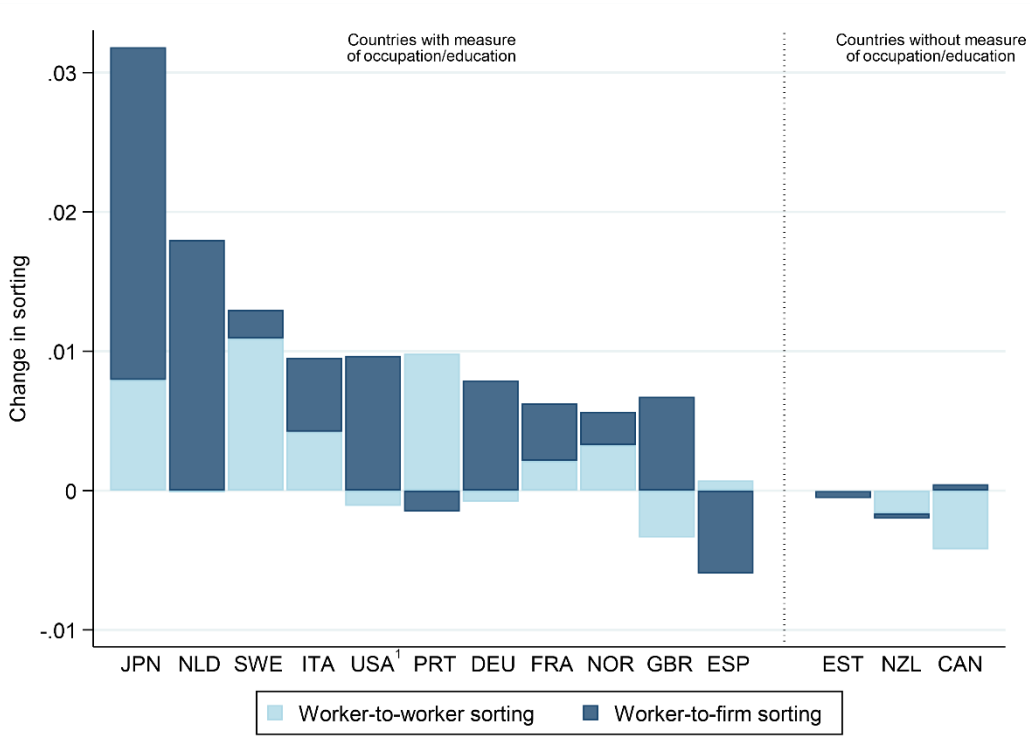
2.5.2. Dissecting the contribution of sorting to between-firm wage inequality

Turning to the role of worker sorting, the evidence suggests that in many countries sorting has also tended to exacerbate between-firm wage inequality and, to a lesser extent, overall wage inequality developments (recall that only worker-to-firm sorting contributes to overall wage inequality). Moreover, within countries, worker-to-worker sorting and worker-to-firm sorting have often moved in the same direction (Figure 2.8). Thus, from the perspective of firms, specialisation in tasks with different skill requirements – be it to take advantage of pure gains of specialisation or to limit rent-sharing with low-skilled workers – has increased over time. From the perspective of workers, increases in the dispersion of firm-wage premia may also have raised incentives for sorting into higher-paying firms. Consistent with this hypothesis, Spain and Portugal, which are the only countries that experienced declines in the dispersion of firm-wage premia (in the group of countries with measures of occupation and/or education), also experienced a decline in worker-to-firm sorting.

Figure 2.8. Worker-to-worker and worker-to-firm sorting have often moved together



Note: Start year: 1991 for Canada, Italy, Portugal; 1992 for the United States; 1996 for Germany and Spain; 1998 for the United Kingdom; 1999 for Sweden; 2000 for New Zealand; 2001 for Netherlands; 2002 for France and Estonia; 2004 for Norway; 2005 for Japan. Latest available year: 2007 for the United States; 2009 for Portugal; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Canada, Germany, Netherlands and Spain; 2017 for New Zealand; 2018 for Estonia and the United Kingdom.
1. Figures for the United States are based on Barth et al. (2016[5]).

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With increased sorting of workers and more homogenous workforces (in terms of observable earnings characteristics), one would expect a declining contribution of within-firm wage differences to inequality (not reported, see Criscuolo et al. (2020[30]). However, many countries have also experienced widening wage gaps within firms. This is because, on average across the countries covered in this chapter, returns to worker skills, which represent the main part of within-firm difference in wages, have increased by around 6 percentage points.[12] This points to skill shortages due the failure of education systems to keep pace with developments in demand for certain skills by firms (OECD, 2018[31]; OECD, 2019[32]). For instance, digitalisation may have raised the demand for highly skilled engineers by more than the education system can rapidly supply.

2.6. A tentative exploration of the determinants of firm wage premia dispersion

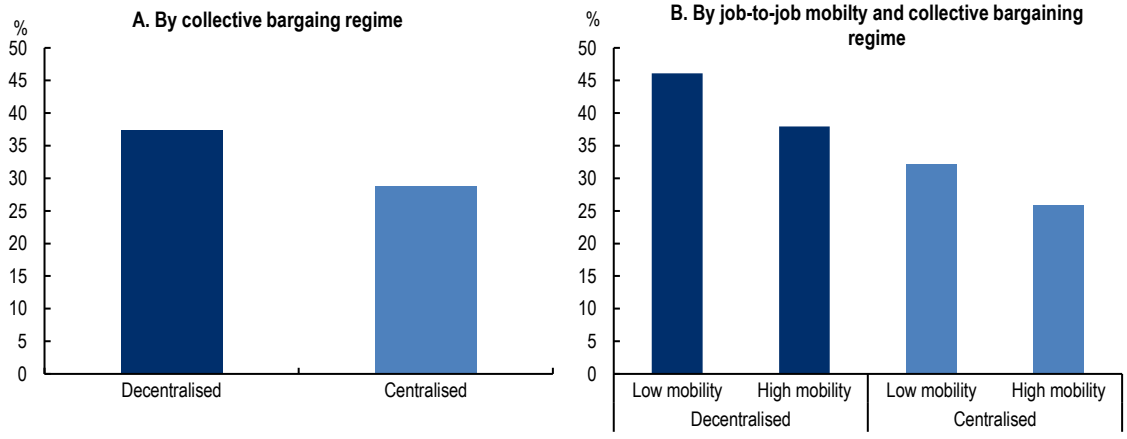
The variation in the contribution of firm wage premia dispersion to overall wage dispersion across countries raises important questions about the role of policies and institutions. At a given level of labour market frictions, policies and instutions may shape the dispersion of firm productivity and thereby the dispersion of firm wage premia (Andrews, Criscuolo and Gal, 2016[1]). But policies and institutions may also shape the transmission of productivity to firm wage premia at a given level of productivity dispersion, either by

affecting the degree of frictions in the labour market or by institutional limits on the dispersion of wage premia.

To provide a first indication of the possible role of policies and institutions in firm wage premia dispersion, Figure 2.9 compares the contribution of wage premia dispersion to overall wage inequality across different groups of countries according to the degree of centralisation of their collective bargaining systems and the degree of voluntary job mobility between firms. These simple descriptive statistics provide a number of insights. First, the share of firm wage premia dispersion is higher in countries with more decentralised collective bargaining institutions (Panel A). These are countries where collective bargaining predominantly takes place at the firm-level or wages are set through individual-level bargaining. Second, conditional on the collective bargaining arrangements, the share of firm wage premia dispersion tends to be higher in countries with low job mobility (Panel B). This is consistent with the view that more productive firms offer higher wage premia to attract and retain the workers required to reach their desired employment levels in a frictional labour market. The results are qualitatively similar when using the level of wage premia dispersion instead of its share in overall wage dispersion.[13]

Figure 2.9. The role of collective bargaining and job mobility in firm wage premia dispersion

The share of firm wage premia dispersion in overall wage dispersion across country groups



This figure makes use of the dispersion in firm wage premia as documented in Figure 2.6. Countries with decentralised bargaining regimes (9): Canada, Costa Rica, Estonia, Japan, Hungary, New Zealand, the Slovak Republic, United Kingdom, United States; countries with centralised bargaining regimes (11): Austria, Denmark, Germany, Finland, France, Italy, Portugal, the Netherlands, Norway, Spain, Sweden. Countries with low job mobility (7, European countries only): France, Germany, Hungary, Italy, Norway, Portugal and the Slovak Republic; countries with high job mobility (8, European countries only): Austria, Denmark, Estonia, Finland, the Netherlands, Spain, Sweden, United Kingdom.

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2.7. Conclusion

In many OECD countries, low productivity growth has coincided with rising wage inequality. Widening wage and productivity gaps between firms may have contributed to both developments. This chapter uses a new harmonised cross-country linked employer-employee dataset for 20 OECD countries to analyse the role of firms in wage inequality. The main finding is that, on average across countries, changes in the dispersion

of average wages between firms explain about one-half of the changes in overall wage inequality. Two-thirds of these changes in between-firm wage inequality are accounted for by changes in firm wage-setting practices. The remaining third can be attributed to changes in workforce composition, including the sorting of high-skilled workers into high-paying firms.

Wage premia dispersion is in part determined by differences in productivity between firms. This suggests that productivity developments matter for wage inequality, both directly, by affecting firms' wage-setting practices, and indirectly, by affecting incentives for sorting of workers across firms. The implication is that a better understanding of the factors driving productivity dispersion between firms, the extent to which productivity-related rents are shared with different types of workers, and the effect of these developments on worker sorting across firms are crucial for developing public policies that address concerns around slowing productivity growth and increasing wage inequality.

Apart from directly influencing productivity dispersion between firms, public policies and institutions may also shape the link between productivity and wage premia dispersion. This link is determined by the degree of competition for workers among employers and the presence of institutional constraints on the wage-setting power of firms. The exploratory evidence in this chapter suggests that wage premia differences between firms tend to be more pronounced in countries with decentralised collective bargaining systems, i.e. fewer institutional restrictions on the wage-setting behaviour of firms, as well as countries with higher rates of job mobility and thus stronger competition for workers between firms.

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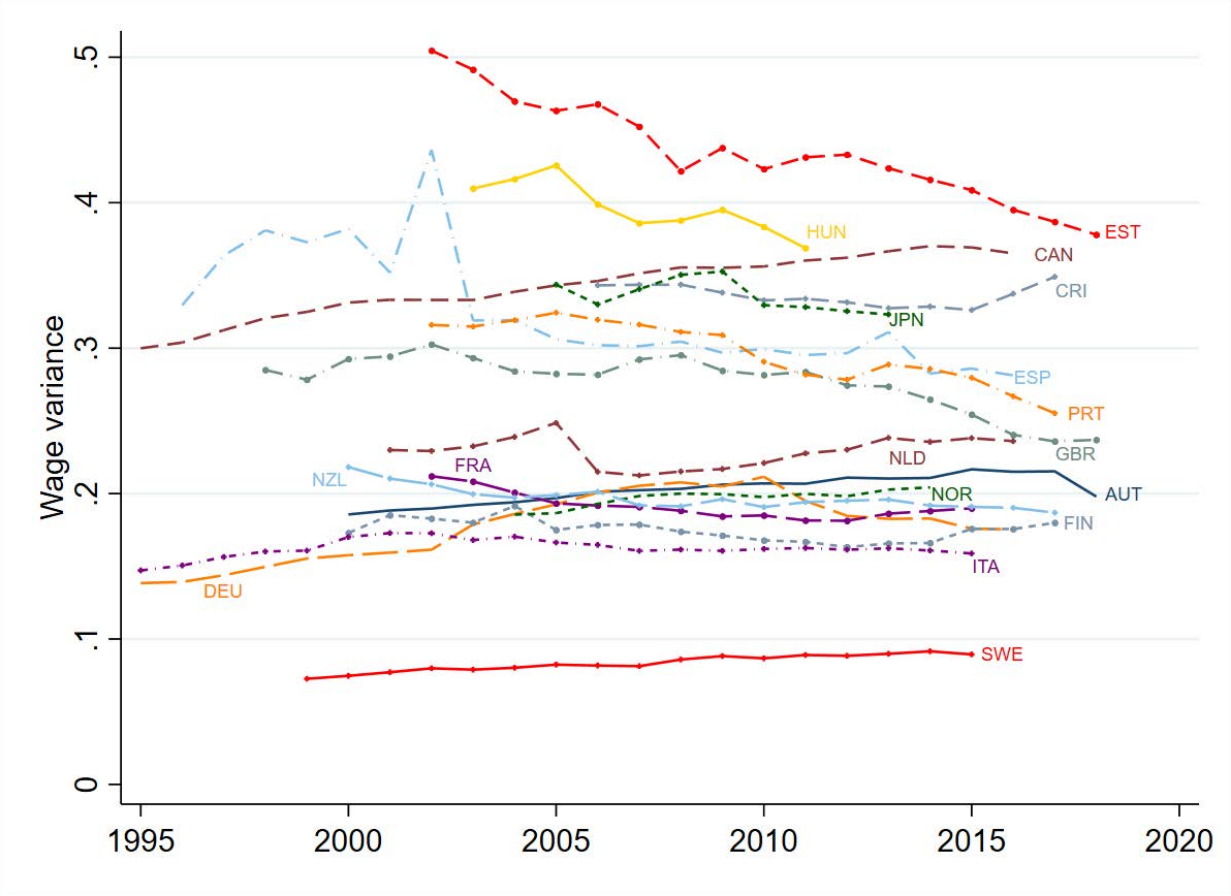
Annex 2.A. Additional material

Annex Figure 2.A.1. Total log wage variance, all years and countries



Note: This graph shows the variance of log real wages for each country and year in the data used for this paper, for 17 OECD member and accession countries. Countries are identified by the ISO-3 codes: Austria (AUT), Canada (CAN), Costa Rica (CRI), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Hungary (HUN), Italy (ITA), Japan (JPN), Netherlands (NLD), Norway (NOR), New Zealand (NZL), Portugal (PRT), Spain (ESP), Sweden (SWE), United Kingdom (GBR) and the United States (USA).

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Notes

[1] This chapter has been written by an OECD team consisting of Chiara Criscuolo, Alexander Hijzen, and Cyrille Schwellnus with contributions of: Erling Barth (Institute for Social Research Oslo, NORWAY), Antoine Bertheau (University of Copenhagen, DENMARK), Wen-Hao Chen (Statcan, CANADA), Richard Fabling (independent, NEW ZEALAND), Priscilla Fialho (OECD, PORTUGAL), Katarzyna Grabska-Romagosa (Maastricht University, NETHERLANDS), Ryo Kambayashi (Hitotsubashi University, JAPAN), Valerie Lankester and Catalina Sandoval (Central Bank of Costa Rica, COSTA RICA), Michael Koelle (OECD), Timo Leidecker (OECD), Balazs Murakőzy (University of Liverpool, HUNGARY), Oskar Nordström Skans (Uppsala University, SWEDEN), Satu Nurmi (Statistics Finland/VATT, FINLAND), Vladimir Peciar (Ministry of Finance, SLOVAK REPUBLIC), Capucine Riom (LSE, FRANCE), Duncan Roth (IAB, GERMANY), Balazs Stadler (OECD), Richard Upward (University of Nottingham, UNITED KINGDOM) and Wouter Zwysen (ETUI, formerly OECD). For details on the data used in this chapter please see the standalone Data Annex and Disclaimer Annex.

[2] The role of firms in determining the labour share has, for instance, been the subject of Autor et al. (2020[33]), Kehrig and Vincent (2019[34]) and Schwellnus et al. (2018[35]). The role of firms in determining wage inequality has, for instance, been the subject of Barth et al. (2016[5]; 2018[6]) and Song et al. (2019[8]).

[3] Two notable exceptions are provided by Lazear and Shaw (2009[28]) and Tomaskovic-Devey et al. (2020[4]). Lazear and Shaw (2009[28]) focus largely on an earlier period that complements the analysis in the present paper and only make limited efforts to ensure results are comparable across countries. Tomaskovic-Devey et al. (2020[4]) focus on a similar period for 14 countries, but importantly from the perspective of the present paper do not account for the role of worker composition for wage differences between firms.

[4] As a robustness check, Box 2.4 further augments the human capital earnings equation by including worker in addition to firm fixed effects (Abowd, Kramarz and Margolis, 1999[7]).

[5] This is, for instance, the case in the United Kingdom.

[6] The project currently has direct access to linked employer-employee data for Estonia, France, Italy and Spain.

[7] Barth et al. (2018[6]) based on US data and Skans, Edin, and Holmlund (2009[36]) based on Swedish data show that the within-firm between-establishment variance in earnings is very small. Similarly, Song et al. (2019[8]) show that almost all of the increase in earnings inequality occurred between firms rather than between establishments within firms.

[8] In a number of countries, including Japan and Norway, the sample period is significantly shorter than two decades, implying that overall changes in wage inequality may not be directly comparable across all countries.

[9] The measurement of wage inequality in Japan is particularly sensitive to the inclusion of part-time workers because their average hourly wages are lower than those of full-time workers. When including all workers, wage inequality is among the highest in the OECD (OECD, 2015[38]; Garnero, Hijzen and Martin, 2019[37]). However, when focusing on full-time workers only, wage inequality in Japan is around the OECD average (Figure 2.2).

[10] International Labour Organization (2016[27]) covers a limited sample period (2002-2010) using the European Structure of Earnings Survey data that consists of repeated cross sections of random samples of workers and their establishments. Lazear and Shaw (2009[28]) use national administrative data but do not cover the past two decades (their sample period typically covers 1980-2000).

[11] Consistent with these results, most of the available evidence suggests that changes in wage dispersion between firms account for at least 60-70% of changes in overall wage dispersion (Lazear and Shaw, 2009[28]). Annual changes in wage dispersion are reported in Annex Figure 2.A.1.

[12] The skill premium is defined as the wage gap between high-skilled and low-skilled workers (based on occupation or educational attainment) controlling for other earnings characteristics in Equation 2.1. The estimated increase of 6 percentage points is based on regressing the skill premium on a linear time trend and country fixed effects and using the estimated coefficient on the linear trend to predict the average gaps in 1990 and 2016. The sample for these regressions includes France (2002 to 2015), Italy (1991 to 2015), Japan (2005 to 2013), Netherlands (2001 to 2016), Norway (2004 to 2014), Portugal (1995 to 2009), Spain (1996 to 2016), Sweden (1999 to 2015), and the United Kingdom (1998 to 2018).

[13] The role of wage-setting institutions and job mobility is analysed in more detail in Chapter 3 combining the present data on firm wage premia dispersion with data on productivity dispersion at the industry level in a regression framework. The results of that analysis confirm the insights obtained from the descriptive statistics presented here.

3 The firm-level link between productivity dispersion and wage inequality: A symptom of low job mobility?

This chapter investigates the role of cross-firm dispersion in productivity in explaining dispersion in firm wage premia, as well as the factors shaping the link between productivity and wages at the firm level. The results suggest that around 15% of cross-firm differences in productivity are passed on to differences in firm wage premia. The degree of pass-through is systematically larger in countries and industries with more limited job mobility, where low-productivity firms can afford to pay lower wage premia relative to high-productivity ones without a substantial fraction of workers quitting their jobs. Stronger product market competition raises pass-through while more centralised bargaining and higher minimum wages constrain firm-level wage setting at any given level of productivity dispersion. From a policy perspective, the results suggest that the key priority to reduce wage differences between firms while easing the efficient reallocation of workers across them is to promote job mobility.[1]

In Brief

This paper investigates the link between increased dispersion of productivity and increased dispersion of firm wage premia (the part of wages that depends on characteristics of firms rather than workers), as well as the factors shaping it. The main results and policy implications are as follows:

- Dispersion of firm wage premia is typically larger in countries with larger productivity dispersion, with empirical estimates suggesting a pass-through of around 15%.
- The degree of pass-through depends systematically on job-to-job mobility (voluntary worker transitions between jobs), competition in product and labour markets, as well as wage-setting institutions.
  - In labour markets where frictions limit voluntary job mobility, wages tend to be lower than elsewhere but, given limited opportunities for job mobility, the wage penalty is particularly large in low-productivity firms.
  - Stronger product market competition tends to raise productivity-wage pass-through, and hence wage dispersion between firms, by increasing the sensitivity of profits to wages.The adverse effects of product market competition on wage inequality may partly be offset by stronger competition for workers from the market entry of new firms.
  - More centralised collective bargaining and higher minimum wages weaken the pass-through of productivity to wage premia by limiting the scope of low-performing firms to compete on the basis of low wages, and hence reduce wage dispersion between firms.
- Promoting job mobility by eliminating avoidable labour market frictions represents a first-best policy response to improve the allocation of labour across firms while limiting wage inequality. This involves:
  - Reducing legal and contractual barriers to voluntary job mobility, including in the areas of occupational licensing and non-compete clauses.
  - Promoting adult learning and extending public employment services (e.g. job-search assistance, training) beyond unemployed people to workers in subsidised or non-standard forms of employment, as well as workers who are currently employed but lack labour market-relevant skills or live in lagging regions.
  - Promoting residential mobility and supporting telework.
- Collectively agreed or legal wage floors provide a second-best policy response in the sense that they target the consequences of limited job mobility for the wage-setting power of firms rather than directly reducing avoidable barriers to job mobility.

3.1. Introduction

In many OECD countries, there are large and increasing productivity differences between firms, even within narrowly defined industries (Andrews, Criscuolo and Gal, 2016[1]; Syverson, 2011[2]) . At the same time, and as shown in Chapter 2, in these countries, differences in average wages between firms have also increased, explaining more than half of the overall increases in wage inequality. To some extent, such increases in between-firm wage differences reflect the sorting of workers with higher education and more experience into firms paying higher wages. But differences in wages between firms are large even for workers with similar characteristics, suggesting the existence of firm wage premia. Chapter 2 already

suggested that increased dispersion in firm wage premia accounts for around two-thirds of increased between-firm wage inequality. This raises the question of the structural and policy determinants of the link between productivity and firm-level wage premia, with possibly large implications for wage inequality and the allocation of workers across firms.

A link between productivity and firm wage premia arises because workers are not perfectly mobile between firms. With limited job mobility, high-productivity firms need to pay high wages to attract workers while low-productivity firms may afford to pay low wages to workers who have limited outside job options. Job mobility, in the sense of voluntary job-to-job transitions rather than overall job churn, may be limited because there are costs for workers to search for jobs and for firms to hire workers due to labour market frictions (e.g. imperfect information on job opportunities or costs related to changing jobs), or because workers have preferences over non-wage characteristics of jobs, such as geographical location or working time flexibility (Manning, 2020[3]). At any given level of productivity dispersion, promoting job mobility would not only reduce wage premia dispersion between firms but also allow high-productivity firms to expand employment, thereby promoting the efficient allocation of labour and raising aggregate productivity.[2]

This chapter analyses firm-level pass-through of productivity to wage premia for 13 OECD countries over the period 1995-2017 to better understand the challenges for labour and product market policies that aim to raise aggregate productivity growth while pursuing equity goals. First, the chapter develops a conceptual framework to illustrate the channels shaping the link between productivity and wages at the firm level. Second, it analyses empirically the relevance of different channels using linked employer-employee data complemented with firm-level data. The empirical results suggest that the link between productivity and wages at the firm level is to an important extent shaped by the structure of labour and product markets, as well as wage-setting institutions:

- *Policies that promote voluntary job mobility reduce wage dispersion between firms at any given level of productivity dispersion.* Low rates of job-to-job mobility (a measure of voluntary worker transitions between jobs) and high employer concentration raise the pass-through of firm-level productivity to wages by giving firms some degree of monopsony power on wage-setting. Raising job-to-job mobility from the 20th percentile of countries covered by the analysis (corresponding roughly to Greece) to the 80th percentile (corresponding roughly to Sweden) would reduce overall wage inequality by about 15%. To put this reduction in perspective, the median increase in wage inequality across countries over the period 1995-2015 was around 10% (Chapter 2).[3]
- *Policies that promote product market competition amplify the effect of productivity dispersion on wage dispersion between firms*. With strong product market competition, a given difference in productivity between firms implies a larger difference in output and employment between them. At any given level of job mobility, high-productivity firms need to pay high wages relative to low-productivity firms to attain their desired level of employment. However, the upward effect of product market competition on the pass-through of productivity to wage premia may partially or fully be offset if it raises opportunities for job mobility, including through the market entry of new firms.
- *More centralised collective bargaining (*e.g. *sector-level bargaining) and higher minimum wages reduce productivity pass-through and wage premia dispersion between firms, but risk reducing employment if wage floors are set too high.* With limited job mobility, low wages in low-productivity firms may partly reflect monopsonistic wage-setting by employers so that raising wage floors through more centralised collective bargaining or higher minimum wages may not necessarily reduce employment. However, setting wage floors in excess of workers' productivity risks reducing employment. This risk could be reduced by combining centralised collective bargaining with sufficient scope for further negotiation at the firm level, and focusing minimum wage increases on areas and groups for which initial levels of wages are low.

The results in this chapter have a number of implications for public policies aimed at promoting productivity growth while limiting wage inequality, especially in the wake of the COVID-19 crisis that may require

significant reallocation of workers from distressed firms to those with better growth prospects (Barrero, Bloom and Davis, 2020[4]). The main implication is that policies promoting job mobility, notably by eliminating unnecessary labour market frictions, can complement policies that aim directly at closing productivity gaps between firms, including via the enhancement of skills and innovation capabilities of lagging firms (Nicoletti, von Rueden and Andrews, 2020[5]; Gal et al., 2019[6]). Promoting job mobility would reduce wage dispersion between firms at any given level of productivity dispersion while also raising the efficiency of labour allocation, and thereby productivity, average wages and employment.

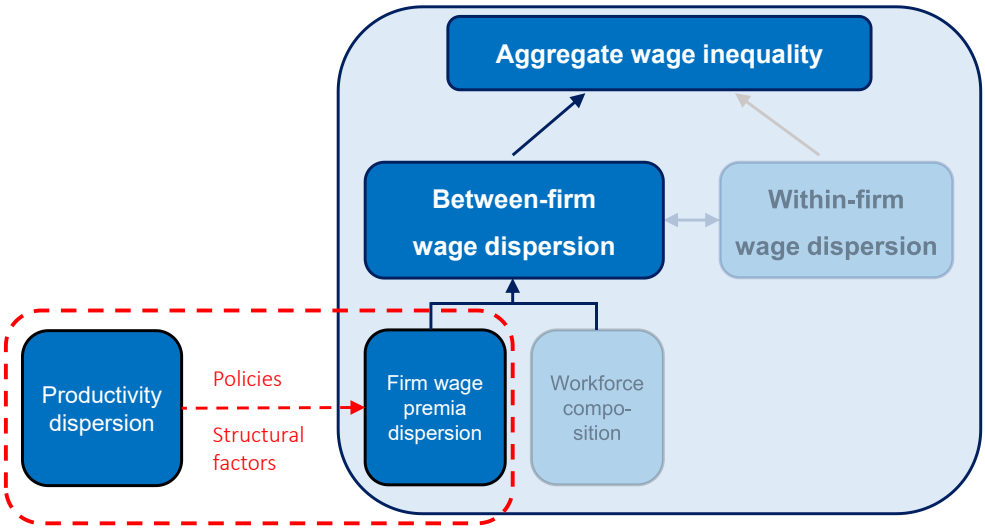
The results further imply that particular care should be taken in reforming wage-setting institutions in countries where job mobility is low, such as a number of Southern European countries. In these countries, a closer alignment of productivity and wages through more decentralised collective bargaining would likely promote employment but may also raise wage dispersion between firms. The possible adverse effects on wage dispersion can be mitigated by combining sector-level bargaining with bargaining at the firm-level through so-called organised decentralisation rather than simply replacing sector-level by firm-level bargaining (OECD, 2019[7]). For example, sector-level agreements could include opt-out clauses or leave more scope for further negotiation at the firm-level. Another way of limiting possible adverse effects of decentralisation on wage dispersion would be to complement decentralisation with increases in, or the introduction of, statutory minimum wages where they are currently low or non-existent.

The remainder of the chapter is organised as follows. Section 3.2 provides a number of stylised facts on the dispersion of firm wage premia across countries, industries and regions. Section 3.3 proposes a conceptual framework to analyse the link between productivity and wages across firms and describes the empirical approach. Section 3.4 presents the results on firm-level productivity-wage pass-through, as well as the structural and policy factors shaping it. Section 3.5 concludes by drawing out the policy implications emerging from the empirical analysis.

3.2. Context and stylised facts on pass-through of productivity to wage premia

In order to situate the analysis in this chapter in the overall context of this Volume, it is useful to resort to a simple decomposition (Figure 3.1). Overall wage inequality can be decomposed into a between-firm and within-firm element. Within-firm wage inequality is largely determined by differences in worker characteristics such as gender, skill and experience. The between-firm element can be decomposed further into differences in workforce composition, and differences in firm wage premia that are independent of workforce composition. Firm wage premia can be obtained by estimating average firm wages while netting out the effect of average workforce characteristics, such as gender, skill and experience (see in Chapter 2 for details). This chapter focuses on the link between productivity and firm wage premia, as well as the policies and structural factors shaping it, including competition in labour and product markets, as well as wage setting institutions.

Figure 3.1. The link between productivity dispersion and firm wage premia dispersion



3.2.1. Wage premia account for a substantial part of overall wage dispersion

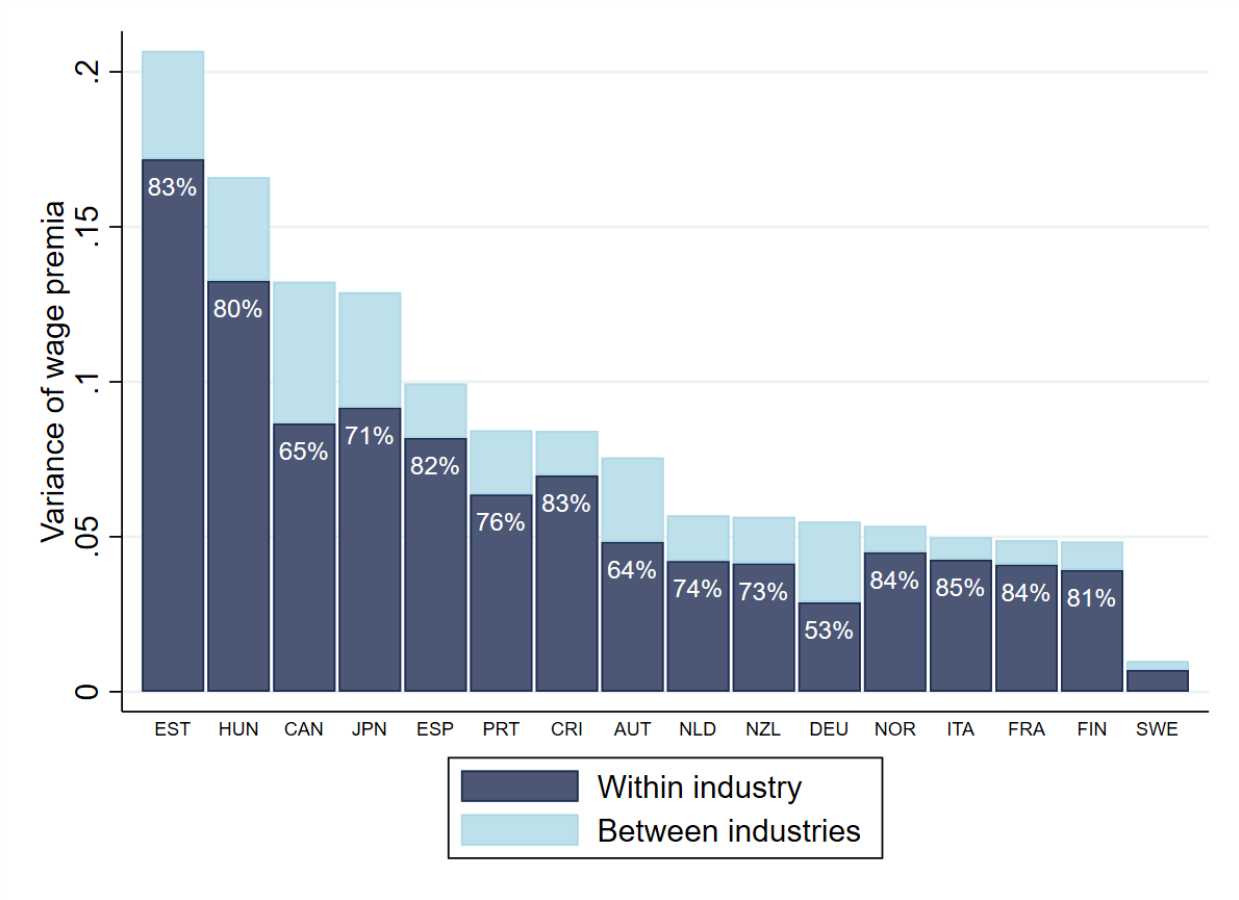
Firm wage premia, i.e. the part of wages that is determined by firms rather than workers' individual characteristics, are estimated using linked employer-employee data as in Chapter 2 by purging firms' average wages from the individual characteristics of their workers, i.e. typically occupation, education, age, gender and working-time status.[4] Using these estimated wage premia, Chapter 2 shows that in most countries, dispersion in firm wage premia accounts for around one-third of overall wage inequality.[5]

3.2.2. Wage premia dispersion between firms mainly reflects within-industry differences

To analyse the role of productivity dispersion in wage dispersion between firms, this chapter focuses on wage premia differentials within industries. Wage premia differentials between industries are small relative to differentials between firms within the same industry.[6] On average across countries, around 75% of dispersion in firm wage premia is explained by wage differences between firms within the same industry (Figure 3.2).[7] The contribution of between-industry wage premia dispersion is likely to increase relative to the within-industry component when using more detailed industry disaggregations. For example, evidence for the United States suggests that at a higher level of industry disaggregation (4-digit instead of 2-digit) the contribution of the between-industry component may account for a significantly higher share of overall wage premia dispersion (Haltiwanger and Spletzer, 2020[8]).

Figure 3.2. Between-firm wage premia dispersion mainly reflects dispersion within the same industry

Within-industry and between-industry dispersion of firm wage premia, latest available year



Note: The total height of the bar denotes the overall variance of wage premia in the last available year; with the height of the dark blue bar denoting the variance of wage premia within industries and the light blue bar denoting the variance of wage premia between industries and the percentage label denoting the share of within-industry wage premia variation in overall wage premia variation. Industries are defined at the two-digit level of aggregation. Latest available year: 2011 for Hungary; 2013 for Japan; 2014 for Norway; 2015 for France, Italy and Sweden; 2016 for Canada, Germany, the Netherlands and Spain; 2017 for Costa Rica, Finland, Portugal and New Zealand; 2018 for Austria, Estonia. Industry-level wage premia for the United States and the United Kingdom are not available in the LinkEED database.

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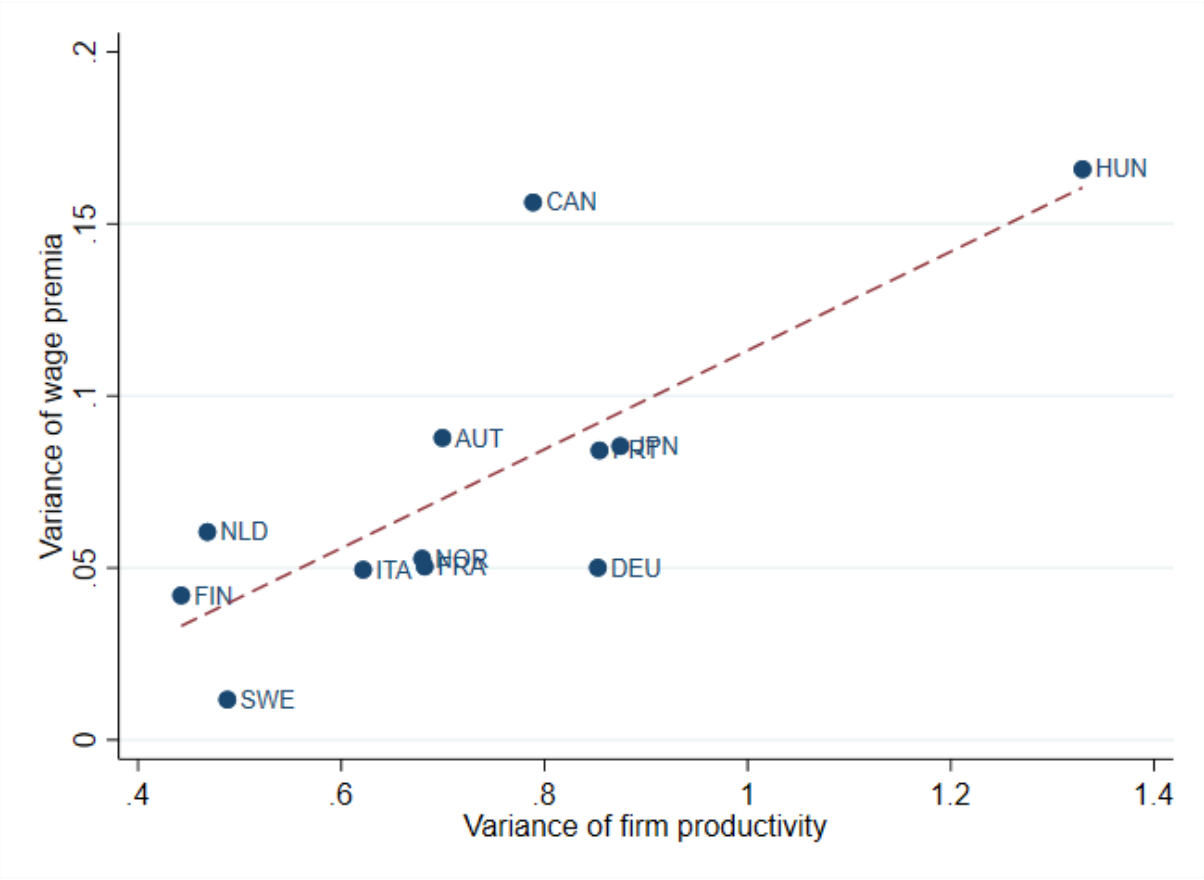
3.2.3. Wage premia and productivity dispersion are positively correlated

Wage premia dispersion is typically larger in countries with larger productivity dispersion, suggesting that wage premia dispersion may at least partly be related to productivity dispersion (Figure 3.3). In labour markets with frictions that limit job mobility, firms partly pass on productivity differentials to wages of workers with similar characteristics. Higher-productivity firms need to offer higher wages to attract workers from lower-productivity firms which can, in turn, offer lower wages without losing all workers. In other words, higher productivity is partly reflected in higher wages and partly in higher employment.

Figure 3.3. Positive association between productivity and wage premia dispersion



Note: The variance of firm productivity is the employment-weighted variance of log value added per worker from the OECD Multiprod database, and the variance of wage premia is the employment-weighted variance of firm wage premia estimated from LinkEED data. Country aggregates cover manufacturing and non-financial market services. Productivity dispersion is not available for Costa Rica, Estonia, New Zealand, Spain, the United Kingdom and the United States. Wage premia for Canada do not account for workforce composition by skills. Each data point corresponds to the latest available common year in Multiprod and LinkEED: 2011 for Hungary; 2012 for Canada, Norway, Portugal and Sweden; 2013 for Finland, Germany and Japan; 2015 for Austria, France, Italy and the Netherlands.

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3.3. Analysing productivity-wage pass-through at the firm-level

3.3.1. Conceptual framework

A positive link between firm-level productivity and wage premia arises as the consequence of labour market frictions, but may also depend on competition in product markets as well as institutional features of the wage-setting process (Manning, 2020[3]).

Labour market frictions are a pre-condition for firm-level productivity-wage pass-through

In perfectly competitive labour markets where workers move from a job in one firm to a job in another one as soon as there are differences in wage premia between them (i.e. there are no barriers to job mobility) productivity differences translate into differences in employment without generating wage differences.

Firms adjust employment until the marginal products of labour are equalised across them and wages equal the marginal products of labour. All firms pay identical wages, i.e. they are "wage-takers", but high-productivity firms employ more workers than low-productivity ones. By contrast, in labour markets where job mobility is limited (i.e. labour supply to the firm is upward-sloping) productivity differences translate into differences in both employment and wages. High-productivity firms demand more labour than low-productivity ones but barriers to the mobility of workers prevent marginal products of labour from equalising across them. Irrespective of whether firms set wages equal to their respective marginal products of labour, or whether they exploit the wage-setting power stemming from the upward-sloping labour supply curve and set wages below marginal products, wages are higher in high-productivity firms.

Limited job mobility may reflect information frictions, pecuniary or non-pecuniary costs to job switching, or individual preferences for non-wage job characteristics (such as working conditions or commuting time). Models of labour market monopsony typically exploit one or a combination of these microeconomic drivers of limited job mobility to generate a surplus from a job match ("rent") that firms may partially share with workers. The common mechanism underlying pass-through of productivity to wages in all of these models is an upward-sloping labour supply curve to the individual firm (Manning, 2020[3]).[8] A flatter labour supply curve increases the average level of wages by limiting the scope for employers to mark down wages relative to marginal productivity, and reduces the link between productivity and wages between firms by limiting the dispersion of marginal labour productivity. In other words, higher productivity pass-through can be viewed as undesirable since it reflects barriers to job mobility and misallocation of labour across firms.

An alternative view, which does not rely on the wage-setting power of firms resulting from an upward-sloping labour supply curve, is that firms and workers bargain over the distribution of rents. In search and matching models with wage bargaining, workers and firms bargain over rents that arise from barriers to job mobility (Pissarides, 2000[9]). Importantly, these different models raise the question whether firm-level productivity-wage pass-through should be viewed as a symptom of low job mobility and a measure of misallocation of workers across firms, or as the potentially efficient sharing of rents between firms and workers (Box 3.1).[9]

Box 3.1. Productivity-wage pass-through and rent sharing

An important policy question is whether productivity-wage pass-through should be viewed as a symptom of low job mobility, or as the result of a strong bargaining position of workers. Low job mobility would imply misallocation of workers across firms, while a strong bargaining position of workers would imply the sharing of productivity-related rents between firms and workers without necessarily implying misallocation.

To frame the issue, it is useful to view productivity-wage pass-through as being based on two possibly related mechanisms:

The dispersion of marginal labour productivity between firms. According to this view, productivity-wage pass-through is predominantly driven by the dispersion of marginal productivity at any given level of average productivity dispersion. With limited labour mobility, differences in *average* productivity between firms – e.g. due to differences in production technology or capital intensity – translate into differences in marginal productivity between them as employment adjusts only imperfectly. Consequently, productivity-wage pass-through increases with the extent of *marginal* productivity dispersion relative to average productivity dispersion.

The sharing of productivity-related rents between firms and workers. According to this view, productivity-wage pass-through is predominantly driven by the bargaining position of workers. However, so long as a stronger bargaining position of workers proportionally raises wages relative to productivity in *all* firms (e.g. because bargaining entails a proportional sharing of rents), it tends to raise average

wages but does not affect wage dispersion between firms. This suggests that, on its own, the degree of firm-level productivity-wage pass-through cannot be interpreted as a measure of workers' bargaining strength. In line with this argument, the available empirical evidence suggests that search and matching models with bargaining *à la* Pissarides (2000[9]) can explain only a very small share of observed wage dispersion (Yashiv, 2007[10]).

The remainder of the chapter focuses on the link between productivity dispersion and wage dispersion at the industry level. In this context, larger wage premia dispersion at any given level of productivity dispersion (and thus larger wage inequality) does not necessarily imply larger sharing of productivity-related rents with workers at the industry level.[1]

[1] Indeed, over the past two decades, larger dispersion of firm wage premia and declining labour shares have tended to go together (Annex Figure 3.B.2), suggesting that the concept of firm-level productivity wage pass-through in this chapter cannot be interpreted as a measure of aggregate rent sharing. The negative relation between productivity-wage pass-through and the labour share is consistent with the labour market monopsony model in which a less elastic labour supply generates both a larger markdown of wages from marginal productivity and a higher pass-through of productivity to wages across firms.

Policies and institutions shape labour market frictions and productivity pass-through

Given the importance of labour market frictions, firm-level productivity-wage pass-through is expected to be large when labour market frictions are large, which is likely to be reflected in low rates of voluntary job mobility.[10] To some extent, voluntary job mobility can be influenced by policies that reduce the cost of job switching for workers, including in the areas of occupational licensing and non-compete clauses; job-search assistance and training; as well as residential mobility and telework. A more competitive product market environment may also raise pass-through (Annex A). In such an environment, firms pass on a large share of productivity gains to product prices and gain a larger share of the market than in an environment with more limited product market competition, which induces a larger adjustment in employment and thus a larger adjustment in wages. Finally, pass-through will tend to be larger the more wage setting takes place at the firm-level (or worker level) rather than at the industry or national levels. Wage-setting institutions such as collectively agreed industry-level wage floors or national minimum wages may constrain firms' wage-setting choices and thereby weaken the link between firm-level wages and productivity.

Productivity-wage pass-through may vary across groups of workers

While productivity pass-through is partly determined by market-level variables such as job mobility, product market competition and wage institutions, it may vary even within the same firm. Such within-firm differences could reflect monopsonic wage discrimination as firms set lower wages for workers with fewer opportunities (e.g. women, low-skilled workers); differences in demand for different groups of workers across low- and high-productivity firms, e.g. due to complementarities between technology and skills; or differences in bargaining power.

3.3.2. Empirical approach

Ideally, firm-level productivity-wage pass-through is analysed empirically using worker-level linked employer-employee data. The worker-level approach relates worker-level wages to firm-level productivity (see Box 3.2 for the technical details). Its main advantage is that it can provide granular insights into firm-level pass-through, including differences between different groups of workers such as low-skilled and high-skilled workers or men and women. Worker-level data can also be used to construct measures of local labour market concentration to analyse the extent to which the degree of productivity-wage pass-through depends on the number of potential employers. The drawback of the individual-level approach based on worker-level data is that it is only feasible where productivity is available in linked employer-employee data,

which is currently only the case in nine of the countries for which data were collected for this study, making it difficult to systematically relate the degree of pass-through to industry and country characteristics.

In the absence of matched employer-employee data with information on productivity at the firm level for a large number of countries and the impossibility of pooling the worker level information across countries due to confidentiality issues, the analysis resorts to an industry-level approach to analyse the cross-industry and cross-country pattern of productivity-wage pass-through. The industry-level approach relates between-firm dispersion in wage premia within industries to between-firm dispersion in productivity. Its main advantage is that it can be applied to countries for which productivity is not available in the linked employer-employee data by computing between-firm dispersion in productivity from external data sources, namely representative firm-level data through the OECD MultiProd database (Berlingieri et al., 2017[11]). The significant variation across countries, industries and over time makes this approach ideal for analysing the structural and institutional determinants of firm-level productivity-wage pass-through. The industry-level empirical analysis is conducted on 13 OECD countries over the period 2001-15 and covers 22 industries for which high-quality data on productivity dispersion are available.

The empirical analysis considers structural and institutional characteristics that relate to job mobility, product market competition, as well as wage-setting institutions (Annex Table 3.B.1). Job mobility is proxied by the share of annual job-to-job transitions in total employment.[11] The idea is that in a near perfectly competitive labour market without frictions the elasticity of labour supply is high, so that employed workers can be expected to voluntarily move between jobs as soon as they receive a job offer with a marginally higher wage. The advantage of the rate of job-to-job transitions as a measure of the elasticity of labour supply is that it is likely to exclude most involuntary job transitions, which typically involve transitions into non-employment. Product market competition is proxied by import competition (defined as the share of imported value added in domestic demand) which, in contrast to indicators of product market regulation, is available at the country-industry level of disaggregation, and is unlikely to be correlated with labour market competition. The role of collective bargaining is analysed by focusing on the level of decentralisation in collective bargaining systems, i.e. largely decentralised systems based on firm-level bargaining or more centralised systems with a stronger emphasis on sector or national level bargaining (OECD, 2019[7]).[12] The minimum wage is expressed by the ratio of the statutory minimum wage to the median wage of full-time workers.

Box 3.2. Estimating firm-level productivity-wage pass-through

Country-by-country estimation based on worker-level data ("individual-level approach")

When productivity is available in linked employer-employee data, productivity-wage pass-through at the firm-level can be estimated in a single stage using worker-level data:

$$\ln w_{ijst} = \beta x_{it} + \rho \ln\ y_{jt}\ + \delta_s + \delta_t + \varepsilon_{ijst} \qquad \text{Equation 3.1}$$

where w_{ijst} denotes the wage of worker i, firm j, sector s and year t; x_{it} denotes individual worker characteristics such as occupation, education, age, gender and working-time status; y_{jt} log labour productivity; ρ the estimated pass-through parameter; δ_s and δ_t industry and year fixed effects; and ε_{ijst} the error term. Labour productivity is either measured as value added per worker or, if information on value added is not available, as sales per worker.[1] This procedure can be used to estimate productivity pass-through for different groups of workers by interacting productivity with indicator variables for each group (e.g. men and women).[2]

Specification (1a) effectively uses variation in wage premia and productivity within firms over time as well as between firms at any given point in time (and in a given industry) to estimate pass-through. The advantage of using cross-sectional variation on top of the within-firm variation is that the estimated pass-through directly addresses the question of the long-term relation between the dispersion in firm wage premia and dispersion in productivity rather than the short-term response of wage premia to productivity shocks.

Equation 3.1 is estimated separately for each country where productivity is available in linked employer-employee data, as well as separately for different groups of workers within these countries (by skills and gender). So far, estimates are available for Canada, Costa Rica, Finland, France, Germany, Hungary, Japan, the Netherlands and Portugal.

Cross-country estimation using industry-level data ("industry-level approach")

Defining $p_{ijst} \equiv \ln w_{ijst} - x_{it}\beta$ and taking the firm-level average $\bar{p}_{jst}$, Equation 3.2 can be re-written as:

$$\bar{p}_{jst} = \rho \ln y_{jt} + \delta_s + \delta_t + \varepsilon_{jst} \qquad \text{Equation 3.2}$$

where $\bar{p}_{jst}$ denotes the firm wage premium in firm *j* and year *t*.[2] So long as Equation 3.3 is estimated using employment weights, the two approaches yield identical estimates of productivity pass-through.

Assuming non-zero productivity-wage pass-through, taking the variance of Equation 3.3 and pooling across countries provides an alternative empirical model to estimate productivity-pass through at the firm-level while accounting for its cross-country and cross-industry pattern:

$$Var(\bar{p}_{jst})_{sct} = \rho^2 \, Var(\ln \ y_{jt})_{sct} + \delta_c + \delta_s + \delta_t + \nu_{sct} \qquad \text{Equation 3.3}$$

where Var denotes the employment-weighted variance; ρ^2 denotes the squared pass-through elasticity; δ_c, δ_s and δ_t denote country, industry and time fixed effects; and ν_{sct} denotes the error term.

To identify factors associated with productivity wage pass-through, the coefficient on productivity dispersion is allowed to vary according to structural and institutional characteristics:

$$Var(\mathrm{z}_{jt})_{sct} = \gamma_0 Var(\ln \ y_{jt})_{sct} + \gamma_1 Z_{sct} + \gamma_2 \, Var(\ln \ y_{jt})_{sct} \cdot Z_{sct} + \delta_c + \delta_s + \delta_t + \nu_{sct} \qquad \text{Equation 3.4}$$

where the parameter γ_1 captures the association between wage premia dispersion and the structural and institutional characteristics Z_{sct}, while the parameter γ_2 on the interaction term between the structural and institutional characteristics Z_{sct} and the variance of firm productivity $Var(\ln \ y_{jt})_{sct}$ captures the association with the squared pass-through elasticity. The structural and institutional characteristics are measured using dummy variables to limit the role of outliers.[3]

1. Estimates of productivity pass-through should be unaffected when replacing value added per worker by sales per worker so long as the share of intermediate inputs costs in sales is constant (Card et al., 2018[12]). If the share of intermediate inputs in sales is positively correlated with the value of sales, e.g. because firms pass on fluctuations in intermediate input costs to prices, pass-through estimates based on sales per worker will be lower than estimates based on value added per worker.

2. A more demanding approach would be to control for worker-fixed effects on top of observable time-varying worker characteristics, which would remove any correlation between productivity and wages due to unobservable workforce composition. However, this approach is only feasible in the subset of countries where workers can be followed over time, and would thus further reduce the country sample included in the empirical analysis.

[3] More specifically, if the underlying variable is continuous, it is set to one when its value exceeds the sample median and zero otherwise. Results using continuous variables yield very similar results (see Annex Table 3.B.4).

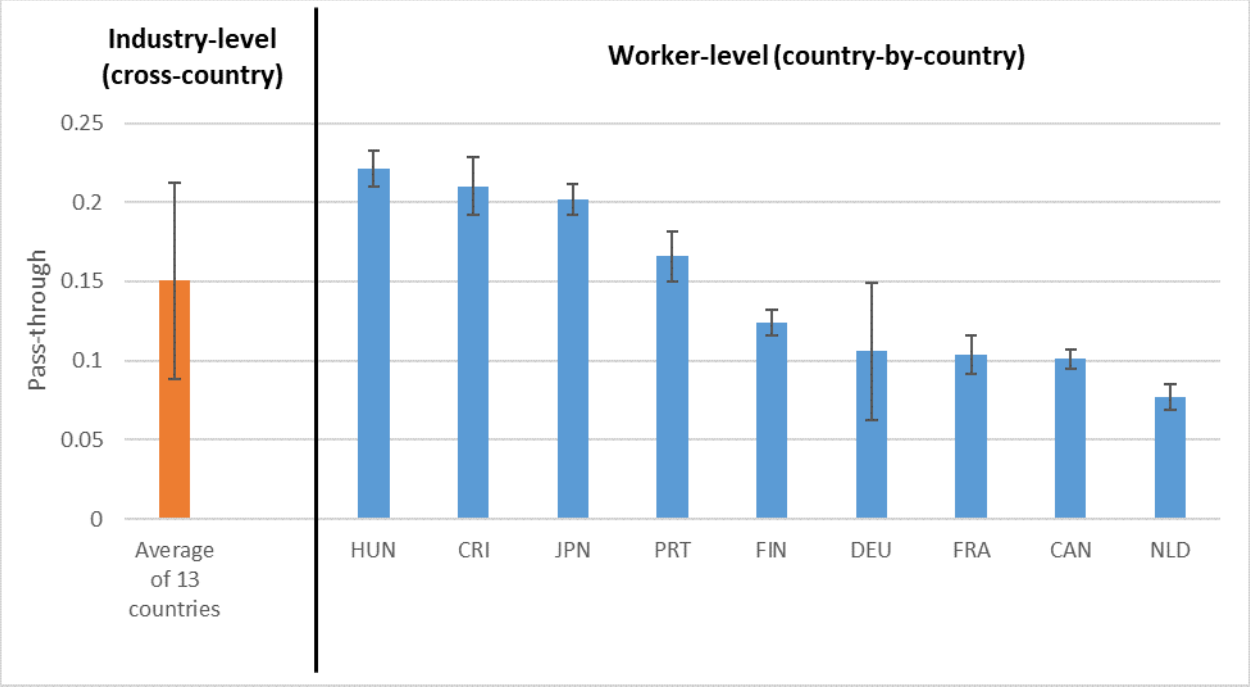
3.4. The size and the drivers of firm-level productivity-wage pass-through

3.4.1. Around one-sixth of productivity differences between firms are passed on to wage premia, contributing to wage dispersion between firms

Using the industry-level approach, the elasticity of firm-level wage premia to productivity is estimated to be around 0.15 on average across countries (Figure 3.4). This is in the range of estimates of firm-level productivity-wage pass-through in previous research (Card et al., 2018[12]). The country-by-country estimates based on the individual-level approach suggest that there is significant variation in pass-through across countries, with the pass-through elasticity ranging from 0.08 in the Netherlands to 0.22 in Hungary. Thus the average estimate of productivity pass-through across countries is likely to depend on country composition.

Figure 3.4. Firm-level productivity-wage pass-through

Industry- and worker-level approach, 2000-15



Note: The cross-country model is based on Equation 3.3) and estimated for 13 countries. The country-by-country model is based on Equation 3.1 and is estimated for a subset of countries where firm productivity is available in the linked employer-employee micro data. Error bars denote 95% confidence intervals based on cluster-robust standard errors. Countries included in the cross-country analysis are as follows: Austria (2008-15), Canada (2001-12), Finland (2000-12), France (2002-15), Germany (2003-13), Hungary (2003-11), Italy (2001-15), Japan (1995-2013), the Netherlands (2001-15), New Zealand (2001-11), Norway (2004-12), Portugal (2004-12) and Sweden (2002-12). Sample periods for the country-by-country analysis are as follows: Canada (2001-16), Costa Rica (2006-17), Finland (2000-17), France (2002-15), Germany (2000-16), Hungary (2003-11), Japan (1995-2013), the Netherlands (2001-16), Portugal (2002-17).

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Productivity pass-through is higher for skilled workers and men, contributing to wage dispersion within firms

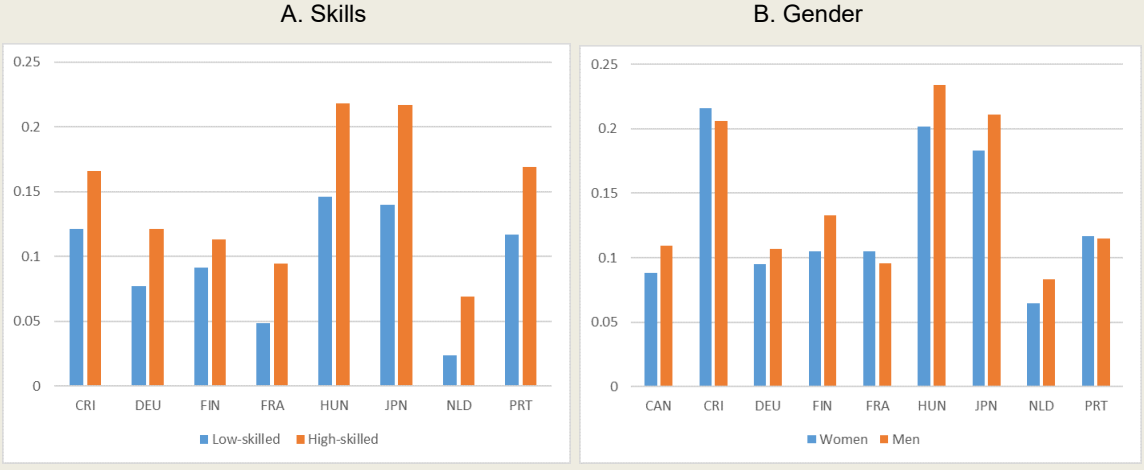
Across firms within the same industry, productivity-wage pass-through tends to be higher for high-skilled workers than low-skilled workers and higher for men than women (Figure 3.5). Differences in pass-through across different groups of workers imply that productivity-wage pass-through affects both wage inequality between firms and inequality within them. With homogeneous pass-through across different groups of workers, larger productivity dispersion only raises between-firm wage inequality. It may additionally raise within-firm wage inequality if pass-through is larger for high-skilled workers and men who typically earn higher wages to begin with. In other words, larger pass-through for high-skilled workers and men provides an explanation for the empirical fact documented in Chapter 2 that within-firm and between-firm wage inequality tend to go together.

Box 3.3. Productivity-wage pass-through across different groups of workers

Estimating Equation 3.1 for high-skilled and low-skilled workers as well as men vs women separately suggests that pass-through is typically larger for high-skilled workers and men (Figure 3.5). This may partly reflect differences in labour demand and labour supply elasticities. For instance, a number of empirical studies suggest that the firm-level labour supply elasticity is particularly high for low-skilled workers (Matsudaira, 2014[13]). But higher pass-through for skilled workers could also reflect technology-skill complementarities that give rise to higher relative demand for skilled workers in more productive firms. As a result, a given productivity difference between firms may result in larger differences in the demand for skilled labour than for the demand for less skilled labour, raising productivity-wage pass-through for high-skilled workers relative to low-skilled workers. A related explanation could be that higher-skilled workers have a stronger bargaining position and may be able to negotiate higher wages in high-productivity firms. In the case of gender, worker-firm complementarities may also explain the larger pass-through for men as higher-productivity firms may disproportionately reward worker flexibility. For instance, recent evidence suggests that the gender wage gap tends to be larger in exporting firms (which tend to be more productive) than in non-exporting ones (Bøler, Javorcik and Ulltveit-Moe, 2018[14]). The opposite pattern in Costa Rica, France and Portugal could reflect monopsonic wage discrimination by profit-maximising firms based on differences between men and women in opportunities for job mobility (i.e. less elastic labour supply for women). These issues will be explored in more detail in future work of the LinkEED project.

Figure 3.5. Higher pass-through for high-skilled workers and men

Based on Equation 3.1, 1995-2015



Note: Productivity pass-through is estimated using a modified version of Equation 3.1 where productivity is interacted with the worker characteristic. Separate regression models are estimated for each country. Skills are measured by education (tertiary, secondary and less than secondary) where available, otherwise by occupation. Each regression controls for industry fixed effects so that the coefficients can be interpreted as within-industry pass-through for different types of workers. Education and occupation not available for Canada. Sample periods for each country: Canada (2001-16), Costa Rica (2006-17), Finland (2000-17), France (2002-15), Germany (2000-16), Hungary (2003-11), Japan (1995-2013), the Netherlands (2001-16), Portugal (1991-2009).

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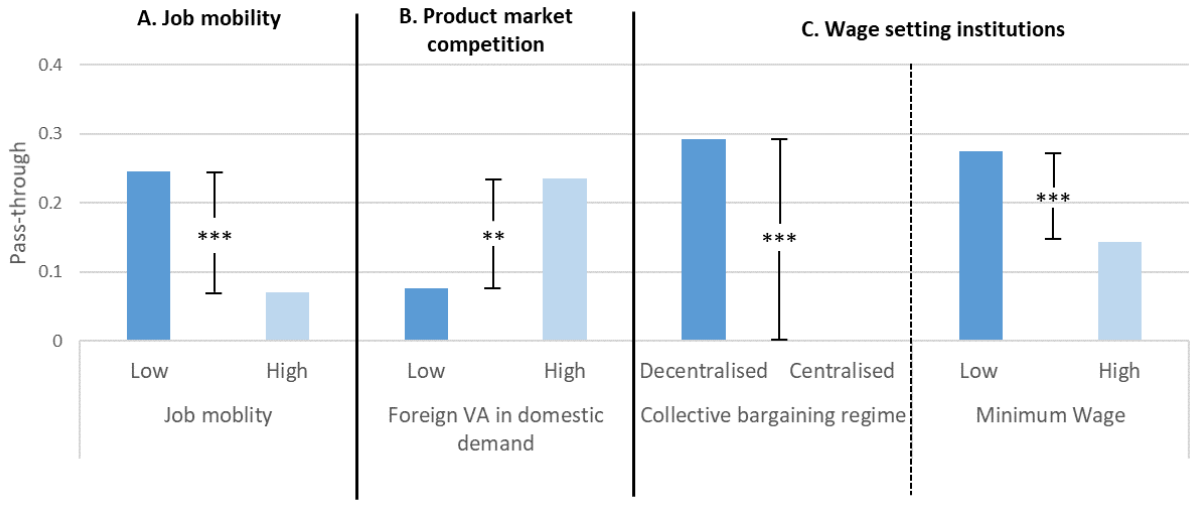
Labour market frictions are a key driver of productivity-wage pass-through at the firm level

The role of labour market frictions is analysed by relating productivity-wage pass-through to (i) the share of job-to-job transitions in employment as a proxy of voluntary job mobility, or (ii) to local labour market concentration as a proxy of employers' wage-setting power (monopsony). The results suggest that productivity-wage pass-through increases with the degree of labour market frictions as measured by a low rate of job-to-job transitions (Figure 3.6, Panel A). As workers do not easily move from one job to another, low-productivity employers can afford paying low wages relative to high-productivity ones. Conversely, high-productivity employers need to raise wages well above low-productivity ones to poach workers from them. The negative relation between job mobility and productivity pass-through is robust to the use of alternative measures of job mobility (Annex Table 3.B.3, Column 6), as well as to controlling for interactions of productivity with trade in value added and collective bargaining (Annex Table 3.B.2, Column 10).[13] The effect of raising job mobility on overall wage inequality through the pass-through channel is quantitatively significant: raising job mobility from the average of countries with low job mobility to the average of those with high mobility – roughly equivalent to an increase from the 20th percentile of job mobility (Greece) to the 80th percentile (Sweden) – would reduce overall wage inequality by about 15%. To put this reduction in perspective, the median increase in wage inequality across countries over the period 1995-2015 was around 10% (see Chapter 2).[14]

The importance of job mobility for productivity pass-through is confirmed in a variety of sensitivity checks (Annex Table 3.B.3). A first issue with the rate of job-to-job transitions as a measure of job mobility is that it may be positively correlated with the business cycle so that it may pick up the effects of low unemployment rather than job-to-job mobility. However, while the estimated coefficient on the interaction between productivity and unemployment is indeed highly significant, the rate of job-to-job transitions continues to be negatively related to productivity pass-through (Annex Table 3.B.3, Column 2). Similarly, controlling for the employment rate does not significantly change the estimated pass-through coefficient (Annex Table 3.B.3, Column 3). Another issue with the rate of job-to-job transitions is that it may be endogenous to the wage structure. For a given level of productivity dispersion, a more compressed wage structure may reduce incentives for job-to-job mobility. To reduce the risk of endogeneity, an alternative mobility measure is constructed as the product of average job mobility in all other industries in the same country and average job mobility in the same industry in all other countries. The advantage of this measure is that it can reasonably be considered as exogenous to wage-setting in a specific industry and country. The negative relation between industry labour market frictions and productivity pass-through at the firm level is robust to using this transformed variable as an instrument (Annex Table 3.B.3, Column 5).[15]

Figure 3.6. The structural and policy drivers of productivity-wage pass-through

Based on Equation 3.4, 1995-2015



Note: Job mobility is measured by the industry-level share of job-to-job transitions in employment. Foreign value added content is defined as the industry-level share of direct and indirect foreign value added in total domestic demand. The minimum wage is incidence is measured by the ratio of the statutory minimum wage to the median wage of full-time workers. These variables are denoted high when their value exceeds the sample median, and zero otherwise. Collective bargaining regimes are differentiated only at the country level. The taxonomy of collective bargaining regimes follows (OECD, 2018[15]), where "largely or fully decentralised" countries are classed as decentralised, otherwise centralised. Country coverage: Austria (2008-15), Canada (2001-12), Finland (2000-12), France (2002-15), Germany (2003-13), Hungary (2003-11), Italy (2001-15), Japan (1995-2013), the Netherlands (2001-15), New Zealand (2001-11), Norway (2004-12), Portugal (2004-12) and Sweden (2002-12). *, ** and *** denote a statistically significant difference across the groups at the 10%, 5% and 1% levels. See Annex Table 3.B.2 for the full results.

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Evidence from Portuguese LinkEED data with information on firm-productivity suggests that wages are lower and the degree of wage-productivity pass-through is generally higher in local labour markets where employment is highly concentrated in a small number of employers than elsewhere (Box 3.4). This is consistent with previous studies suggesting that local labour market concentration reduces the elasticity of labour supply as job opportunities in other firms decline (Azar, Marinescu and Steinbaum, 2019[16]). On average, as described in Figure 3.7, the empirical model suggests that wage premia are about 6% lower in firms in highly concentrated labour markets (i.e. at the 75th percentile of the distribution of local labour market concentration) than in less concentrated ones (i.e. those at the 25th percentile). Importantly, however, while wage premia appear to be lower, productivity-wage pass-through appears to be significantly larger in highly concentrated labour markets. The most productive firms pay about 55% higher wage premia than the least productive firms in highly concentrated labour markets. By comparison, in less concentrated labour markets, this pay difference is significantly lower at around 45%. This is likely to reflect the fact that when workers have limited job options outside of their current employer, as is the case in highly concentrated labour markets, low-productivity firms can afford paying lower wages relative to high-productivity ones and nonetheless attract (or retain) a sufficient number of workers. The results account for the role of unobserved factors that affect wages and local labour market concentration and are robust to different definitions of local labour market concentration. In future work of the OECD LinkEED project, this analysis will be extended to a number of other countries for which the necessary data are available.

Box 3.4. The effect of local labour market concentration on firm-level productivity pass-through

This box relates local labour market concentration to firm-level productivity-wage pass-through using country-specific linked employer-employee data. The analysis is conducted for Portugal over the period 1991-2009. Developments in local labour market concentration across countries and industries, as well as its effects on wages, are analysed in Chapter 4.

The analysis closely follows the empirical approach developed in previous research analysing the effect of local labour market concentration on wages but focuses on differential productivity-wage pass-through across local labour markets with different levels of employment concentration.[1] The basic estimating equation is as follows:

$$\ln w_{iojsrt} = \beta_1 x_{it} + \rho_1 \ln y_{jt} + \beta_2 \ln C_{l(o,r)t} + \rho_2 \ln y_{jt} \times \ln C_{l(o,r)t} + \delta_o + \delta_r + \delta_t + \delta_s + \varepsilon_{iojsrt} \quad \text{Equation 3.5}$$

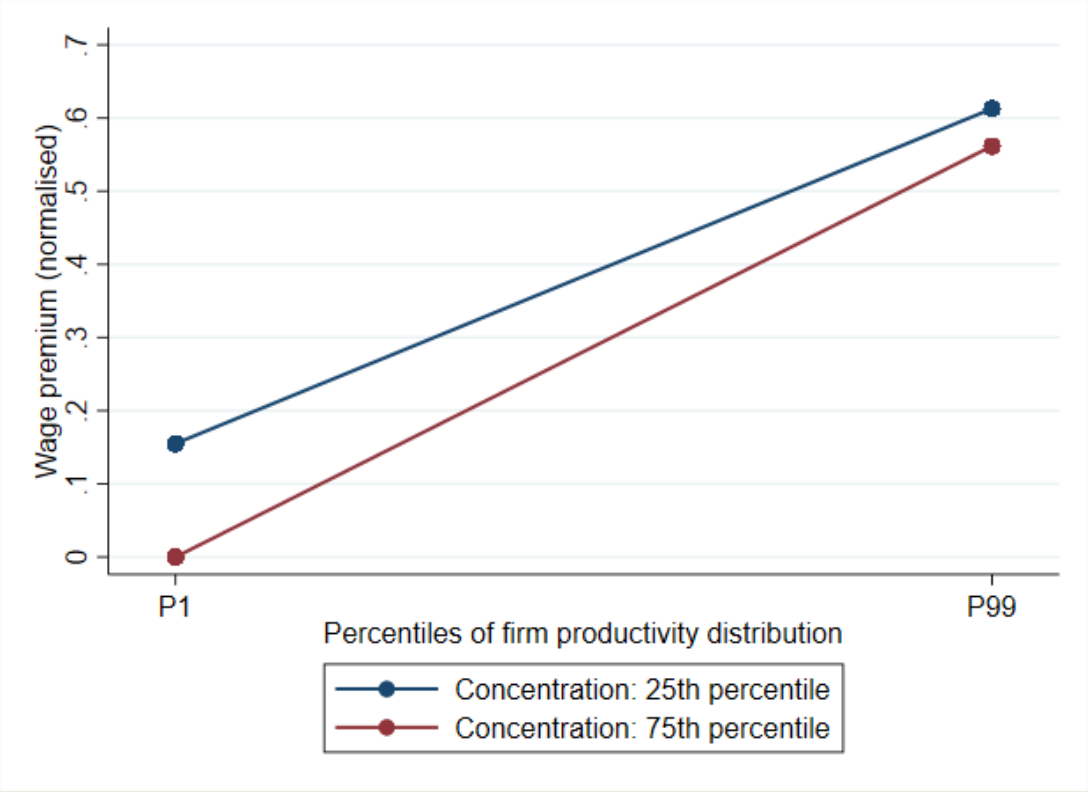
where w_{iojsrt} denotes the wage of worker *i* in occupation *o* working in firm *j*, sector *s*, region *r* and year *t*; x_{it} denotes individual worker characteristics such as gender, age and skill; (demeaned) productivity *y* is measured as sales per worker, *C* denotes (demeaned) local labour market concentration in market *l*, defined as an occupation-region (*o-r)* pair at time *t,* ρ_1 is the estimated average productivity pass-through parameter, β_2 is the direct effect of concentration on firm wage premia levels, ρ_2 measures the sensitivity of productivity pass-through to local labour market concentration, and δ is a set of fixed effects based on occupation, region, industry (*s)* and time.

Local labour market concentration is measured by the Hirschman-Herfindahl Index (HHI) for hiring in local labour markets defined in terms of regions and occupations (120 occupations by 29 regions). HHI is the sum of the squared hiring shares of firms in the local labour market. It can take values between zero (perfect competition) and one (perfect monopsony). It is preferable to other measures of concentration, as it is easy to interpret, uses information about all firms in the local labour market, and has a clear relation to policy (e.g. the Department of Justice in the United States has published guidelines on horizontal mergers based on the HHI).[2] Following the literature, labour market concentration is instrumented by average concentration across all other regions within the same occupation in order to address potential endogeneity (e.g. due to omitted labour supply or demand shocks that simultaneously affect wages and concentration).

The results suggest that local labour market concentration is associated with lower wage premia on average and higher pass-through of productivity to wages at the firm-level (Figure 3.7). Higher labour market concentration directly reduces wage premia as firms mark down wages by more. At the same time, the firm-level pass-through of productivity to wage premia is larger in more concentrated local labour markets, with the least productive firms able to pay significantly lower wages than the most productive ones without losing all their workers. Both results are consistent with the view that the labour supply facing individual firms is less responsive to changes in wages in highly concentrated local labour markets.

Figure 3.7. Labour market concentration reduces wages but raises productivity-wage pass-through

Based on Equation 3.5, Portugal, 1991-2009



Note: The graph shows predicted values of log wage premia for different points in the firm productivity and labour market concentration distributions in Portugal. Predicted values are obtained from estimated coefficients on productivity, concentration, and their interaction; as well as the quantiles of the corresponding distributions in the regression sample. To ease interpretation, predicted values are normalised, such that the values on the y-axis correspond to log point differences with respect to the lowest wage premium. Productivity is measured as sales per worker, concentration is measured as the log of the Hirschman-Herfindahl index (HHI) for hiring. Labour market concentration is instrumented by average concentration across all other regions within the same occupation.

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1. A number of recent studies analyse the effect of local labour market concentration on wages. The basic setup of these studies is to relate individual-level wages to measures of local labour market concentration while controlling for individual worker and firm characteristics. These studies typically find that firms mark down wages in highly concentrated labour market relative to less concentrated ones (Azar, Marinescu and Steinbaum, 2017[17]) for the United States; (Martins, 2018[18]) for Portugal; and (Marinescu, Ouss and Pape, 2020[19]) and (Bassanini, Batut and Caroli, 2019[20]) for France).
2. In robustness checks, alternative measures of concentration are used, such as the HHI defined in terms of employment instead of hires. The HHI based on hires is typically higher than the HHI based on employment as only a subset of firms hire at a given time. The hiring HHI might give a more accurate picture of local labour market concentration than the employment HHI if aggregate job mobility is low. If it is relatively easy to switch jobs, then the employment HHI might be more accurate because a firm could still be a potential employer even if it does not hire in a given year.

Product market competition raises productivity pass-through

Pass-through of productivity to wage premia is larger in industries that face stronger import competition as measured by the share of imported value added in final domestic demand (Figure 3.6, Panel B). In a competitive environment, a given change in productivity induces a larger adjustment in employment and thus a larger adjustment in wages, as firms passing on the productivity gain to product prices gain a larger share of the market than in an environment with limited product market competition. According to the empirical estimates, productivity pass-through at the firm-level is about 13 percentage points larger in countries and industries with an above-median share of imported value added in final domestic demand than in those with a below-median share (22% compared with 9%). Measures that proxy domestic competition, such as industry concentration, are generally not statistically significant, which could reflect the fact that stronger product market competition may also raise competition for workers, including through the market entry of new firms (Annex Table 3.B.2).[16]

Wage-setting institutions can constrain productivity pass-through at the firm-level

The decentralisation of collective bargaining tends to increase the pass-through of firm-level productivity to wages (Figure 3.6, Panel C).[17] Collective bargaining systems characterised by a predominance of industry-level bargaining (labelled "centralised") focus on industry-wide productivity in wage setting, whereas systems based on a predominance of firm-level bargaining (labelled "fully or largely decentralised") allow for larger differentiation of wages according to firm-specific productivity. [18] Country-specific evidence on decentralisation of collective bargaining in Germany supports the cross-country evidence on the positive link between decentralisation and productivity-wage pass-through at the firm-level. In Germany, there has been a tendency towards more flexibility in wage setting at the firm-level over the past three decades, partly driven by the increased scope for within sector-level agreements in bargaining at the firm-level and partly by declining collective bargaining coverage, which has tended to raise the pass-through of firm-level productivity to wages (Box 3.5).

Box 3.5. The decentralisation of collective bargaining in Germany and the pass-through of firm-specific productivity performance to wages

In countries where collective bargaining takes place predominantly at the industry level, including in Germany, concerns about the flexibility of firms to adjust wages in line with productivity have given rise to calls for the decentralisation of collective bargaining. The introduction of flexibility in such systems is typically considered as requiring a shift from sector to firm-level bargaining. While such a shift would indeed provide more flexibility to firms, it would also tend to reduce collective bargaining coverage. A number of countries have therefore sought to introduce more flexibility at the firm-level within the broader framework of industry-level bargaining through a process of "organised decentralisation".

In Germany, there has been a strong shift towards decentralised collective bargaining since the 1990s. The process shares elements of organised decentralisation, such as the introduction of opting-out clauses in industry-level collective agreements. At the same time, state support for industry-level collective bargaining has tended to weaken, notably through the reduced use of administrative extensions. This process of decentralisation has been associated with one of the strongest declines in collective bargaining coverage in the OECD, with collective bargaining coverage declining from about 85% in 1990 to less than 60% in 2015. The decline in coverage may in turn have undermined the effectiveness of wage co-ordination across industries in which the metal industry sets a wage norm for subsequent collective wage negotiations in other industries.

This process of decentralisation in Germany could potentially have had important implications for the pass-through of productivity to wages. The introduction of opt-out clauses in industry-level agreements is likely to allow for wage differentiation between firms according to their productivity, but reduce the pass-through of industry-wide productivity performance. There is indeed some evidence that suggests that firm-level productivity pass-through is stronger among firms not covered by collective bargaining (Gürtzgen, 2009[21]) and that the rise in between-firm wage dispersion is related to the tendency of new firms to opt out of sectoral collective bargaining (Card, Heining and Kline, 2013[22]).

New evidence for Germany suggests that the pass-through of both firm-specific and industry-level productivity has tended to increase since the late 1990s/early 2000s (Table 3.1). The rise in the pass-through of firm-specific productivity gains is consistent with the trend towards greater decentralisation of collective bargaining. The increase in the pass-through of industry-wide productivity gains suggests that there has also been an increasing pass-through of wages and productivity at the industry level. In principle, this could indicate that the system of wage co-ordination across sectors has weakened over time, possibly as a result of the decline in collective bargaining coverage.[1] The increase in pass-through at the industry and firm levels contributed to increasing wage dispersion between firms, both within and between industries.

Table 3.1. Firm-specific and industry-level productivity-wage pass-through in Germany

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled		**1995-2005**		**2006-2015**	
Pass-through	**Firm**	**Industry**	**Firm**	**Industry**	**Firm**	**Industry**
Overall	0.10***	0.23***	0.07***	0.06	0.14***	0.19***
	(0.02)	(0.04)	(0.02)	(0.05)	(0.01)	(0.05)
Manufacture	0.09***	0.31***	0.06**	0.14*	0.16***	0.22***
	(0.02)	(0.07)	(0.03)	(0.08)	(0.01)	(0.07)
Services	0.11***	0.08	0.11***	0.04	0.11***	0.04
	(0.01)	(0.06)	(0.01)	(0.08)	(0.01)	(0.08)

Note: The table shows the estimated elasticity of firm-level productivity, measured as sales per worker, and industry-level productivity measured as value added per worker, on gross monthly earnings. The estimates control for gender, a third power polynomial of age, the interaction between age profiles and gender, as well as year and industry fixed effects. The total sample consists of 11 301 867 observations; of which 8 153 583 are in manufacturing and 3 148 284 in services. *, ** and ** denote statistical significance at the 10%, 5% and 1% levels.

1. The pass-through of industry-wide productivity gains is much larger than the pass-through of firm-specific productivity gains, which is consistent with previous studies (Carlsson, Messina and Skans, 2016[23])

Statutory minimum wages (relative to the median wage) also tend to reduce productivity pass through at the firm-level (Figure 3.6, Panel C). A key argument for the use of minimum wage is to contain the wage-setting power of employers in imperfectly competitive labour markets and ensure fair wages for workers, particularly those with limited skills or a weak bargaining position.[19] The results suggests that the impact of minimum wages on overall wage dispersion, as documented for example in OECD (2018[24]), is partly driven by a reduction in wage dispersion between firms for a given level of productivity dispersion. The compression of the wage distribution may have adverse effects on the efficiency of labour allocation but recent evidence for Germany and Israel suggests that this may not necessarily be the case. Higher minimum wages may force low-productivity firms to raise productivity or exit the market, thereby reducing productivity dispersion (Drucker, Mazirov and Neumark, 2019[25]; Dustmann et al., 2021[26]).

3.5. Policy implications and concluding remarks

While wage differences between firms originating from productivity-wage pass-through provide incentives for workers to move from lower-productivity to higher-productivity firms, they also raise overall wage inequality (Criscuolo et al., 2020[27]). The results in this chapter suggest that the extent of firm-level productivity-wage pass-through is shaped by the degree of competition in labour and product markets, as well as the nature of wage-setting institutions. Conditional on productivity dispersion, wage dispersion between firms increases with frictions in the labour market and is amplified by strong product market competition and decentralised collective bargaining. The key policy question raised by these empirical results is how to promote productivity-enhancing reallocation without widening pay differences between firms, especially in a context of potentially large shifts in labour demand across firms and industries in the wake of the COVID-19 crisis.

The main policy implication emerging from this chapter is that facilitating voluntary job mobility of workers would not only raise productivity growth by easing reallocation from low to high-productivity firms but may also limit wage dispersion between firms by weakening the link with productivity dispersion. In the absence of complementary measures to facilitate job mobility and strengthen competition in labour markets, trade and competition-friendly product market reforms as well as the gradual decentralisation of collective bargaining in countries with a strong tradition of sector-level bargaining risk raising overall inequality by raising wage dispersion between firms. Policies that would facilitate job mobility and strengthen competition in labour markets include:

- Limiting legal and contractual barriers to job mobility can promote competition between employers for workers and strengthen worker incentives for taking up new opportunities. Opportunities for job mobility tend to be more limited in more concentrated local labour markets (Naidu, Posner and Weyl, 2018[28]; OECD, 2019[29]) and where the importance of non-compete clauses, no-poaching agreements, and occupational licensing requirements is greater (Bambalaite, Nicoletti and von Rueden, 2020[30]; Kleiner and Xu, 2020[31]; Lipsitz and Starr, 2019[32]).
- Strengthening adult learning and taking a more comprehensive approach to activation that goes beyond promoting access to employment would help workers find better jobs in other firms. For instance, public employment services in the form of job-search assistance, training and career counselling could be made available to workers in jobs that are supported by job retention schemes that were used on a massive scale in most OECD countries to curb job losses as a result of the COVID-19 crisis (OECD, 2020[33]; OECD, 2020[34]). More generally, public employment services could be made available to all workers who would like to progress in their careers but face significant barriers in moving to better jobs, including people in non-standard forms of work, as well as people who are currently employed but lack relevant skills or live in lagging regions. This would require a more active role of public employment services in advising workers on adult learning opportunities, as well as collecting information on skill requirements of prospective employers.
- Mobility across geographical areas could be fostered by reforming housing policies, including by redesigning land-use and planning policies that raise house price differences across locations, reducing transaction taxes on selling and buying a home, and relaxing overly strict rental regulations (Causa and Pichelmann, 2020[35]). Social cash and in-kind expenditure on housing could also support residential mobility by raising the affordability of housing for low-income households, especially if such expenditure is designed in such a way that benefits are fully portable across geographical areas.
- An expansion of telework could partly compensate for limited geographical mobility. A significant fraction of jobs can potentially be conducted remotely – between one-quarter and one-third of all jobs according to some estimates (Dingel and Neiman, 2020[36]; Boeri, Caiumi and Paccagnella, 2020[37]; OECD, 2020[38]) – potentially raising job opportunities for workers and reducing costs to move from one job to another. Promoting telework will require strengthening digital infrastructure

to increase network access and speed for all workers as well as digital adoption by firms; enhancing workers' ICT skills through training; as well as raising employers' management capabilities through the diffusion of managerial best practices (Nicoletti, von Rueden and Andrews, 2020[5]; OECD, 2020[38]).

A significant degree of barriers to job mobility are likely to remain even after addressing policy distortions that contribute to labour market frictions. Workers differ in their preferences for jobs in different firms, industries and geographical areas as well as their ability to perform them, and firms differ in terms of non-wage working conditions and skill requirements, which creates inherent barriers to job mobility. Moreover, raising job mobility may not be the most effective policy to address within-firm wage inequality, which is likely to mainly reflect differences in individual worker characteristics such as skills or gender. Skills policies that allow all workers to acquire and update relevant skills over the life cycle and policies that raise women's opportunities to work in high-productivity firms, including through flexible work schedules and telework, will need to complement policies to raise job mobility. Tax and benefit systems can also prevent workers who have limited job opportunities despite measures to promote mobility, skills and working time flexibility from experiencing poverty and financial hardship.

In principle, wage-setting institutions in the form of minimum wages and collective bargaining could help to contain the wage-setting power of firms in labour markets with limited job mobility, thereby reducing pay differences between them. In areas and occupations where wages are well below workers' productivity, this could even raise employment by raising labour market participation among people who are unwilling to work at current wages. However, there is a risk that wage floors are set at levels in excess of workers' productivity, which would reduce employment. This risk could be reduced by combining centralised collective bargaining with sufficient scope for further negotiation at the firm level, and focusing minimum wage increases on areas and groups for which initial levels of wages are low. Ongoing research based on a comparison between Norway and the United States further suggests that wage compression between firms does not necessarily reduce the efficiency of labour allocation between firms (Hijzen, Zwysen and Lillehagen, 2021[39]). The key to achieve high productivity through an efficient allocation of labour is to complement wage-setting institutions that constrain the ability of firms to pay different wages for similar workers with measures that promote innovation in low productivity firms and strengthen job mobility.

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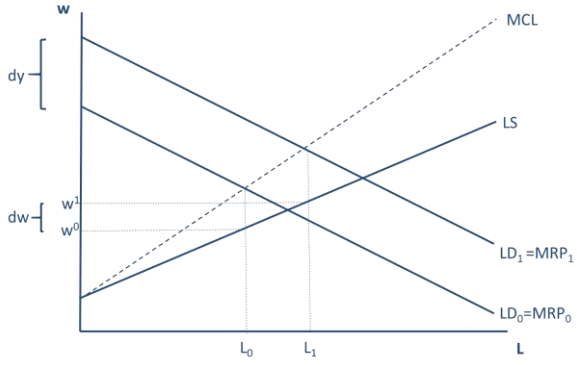
Annex 3.A. Firm-level productivity-wage pass-through: The static monopsony model

In a perfectly competitive labour market, there are no frictions related to the costs of finding and changing jobs that limit workers' job options outside of their firms. In such a setting, all firms pay the single market wage irrespective of their productivity since no worker would accept a lower wage and paying a higher wage would reduce firms' profits. In formal terms, this implies that firms are price-takers in labour markets, with the labour supply curve being flat ("perfectly elastic"). Workers receive a wage equal to the market wage, which is in turn equal to workers' marginal product. Importantly, the market wage is independent of the productivity of the firm for which they work.

In imperfectly competitive labour markets with frictions related to the cost of finding and changing jobs, or preferences over jobs' non-wage characteristics, workers' job options outside of their firms are limited. Consequently, not all workers quit when paid less than their marginal product and individual firms face an upward-sloping labour supply curve, which describes reservation wages of marginal workers (Annex Figure 3.A.1).[20] Assuming that firms are unable to observe the outside options of individual workers (i.e. they cannot price discriminate between them), the cost of attracting additional workers (i.e. the marginal cost of labour) typically exceeds their reservation wage.[21] Firms set wages so that labour supply to the firm corresponds to the profit-maximising employment levels, i.e. where the marginal revenue product of labour (MRP) and the marginal cost of labour (MCL) are the same.[22]

As productivity increases, at each level of employment the more productive firm is in principle willing to pay a higher wage (i.e. labour demand shifts outwards), since higher productivity allows it to absorb higher labour costs. Thus, firm-level wages co-move with productivity even for workers with identical earnings characteristics. Labour demand of the high-productivity firm (firm 1) is above that of the low-productivity firm (firm 0), resulting in a positive wage gap between the high-productivity and the low-productivity firm (w1 – w0). In other words, there is positive pass-through of productivity to wages at the firm level, leading to dispersion in wages that is proportional to productivity dispersion. By contrast, in perfectly competitive labour markets with perfectly elastic labour supply, firms have no wage-setting power and productivity dispersion does not translate into wage dispersion between firms.

Annex Figure 3.A.1. Firm-level productivity-wage pass-through in imperfectly competitive labour markets



Note: w: wage; dw: wage dispersion; dy: labour productivity dispersion; L: employment; LS: (inverse) labour supply curve; LD: (inverse) labour demand curve; MRP: marginal revenue product of labour; MCL: marginal cost of labour.

The degree of productivity pass-through (i) declines with the elasticity of labour supply; (ii) increases with the elasticity of labour demand; and (iii) declines with the level of institutional wage floors (Annex A).

I. A decline in the elasticity of labour supply rotates the labour supply curve anti-clockwise, so that a given productivity difference between firms translates into a larger equilibrium wage difference. The elasticity of labour supply increases with job mobility, which is in turn partly determined by labour market frictions (Annex Figure 3.A.2, Panel A).

II. An increase in the labour demand elasticity rotates the labour demand curve anti-clockwise, so that a given productivity difference between firms – as measured by the vertical distance in the labour demand curve – translates into a larger difference in firm wage premia (Figure A.2., Panel B). The elasticity of labour demand increases with competition in product markets.

III. Collectively agreed wage floors at the industry level or statutory minimum wages may raise wages of low-productivity firms above their profit-maximising levels, which would reduce wage differences between firms at any given productivity difference.

Productivity pass-through declines with the elasticity of labour supply

A reduction in the elasticity of labour supply rotates the labour-supply curve anti-clockwise, giving rise to an upward-sloping labour-supply curve (Annex Figure 3.A.2, Panel A). The productivity difference between a less productive firm 0 and a more productive firm 1 – as reflected by the vertical distance between their labour demand curves, LD0 and LD1 – translates into a difference in firm wage premia (w1(B)-w0(B)). The pass-through of productivity to wages (and wage dispersion at any given level of productivity dispersion) declines with the elasticity of labour supply, i.e. the flatter the labour supply curve. At the same time, wages are marked down relative to marginal labour productivity, implying that workers earn less on average in the imperfectly competitive equilibrium than in the perfectly competitive one.

The elasticity of labour supply to the individual firm is partly determined by job mobility, which in turn depends, among other things, on local labour market concentration; the number of job vacancies per firm; hiring and firing costs (e.g. employment protection); the availability of easily accessible information on job opportunities (e.g. on-line platforms, public employment services); and regulatory barriers to mobility such as occupational licensing or distortions in the housing market (e.g. high taxes on housing transactions). In some cases, job mobility may also be held back by tacit agreements between firms not to hire workers from each other (no-poaching agreements) or contract clauses that prevent workers from moving to competing firms during a certain period (non-compete clauses).

Productivity pass-through increases with the elasticity of labour demand

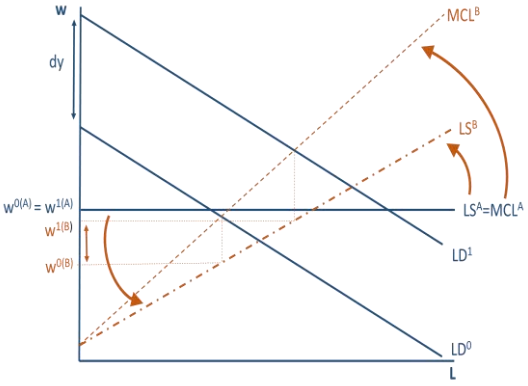
An increase in the elasticity of labour demand rotates the labour-demand curve anti-clockwise, making the labour-demand curve flatter (Annex Figure 3.A.2, Panel B). The productivity difference between two firms, as reflected by the vertical distance in the labour demand curve, translates into a larger difference in firm wage premia the higher the elasticity of labour demand (w1(B)-w0 compared with w1(A)-w0). The wage-elasticity of labour demand increases with the price-elasticity of final demand (product market competition) and the elasticity of substitution between labour and other factors of production, such as capital or services (automation, outsourcing and offshoring).

A pro-competitive environment in product markets, which could for instance reflect domestic product market policies or trade policies, tends to raise the price-elasticity of final demand and thereby the wage-elasticity of labour demand. In such an environment, a change in productivity induces a larger response of output and employment at any given level of wages (a larger horizontal shift in labour demand). Given an upward sloping labour supply curve, wages need to adjust by more to accommodate the shift in labour demand.

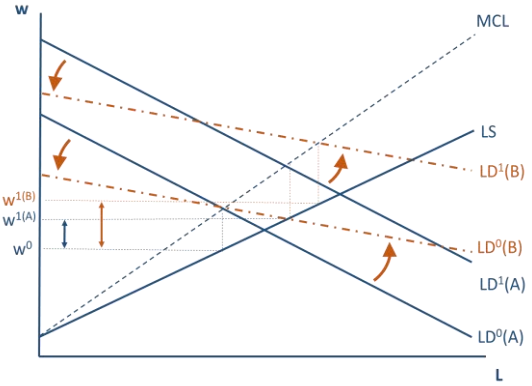
Technology also shapes the transmission of productivity to wages, but is likely to be less relevant in practice. Automation and offshoring increase the ease with which labour can be substituted by capital or imported intermediate inputs and hence increases the sensitivity of firm employment to wages. In imperfectly competitive labour markets this has a tendency to mitigate the effects of productivity dispersion on wage dispersion by reducing the labour intensity of production in more productive firms. Given the second-order role of technology via this channel in the present framework this will not be analysed empirically.

Annex Figure 3.A.2. Labour demand and supply elasticities determine firm-level productivity-wage pass-through

A. More elastic labour supply reduces pass-through



B. More elastic labour demand increases pass-through



Note: w: wage; L: employment; LS: Inverse labour supply curve; LD: Inverse labour demand curve. In Panel A, initially labour supply LSA is perfectly elastic and equals the marginal cost of labour MCLA. Then labour supply rotates clockwise to LSB (less elastic) and a wedge opens up with the marginal cost of labour MCLB that tilts even more. In Panel B, initially labour demand of firms 0 and 1 is at LD0(A) and LD1(A). Then labour demand of both firms rotates counter-clockwise to LD0(B) and LD1(B), respectively (more elastic).

Wage-setting institutions constrain productivity pass-through at the firm level

Collectively agreed wage floors at the industry level or statutory minimum wages may raise wages of low-productivity firms above their profit-maximising levels (w^0 in Annex Figure 3.A.1). This would reduce wage premia dispersion between firms at any given level of productivity dispersion, i.e. it would weaken the degree of firm-level productivity-wage pass-through. The co-ordination of collective bargaining outcomes across sectors by means of wage norms or wage ceilings would also tend to reduce wage premia differences but mainly between industries rather than between firms (OECD, 2019[7]). By contrast, the decentralisation of collective bargaining from the industry to the firm level is likely to increase firm-level productivity-wage pass-through with respect to either industry-level or national-level collective bargaining.

Annex 3.B. Supplementary tables and figures

Annex Table 3.B.1. Explanatory variables

Variables included in the regression analysis

	Variable	Definition	Variation	Source
Labour supply elasticity	Rate of industry job-to-job transitions	Annual job-to-job transitions within the industry as a share of total employment in the industry	Country-sector-year	Causa and Luu (2020) based on EU-LFS
Labour demand elasticity	Foreign value added in domestic final demand	Share of foreign value added (direct or via intermediate inputs) in domestic final demand of an industry	Country-sector-year	OECD TiVA database
	Import share	Imports over value added of an industry	Country-sector-year	OECD TiVA database
	Industry concentration	Share of 8 largest business group in the sales of each industry (CR8)	Country-sector-year	Bajgar, Criscuolo and Timmis (2019)
Wage-setting insitutions	Collective bargaining (CB)	Decentralised CB includes countries with largely or fully decentralised CB systems in the OECD taxonomy	Country-year	OECD (2019)
	Minimum Wage incidence (Kaitz index)	Ratio of statutory minimum wage to median wage of full-time employees	Country-year	OECD earnings database

Note: Continuous variables are transformed into binary variables in the regression analysis, by means of a split among the median into high and low values of the variable.

Annex Table 3.B.2. Structural and institutional drivers of firm-level productivity pass-through

Based on Equation 3.4, 1995-2015

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable:	**Var(Firm Wage Premia)**								
	Var(Firm Productivity)	0.02**	0.06***	0.01	0.01	0.05**	-0.00	0.08***	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)	(0.01)
Labour supply elasticity	Var(Prod) x High rate of industry job-to-job transitions		-0.06***							-0.02**
			(0.01)							(0.01)
Labour demand elasticity	Var(Prod) x High share of foreign VA in domestic final demand			0.05***	0.06***					0.02*
				(0.02)	(0.02)					(0.01)
	Var(Prod) x High share of imports over value added				-0.01					
					(0.02)					
	Var(Prod) x Highly concentrated industry					0.01				
						(0.02)				
Wage-setting institutions	Var(Prod) x Decentralised collective bargaining country						0.09***		0.07***	0.07***
							(0.02)		(0.02)	(0.01)
	Var(Prod) x High minimum wage relative to median wage							-0.05***	-0.01	
								(0.02)	(0.01)	
	Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Non-interacted determinant		YES	YES	YES	YES	YES	YES	YES	YES
	Observations	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823
	Adjusted R^2	0.70	0.74	0.74	0.74	0.76	0.78	0.78	0.80	0.81

Note: Variances of productivity and firm wage premia within each industry-country-year cell are weighted by employment of each firm. Productivity refers to value added per worker. Each regression contains a full interaction with an indicator for any missing values on the independent variables. Standard errors clustered at the country-sector in parentheses. *, ** and ** denote statistical significance at the 10%, 5% and 1% levels. Following Equation 3.4, implied productivity pass-through can be calculated from these coefficients as $\sqrt{\tilde{\rho}}$ for the reference group, and $\sqrt{\tilde{\rho} + \gamma_1} - \sqrt{\tilde{\rho}}$ for the difference with respect to the reference group.

Annex Table 3.B.3. Robustness: Job-to-job mobility

Based on Equation 3.4, 1995-2015

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:	**Var(Firm Wage Premia)**									
Model:	OLS	OLS	OLS	OLS	IV-2SLS	OLS	OLS	OLS	OLS	IV-2SLS
Var(Firm Productivity)	0.06***	0.06***	0.05***	0.07***	0.05***	0.05***	0.06***	0.03***	0.06***	0.03**
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)
Var(Prod) x High rate of industry job-to-job transitions	-0.06***	-0.06**	-0.04***	-0.07***	-0.04***					
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)					
Var(Prod) x High rate of job-to-job transitions (incl. from other industries)						-0.04***	-0.04***	-0.03**	-0.05***	-0.01
						(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Var(Prod) x Unemployment rate		-0.33**					-0.30**			
		(0.16)					(0.14)			
Var(Prod) x Employment rate			-0.33***					-0.41***		
			(0.09)					(0.12)		
Country fixed effects	YES	YES	YES			YES	YES	YES		
Industry fixed effects	YES	YES	YES			YES	YES	YES		
Year fixed effects	YES	YES	YES			YES	YES	YES		
Country-year fixed effects				YES	YES				YES	YES
Sector-year fixed effects				YES	YES				YES	YES
Non-interacted determinant	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,823

Note: Variances of productivity and firm wage premia within each industry-country-year cell are weighted by employment of each firm. Productivity refers to value added per worker. Each regression contains a full interaction with an indicator for any missing values on the independent variables. Columns (1) to (5) measure job mobility by the rate of job-to-job transitions within an industry. Columns (6) to (10) alternatively express job mobility by the rate of job-to-job inflows from any industry. Columns (5) and (10) instrument job-to-job mobility of a country-sector-year observation using the average job mobility of the same industry in all other countries and the average of job mobility of the same country in all other industries. Standard errors clustered at the country-sector in parentheses. *, ** and ** denote statistical significance at the 10%, 5% and 1% levels. Following Equation 3.4, implied productivity pass-through can be calculated from these coefficients as $\sqrt{\tilde{\rho}}$ for the reference group, and $\sqrt{\tilde{\rho}+\gamma_1}-\sqrt{\tilde{\rho}}$ for the difference with respect to the reference group.

Annex Table 3.B.4.Robustness: Continuous explanatory variables

Based on Equation 3.4, 1995-2015

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable:	**Var(Firm Wage Premia)**								
	Var(Firm Productivity)	0.02**	0.03***	0.03***	0.01	0.05***	-0.00	0.06***	-0.02	-0.00
		(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	(0.01)
Labour supply elasticity	Var(Prod) x Rate of industry job-to-job transitions		-0.01***							-0.00***
			(0.00)							(0.00)
Labour demand elasticity	Var(Prod) x Share of foreign VA in domestic final demand			0.11***	0.29***					-0.02
				(0.05)	(0.08)					(0.03)
	Var(Prod) x Share of imports over value added				-0.07***					
					(0.02)					
	Var(Prod) x Industry concentration					0.01				
						(0.04)				
Wage-setting institutions	Var(Prod) x Decentralised collective bargaining country						0.09***		0.11***	0.11***
							(0.02)		(0.03)	(0.02)
	Var(Prod) x Ratio of minimum wage relative to median wage							-0.26***	0.20*	
								(0.11)	(0.11)	
	Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Non-interacted determinant		YES	YES	YES	YES	YES	YES	YES	YES
	Observations	2,823	2,073	2,823	2,823	2,823	2,823	2,823	2,823	2,073
	Adjusted R^2	0.70	0.73	0.74	0.74	0.76	0.78	0.78	0.80	0.83

Note: Variances of productivity and firm wage premia within each industry-country-year cell are weighted by employment of each firm. Productivity refers to value added per worker. Determinants are winsorised at top and bottom 1%. Standard errors clustered at the country-sector in parentheses. *, ** and ** denote statistical significance at the 10%, 5% and 1% levels. Following Equation 3.4, implied productivity pass-through can be calculated from these coefficients as $\sqrt{\tilde{\rho}}$ for the reference group, and $\sqrt{\tilde{\rho} + \gamma_1} - \sqrt{\tilde{\rho}}$ for the difference with respect to the reference group.

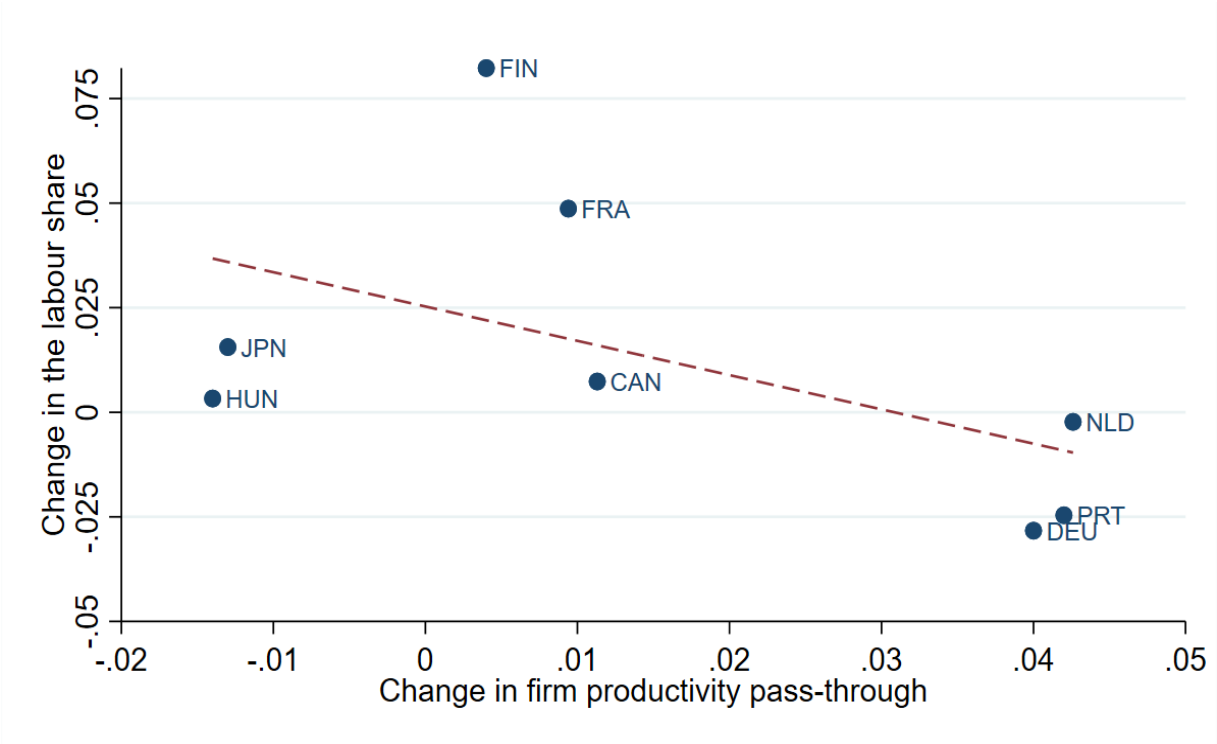
Annex Table 3.B.5. Robustness: More flexible fixed effects structure

Based on Equation 3.4, 1995-2015

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable:	**Var(Firm Wage Premia)**								
	Var(Firm Productivity)	0.02**	0.07***	0.01	0.01	0.05**	-0.00	0.08***	-0.00	0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.00)	(0.01)
Labour supply elasticity	Var(Prod) x High rate of industry job-to-job transitions		-0.07***							-0.02**
			(0.01)							(0.01)
Labour demand elasticity	Var(Prod) x High share of foreign VA in domestic final demand			0.05***	0.06**					0.01
				(0.02)	(0.02)					(0.01)
	Var(Prod) x High share of imports over value added				-0.01					
					(0.02)					
	Var(Prod) x Highly concentrated industry					0.02				
						(0.02)				
Wage-setting institutions	Var(Prod) x Decentralised collective bargaining country						0.09***		0.09***	0.07***
							(0.02)		(0.02)	(0.02)
	Var(Prod) x High minimum wage relative to median wage							-0.07***	0.01	
								(0.02)	(0.02)	
	Country-year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Industry-year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
	Non-interacted determinant		YES	YES	YES	YES	YES	YES	YES	YES
	Observations	2823	2823	2823	2823	2823	2823	2823	2823	2823
	Adjusted R^2	0.67	0.74	0.71	0.71	0.73	0.76	0.74	0.76	0.79

Note: Variances of productivity and firm wage premia within each industry-country-year cell are weighted by employment of each firm. Productivity refers to value added per worker. Each regression contains a full interaction with an indicator for any missing values on the independent variables. Standard errors clustered at the country-sector in parentheses. *, ** and ** denote statistical significance at the 10%, 5% and 1% levels. Following Equation 3.4, implied productivity pass-through can be calculated from these coefficients as $\sqrt{\tilde{\rho}}$ for the reference group, and $\sqrt{\tilde{\rho} + \gamma_1} - \sqrt{\tilde{\rho}}$ for the difference with respect to the reference group.

Annex Figure 3.B.1. Higher firm-level productivity pass-through and lower rent sharing typically go together

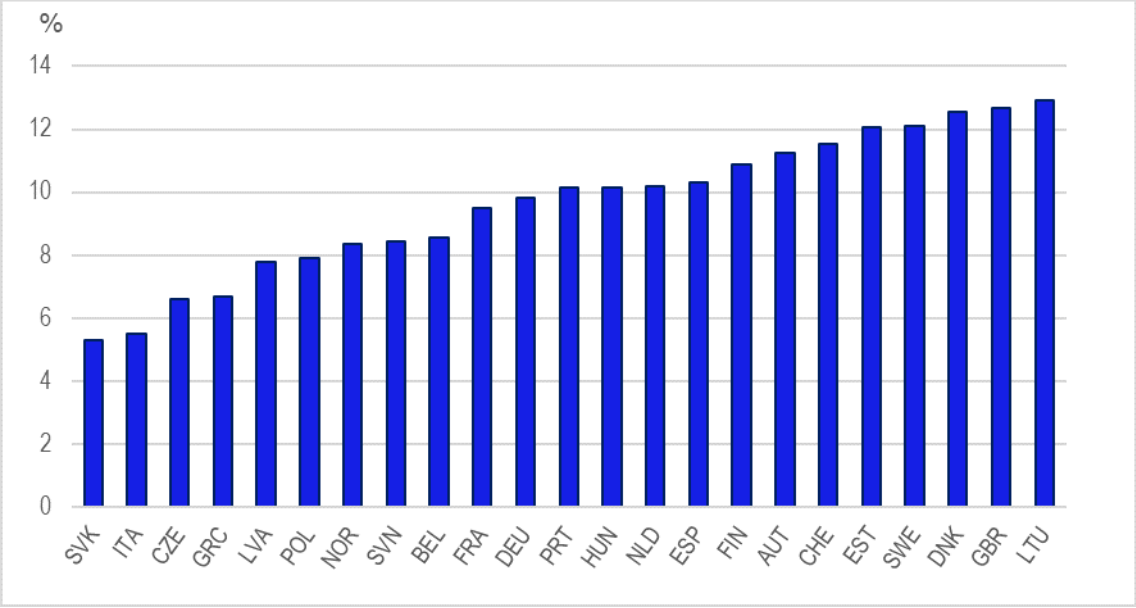


Note: This figure shows that increasing firm-level productivity pass-through tends to go together with a decreasing labour share at the country level, suggesting that the concept of firm-level productivity wage pass-through in this chapter cannot be interpreted as a measure of aggregate rent sharing The change in firm-level productivity pass-through is the difference in pass-through coefficients estimated from linked employer-employee micro data separately at the beginning and the end of the observation period based on Equation 3.1. The labour share is total labour compensation of salaried and self-employed workers as a share of value added at factor costs in the total economy excluding the housing, primary and non-market sectors. Each data point refers to the change between the following estimation periods: Canada (2001/05 and 2011/15), Finland (2001/05 and 2011/15), France (2002/05 and 2011/15), Germany (1996/2000 and 2011/15), Hungary (2003/05 and 2011), Japan (2005 and 2011/13), the Netherlands (2001/05 and 2011/16), Portugal (2002/05 and 2011/16). Labour share not available for Costa Rica.

StatLink https://stat.link/6boild

Annex Figure 3.B.2. Job mobility across countries

Rate of job-to-job transitions, 2019



Note: The rate of job-to-job transitions is defined as the share of workers who change jobs in 2016 in total employment.
Source: OECD calculations from (Causa, Luu and Abendschein, 2021[40])

StatLink https://stat.link/3m7jw4

Notes

[1] This chapter has been written by an OECD team consisting of Chiara Criscuolo, Alexander Hijzen, Michael Koelle and Cyrille Schwellnus with contributions of: Erling Barth (Institute for Social Research Oslo, NORWAY), Wen-Hao Chen (Statcan, CANADA), Richard Fabling (independent, NEW ZEALAND), Priscilla Fialho (OECD, PORTUGAL), Alfred Garloff (IAB, GERMANY), Katarzyna Grabska-Romagosa (Maastricht University, THE NETHERLANDS), Ryo Kambayashi (Hitotsubashi University, JAPAN), Valerie Lankester and Catalina Sandoval (Central Bank of Costa Rica, COSTA RICA), Balazs Murakőzy (University of Liverpool, HUNGARY), Oskar Nordström Skans (Uppsala University, SWEDEN), Satu Nurmi (Statistics Finland/VATT, FINLAND), Balazs Stadler (OECD), Rudy Verlhac (OECD), Richard Upward (University of Nottingham, UNITED KINGDOM), and Wouter Zwysen (ETUI, formerly OECD). Orsetta Causa (OECD, ECO) kindly provided the job-to-job mobility data used in the empirical analysis. Rudy Verlhac (OECD, STI) helped with the access and the analysis based on the MultiProd data. For details on the data used in this chapter please see the standalone Data Annex and Disclaimer Annex.

[2] Weakening the firm-level link between productivity and wage premia should not viewed as a policy objective *per se* but as the consequence of policies that reduce job-mobility reducing distortions in the economy.

[3] To the extent that job mobility may have direct effects on productivity dispersion between firms, the overall downward effect of higher job mobility on wage inequality may be larger or smaller. It may be larger if higher job mobility forces low-productivity firms out of business but it may be smaller if increased sorting of high-skilled worker into high-technology firms raises productivity in the technologically most advanced firms.

[4] In formal terms, firm premia are recovered as the estimated firm effects in the equation $\ln w_{ijt} = x_{it}\beta + z_{jt} + \varepsilon_{ijt}$, where w_{ijt} denotes the wage of worker *i* in firm *j* at time *t*; x_{it} denotes a vector of observable worker characteristics; β denotes the estimated return to these characteristics; z_{jt} denotes firm fixed effects of firm *j* in year *t*; and ε_{ijt} denotes the error term (Barth et al., 2016[41]).

[5] Accounting for unobservable differences in workforce composition between firms slightly reduces the contribution of firm wage premia to the overall *level* of wage dispersion, but has no systematic impact on their contribution to *changes* in overall wage dispersion.

[6] A large body of evidence has documented significant and persistent inter-industry wage differentials (Abowd et al., 2012[43]; Jean and Nicoletti, 2015[45]).

[7] The role of regions appears to be even smaller. In the restricted number of countries where information on the location of the firm is available, dispersion in wage premia between regions contributes at most 10% to the within-industry dispersion of firm wage premia. In this sense, wage premia dispersion between firms does not simply reflect compensation for higher housing costs in dynamic urban areas.

[8] This mechanism is illustrated in more detail using the simple static monopsony model in Annex A. In static and dynamic monopsony models, high-productivity firms unilaterally post high wages to attract workers who are imperfectly mobile. Wage setting in the static monopsony model is analysed in Robinson (1933[48]), Manning (2013[47]), Card et al. (2018[12]) and Lamadon et al. (2020), while analyses of the dynamic monopsony model include Burdett and Mortensen (1998[44]) and Manning (2011[42]). Another alternative micro-foundation for an upward-sloping labour supply curve are efficiency wage models in which the effective labour input that firms receive rises with the wage because higher-paid workers exert more effort (Manning, 1995[46]).

[9] In the static monopsony model, wages of all firms are marked down by a constant factor relative to their marginal products of labour but firm-level wages are proportional to firm-level productivities.

[10] Job mobility is also determined by worker preferences over non-wage characteristics of jobs (Manning, 2013[47]).

[11] The measure is calculated at the country-industry level from the European Labour Force Survey over the period 2000-17 (Causa, Luu and Abendschein, 2021[40]).

[12] The distinction between decentralised and more centralised collective bargaining systems in based on the OECD taxonomy of collective bargaining systems which consists of three main building blocks (OECD, 2019[7]): i) the level of bargaining at which collective agreements are negotiated (e.g. firm level, sector level or even national level); ii) the role of wage co-ordination between sector-level (or firm-level) agreements to take account of macroeconomic conditions; iii) the degree of flexibility for firms to modify the terms set by higher-level agreements.

[13] The results are qualitatively unchanged when using a measure of job-to-job mobility that accounts for transitions from other industries in addition to within-industry transitions.

[14] Average pass-through when job mobility is low is 25% versus 7% when job mobility is high (Figure 3.6). At the median value of productivity dispersion (corresponding to France for where the variance of log productivity was 0.68 in the last year) this translates into a 0.037 log-point difference in overall wage variance, which is about 15% of the median overall wage variance across countries in the last available year. The average annual rate of job-to-job transitions is about 5.8% when job mobility is low (roughly corresponding to the value for Greece, Annex Figure 3.B.1), while it is around 10% when job mobility is high (roughly corresponding to the value for Sweden).

[15] The negative relation between job mobility and pass-through is also robust to a more flexible fixed effects structure (Annex Table 3.B.5) and replacing discrete explanatory variables with continuous variables (Annex Table 3.B.4).

[16] A complementary explanation may be that measures of industry concentration may not be meaningful indicators of competitive pressures in highly globalised economies, especially in manufacturing industries. Additionally, industry concentration could partly reflect large economies of scale or scope that do not necessarily imply a lack of product market competition so long as market entry is contestable. Unreported results suggest that more competition-friendly product market regulation reduces pass-through, but product market regulation indicators are not available at the country-industry level, and the effect on pass-through is thus identified through cross-country variation and variation over time only.

[17] The associations are effectively based on comparisons of the average degree of productivity pass-through within sectors across groups of countries with different collective bargaining systems. Since collective bargaining systems tend to be deeply embedded in a countries' broader institutional set-up, it is difficult to isolate the impact of specific collective bargaining systems in the present framework.

[18] For the purposes of the econometric analysis underlying Figure 3.6, "centralised" and "organised decentralised" collective bargaining systems are grouped together. Centralised countries include France, Italy and Portugal; organised decentralised countries include Austria, Germany, the Netherlands, Norway and Sweden, and largely or fully decentralised countries include Canada, Costa Rica, Hungary, Japan and New Zealand.

[19] The use of minimum wages has also been justified based on arguments i) to promote work incentives by making work pay; ii) boost tax revenue and/or tax compliance by limiting the scope of wage under-reporting; and iii) anchoring wage bargaining.

[20] Firm-level and aggregate labour elasticities are fundamentally different concepts. Firm-level elasticities capture the degree of competition between firms for workers (or opportunities of workers outside of the firm) whereas aggregate elasticities capture the decision to participate in the labour market.

[21] The inability or unwillingness of firms to price discriminate between workers implies that existing workers are paid the same wage as newly hired workers. This means that labour costs increase more quickly when expanding employment than is suggested by the labour supply curve. If firms could perfectly observe workers' reservation wages, the marginal cost of labour and the labour supply curve would coincide.

[22] Note that the wage set by the firm is below the marginal revenue product of labour (i.e. wages are "marked down") in inverse proportion to the elasticity of labour supply to the firm. If firms could perfectly observe workers' reservation wages, equilibrium wages would be equal to the marginal revenue product of labour but, since marginal revenue products are not equalised across firms, wages would nonetheless be proportional to the firm's average productivity. In other words, firm-level productivity-wage pass-through does not hinge on the assumption of unobservable reservation wages and marked down wages, but on an upward sloping labour supply curve.

4 Monopoly's neglected twin? The effect of labour market concentration on wages and inequality

High labour market concentration (i.e. the concentration of employment or hiring in a small number of firms) may allow employers to suppress wages. This chapter uses linked employer-employee data from seven OECD countries to analyse the extent of labour market concentration across countries, industries, geographical areas and groups of workers, as well as its effects on wages. The main findings are: (1) a significant share of workers (around 20%) are employed in highly-concentrated labour markets, especially in manufacturing and rural areas; (2) high labour market concentration reduces wages; (3) negative wage effects tend to be particularly pronounced for low-qualified workers; and (4) over the past two decades, negative wage effects have become stronger at any given level of concentration, but concentration itself has remained broadly flat. These results imply that labour market concentration is a relevant issue from the perspective of public policies aiming to address inequality but cannot explain broader economic trends related to wage stagnation and the decline in the labour income share experienced by a number of countries over the past two decades.[1]

In Brief

This chapter analyses the links between labour market concentration (i.e. the extent to which employment or hiring is concentrated in a small number of firms), wage growth and inequality across seven OECD countries. The main findings are as follows:

- On average across the seven countries covered in this chapter, around 20% of workers are exposed to high levels of local labour market concentration (defined at the disaggregated industry-by-region level).
    - The Hirschman-Herfindahl Index is above 2500 (a commonly used threshold for high concentration) in 55% of local labour markets, employing around 20% of workers.
    - The share of workers exposed to high concentration is twice as high in rural areas (around 30%) than in urban ones (around 15%).
    - A significantly higher share of workers faces high concentration in manufacturing (around 40%) than in services (15%). This pattern holds both within rural and urban areas.
    - Low-qualified workers face higher concentration than medium and high-qualified workers.
- On average across countries, local labour market concentration has tended to slightly decline over the period 2003-2017, contrasting with the increase in product market concentration over the same period.
    - The decline has been more pronounced in services than manufacturing, where local labour market concentration has remained broadly flat.
    - Trends in local and national labour market concentration have been similar, but national employment concentration has decoupled from national sales concentration, especially in services.
- Local labour market concentration has a significant negative impact on wages.
    - All else equal, a worker in a highly-concentrated local labour market (90^{th} percentile of the employment-weighted distribution) faces a wage penalty of 7% relative to a similar worker in a market with low concentration (10^{th} percentile).
    - The impact of a given level of labour market concentration tends to be significantly more negative for low-qualified workers than for high-qualified ones. Given that low-skilled workers are also exposed to higher levels of concentration, they face a wage penalty of around 6% relative to high-skilled workers.
    - The impact of labour market concentration has tended to become more negative over time, potentially indicating a weakening in workers' bargaining position.

Overall, the results in this chapter suggest that labour market concentration has not been a major determinant of aggregate wage growth and the share of labour income in national income over the past 20 years. However, labour market concentration is a significant issue for around 20% of the workforce, especially low-qualified workers and workers in manufacturing and rural areas, thereby contributing to aggregate wage inequality. Public policies in the following areas could play a useful role to mitigate employers' wage-setting power:

- Labour market policies and institutions: Reducing the costs of job search and mobility for workers would reduce effective labour market concentration at any given level of concentration by expanding workers' outside job options. In principle, wage-setting institutions in the form of minimum wages and collectively-negotiated wage floors could help to contain the wage-setting power of firms in labour markets with limited job mobility.
- Product market policies: Excessive concentration in some segments of the labour market could be addressed by explicitly integrating labour market power considerations into competition policy, including into merger reviews. Competition authorities may also step up enforcement efforts against anti-competitive agreements in labour markets, including wage-fixing, no-poaching agreements and non-compete covenants, especially for low-qualified workers. Promoting market entry of firms through well-designed entrepreneurship policies may not only raise output and employment but also boost wages and reduce inequality.

4.1. Introduction

Large companies with monopoly power can boost their profits by imposing high prices on consumers. But large companies may also be able to suppress wages if workers have few alternative employment options within reasonable commuting distance, i.e. if local employment is highly concentrated. The resulting redistribution of income from workers to company owners hurts workers and reduces overall economic efficiency, as companies paying low wages generally employ fewer workers and curtail output. In many OECD countries, industry sales have become more concentrated (Bajgar et al., 2019[1]) while the share of wages in total income has declined (Autor et al., 2017[2]; Schwellnus et al., 2018[3]), raising the question whether increased sales concentration has gone together with increased labour market concentration and wage-setting power.

This chapter analyses the links between labour market concentration, wages and inequality. The analysis is based on linked employer-employee data from seven OECD countries for which relevant and comparable measures of labour market concentration can be constructed.[2] The main focus is on labour market concentration at the level of detailed industries and regions. The paper presents comparable descriptive evidence on the degree of local labour market concentration across industry groups (manufacturing and services), geographical areas (rural and urban areas) and worker groups (low- and high-qualified workers), as well as its changes over time. It further presents econometric evidence on the causal effect of labour market concentration on wages, distinguishing between low- and high-qualified workers and testing whether the wage effects have changed over time.

A growing literature studies wage-setting power in single-country contexts, but comparable estimates of wage-setting power and its implications for wage growth and wage inequality across OECD countries are still missing. One strand of the literature analyses concentration in local labour markets and its relation to wages in the United States (Rinz, 2020[4]; Benmelech, Bergman and Kim, 2020[5]), France (Marinescu, Ouss and Pape, 2020[6]), the United Kingdom (Abel, Tenreyro and Thwaites, 2018[7]), Austria (Jarosch, Nimczik and Sorkin, 2019[8]), and Portugal (Martins, 2018[9]).[3] Some recent studies have pointed to the key role of job mobility in shaping workers' outside options and thus the relationship between concentration and wages (Caldwell and Danieli, 2018[10]; Jarosch, Nimczik and Sorkin, 2019[8]; Schubert, Stansbury and Taska, 2020[11]; Berger, Herkenhoff and Mongey, 2019[12]).A limitation of these studies is the lack of a unified definition of local labour markets and concentration measures, which limits cross-country comparability.[4] A second strand of literature attempts to estimate the labour supply elasticity to the individual firm, a key theoretical determinant of wage-setting power (Sokolova and Sorensen, 2020[13]; Manning, 2011[14]; Bassier, Dube and Naidu, 2021[15]). While most empirical estimates of the labour supply

elasticity to the individual firm suggest significant potential wage-setting power, the extent to which firms actually exercise it has not yet been clearly established (Manning, 2020[16]).

This chapter makes three main contributions. First, it analyses developments in labour market concentration since the early 2000s from a cross-country perspective, drawing on comprehensive administrative data. The data treatment and the definitions of wages and local labour market concentration are harmonised across countries as much as possible, improving comparability. Second, the chapter provides econometric estimates of the impact of labour market concentration on wages based on instrumental variable techniques, holding constant a large number of potential confounding factors, including unobserved productivity differences between local labour markets. Third, the chapter puts the analysis of labour market concentration into the broader context of firms' wage-setting power (by providing estimates of the labour supply elasticity to the individual firm) and recent trends in product markets (by providing evidence on the links between sales and employment concentration).

The main results of the chapter are as follows. On average across the covered countries, around 20% of the workforce is employed in highly concentrated local labour markets, with the share being even higher for rural and manufacturing workers. The consequent reduction in workers' job options puts significant downward pressure on wages, especially those of low-qualified workers, thus raising overall wage inequality. However, local labour market concentration has tended to slightly decline over the period 2003-17 despite rising sales concentration. These results imply that labour market concentration is a relevant issue from the perspective of public policies aiming to address inequality but cannot explain broader economic trends related to wage stagnation and the decline in the labour income share experienced by number of countries over the past two decades.

Wage-setting institutions such as minimum wages and collective bargaining can counter-balance negative wage effects from labour market concentration, and integrating labour market power considerations into merger control can prevent firms from reaching dominant positions in the first place. In many cases, reforming policy settings in product and labour markets that limit competition would curb market income inequality while at the same time raising economic growth and employment. For instance, reducing regulatory barriers to worker mobility (such as professional licencing or non-compete clauses) and business dynamism (such as regulatory obstacles to firm entry and growth) would raise workers' wages relative to productivity while allowing high-performing firms to expand more easily.

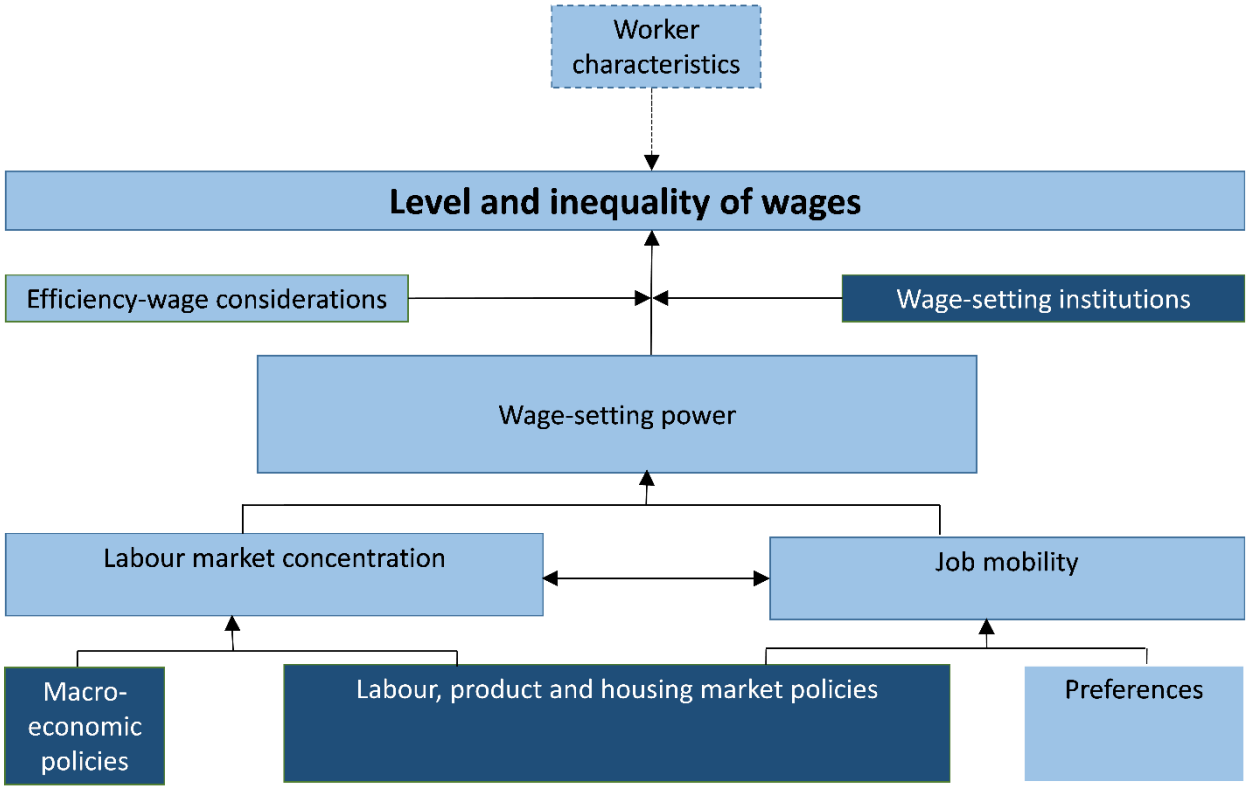
The next Section describes a conceptual framework linking public policies, wage-setting power and wages. Section 4.3 describes the linked employer-employee data used in the empirical analysis, as well as the methodology used to construct the measures of labour market concentration used in the descriptive and econometric analysis. Section 4.4 reports the descriptive evidence on labour market concentration across countries, industries, geographical areas and worker groups and over time. Section 4.5 presents the econometric results on the effects of labour market concentration on wages across worker groups and over time. Section 4.6 concludes and discusses the implications of the analysis for public policy.

4.2. Conceptual framework

Workers' wages are determined by their individual characteristics, such as qualifications, experience and gender, but also by the degree of firms' wage-setting power (Figure 4.1). Wage-setting power arises when workers have only limited job options due to a lack of available jobs in their relevant labour market and/or when there is limited labour mobility. A lack of available jobs may arise when hiring is concentrated among a small number of potential employers, or potential employers post few vacancies relative to the number of job seekers, for example during economic downturns. Even when there is no lack of job vacancies, workers may nonetheless have little options outside their current job if there is low job mobility. Job mobility may be limited for different reasons, e.g. because workers incur monetary costs (including search costs related to gathering information on job opportunities and their suitability) or due to preference-related non-

monetary costs from moving to a different firm, occupation, industry or region. Firms with wage-setting power can afford paying workers lower wages than other firms because only a fraction of its workers would quit to take up higher-paying jobs. This reduces average wages and can contribute to wage inequality.

Figure 4.1. Wage-setting power, wages and wage inequality



While limited job availability and/or labour market frictions give employers the power to set wages, they may choose or be legally constrained not to exercise it. For instance, firms may anticipate that employees perceive low wages as unfair and that they may consequently cut back on effort. This would reduce the firm's output and limit the gains from paying lower wages. In other words, the firm may not fully exercise its wage-setting power out of efficiency-wage considerations (Akerlof and Yellen, 1990[17]). Even if setting wages below workers' (marginal) productivity is optimal from the firm's point of view, institutional constraints such as minimum wages or collectively-agreed wage floors may prevent it from doing so (Azar et al., 2019[18]).[5] The measurement of wage-setting power thus faces the challenge of distinguishing between firms' potential to set wages below marginal productivity and the extent to which they actually use it.

The literature has traditionally measured wage-setting power by the labour supply elasticity to the individual firm. The rationale is that firms ultimately derive their wage-setting power from the fact that workers do not switch jobs in response to small wage differentials between firms. The labour supply elasticity encompasses both wage-setting power deriving from a limited number of employers in a given labour market ("classical monopsony") and from frictions in labour markets related to search and hiring costs ("modern monopsony") (Manning, 2020[16]). When there is a large number of effectively available employers, i.e. employment is not concentrated among a small number of firms and frictions are low, the labour supply elasticity is expected to be high, theoretically approaching infinity in the case of a perfectly-competitive labour market without frictions. By contrast, a much smaller labour supply elasticity is expected when there is only a small number of effectively available employers, indicating the presence of wage-setting power. On average across countries where data to estimate the labour supply elasticity are available, its estimated value is around 2, which is consistent with estimates from previous studies (Sokolova and Sorensen, 2020[13]) and implies significant wage-setting power (Annex Figure 4.B.1). However, estimates of the labour supply elasticity to the individual firm may be affected by significant measurement and endogeneity issues.

Complementing the traditional approach based on the labour supply elasticity, an emerging literature has approximated firms' wage-setting power by local labour market concentration (Schubert, Stansbury and Taska, 2020[11]; Azar et al., 2020[19]; Marinescu, Ouss and Pape, 2020[6]; Rinz, 2020[4]). Unlike the labour supply elasticity, labour market concentration is a partial measure of wage-setting power that does not account for search and hiring frictions. However, it can be directly observed in the data and allows analysing whether wage-setting power is actually exercised by employers by relating concentration to wages at the local labour market level, which is infeasible using the labour supply elasticity.[6] The remainder of the chapter therefore focuses on local labour market concentration.

4.3. Methodology and data

4.3.1. Methodology

Measuring labour market concentration

In contrast to product market concentration, which is often measured at the national level, labour market concentration is typically measured at the local level (Rinz, 2020[4]). Adding the geographical dimension accounts for the fact that there are large barriers to worker mobility across regions, with workers typically searching for new jobs in a local area within commuting distance from their home (Manning and Petrongolo, 2017[20]). By contrast, competition in product markets often takes place at the national or international levels. Indeed, in most OECD countries even local services (e.g. physical retail; hotels and restaurants) are often provided by national and multinational chains.[7]

The definition of a local labour market is too narrow if many workers can find alternative employment in another labour market (i.e. there is a high degree of worker mobility across local labour market boundaries), whereas it is too broad if many jobs within the local labour market are actually not accessible to workers. Ideally, boundaries of local labour markets are defined such that most jobs inside the same market are available to all workers in the market, while worker flows across markets are minimal (Nimczik, 2020[21]). Most of the literature has defined the relevant labour market at the level of occupation by commuting zone (Martins, 2018[9]; Marinescu, Ouss and Pape, 2020[6]; Schubert, Stansbury and Taska, 2020[11]) – the rationale being that there are fewer barriers to job mobility within occupations and within commuting zones. Another common definition of the local labour market is at the level of industries by commuting zones (Benmelech, Bergman and Kim, 2020[5]; Rinz, 2020[4]), reflecting the fact that worker mobility is typically much higher within industries than between them.[8]

The preferred definition of the local labour market used in this chapter is at the level of 3-digit industries (around 230) and TL3 regions (generally comparable to French *départements* or Spanish *provincias*). TL3 regions overlap with commuting zones but do not always coincide with them. The chosen definition of the local labour market represents a compromise between country coverage and a sufficiently narrow definition of local labour markets (Box 4.1). The main measure of local labour market concentration used in the analysis is the Herfindahl-Hirschman-Index (HHI).[9] The HHI can take values between 0 (when a large number of small firms accounts for very small shares of total hiring) and 10,000 (in the extreme case when a single firm dominates the entire market). Larger values thus indicate higher levels of concentration, with values above 2500 typically considered as indicating high concentration (Marinescu and Hovenkamp, 2019[22]; OECD, 2020[23]; OECD, 2019[24]).[10]

Box 4.1. Advantages and disadvantages of different measures of local labour market concentration

While job-to-job mobility is systematically higher within industries than between them, a disadvantage of focusing on industries rather than occupations is that the local labour market definition may be too broad, since workers might not have the required specialised skills or experience to access all occupations within an industry. For instance, not all jobs within a local manufacturing industry may be equally relevant for a machine operator and an engineer.

By contrast, local labour market definitions based on occupation may be too narrow, since relevant outside job opportunities can also arise outside a worker's current occupation. For instance, promotions often imply a change of occupational code but may nonetheless be available to workers at a lower level in the occupational hierarchy.

Ultimately, the quality of approximation of labour market boundaries by occupations or industries is an empirical question. Mobility within industries as a share of total job-to-job mobility is broadly similar to mobility within occupations, suggesting that industry and occupation-based definitions of local labour market concentration yield broadly similar approximations.[1] Moreover, for some occupations, industry and occupation-based definitions would yield very similar local labour markets (e.g. medical staff or teachers).

In terms of the geographical dimension, TL3 regions overlap with commuting zones but do not always coincide with them. However, working with TL3 regions has advantages especially for cross-country comparisons, as they are based on an internationally harmonised territorial grid. Given that TL3 regions generally correspond to lower-level national administrative boundaries (or groups thereof), they are available in most linked employer-employee datasets. Forming geographical boundaries along TL3 regions also has the advantage of allowing comparisons with the literature, which draws on region boundaries at similar levels.[2]

The analysis in this chapter mainly focuses on hiring concentration rather than employment concentration. Concentration in new hires (defined as workers who were not employed by the firm in the previous year) accurately reflects workers' current job options and bargaining position. By contrast, concentration in employment largely reflects past job options given that only a small minority of workers switch jobs every year, especially in relatively rigid labour markets (Marinescu, Ouss and Pape, 2020[6]).

Various alternative measures or extensions of the preferred definition of local labour market concentration are reported. This includes employment rather than hiring-based local labour market concentration and an alternative definition of the local labour market at the coarser 2-digit industry level but that allows concentration to vary by qualification level.[3]

Notes:
1. On average across the countries covered in this chapter, the rate of job switchers who remain within their industry is around 30% and the rate of those who remain within their occupation around 40%. Bassanini (2022[25]) use detailed occupations to define local labour markets and obtain similar estimates for the effect of labour market concentration on wages as the ones obtained in this chapter.
2. For example, Rinz (2020[4]) uses commuting zones with an average population of 450,000 for the United States. Martins (2018) uses districts with an average population of 340,000 for Portugal, which roughly correspond to TL3 regions.
3. Managers, Professionals, Technicians and Associate Professionals are mapped to high-skilled; Clerical Support Workers, Services and Sales Workers, Skilled Agricultural, Forestry and Fishery Workers, Craft and Related Trades Workers, Plant and Machine Operators, and Assemblers are classified as middle-skilled; and elementary occupations are mapped to low skilled.

Estimating the effect of labour market concentration on wages

In order to analyse the degree to which firms exercise their potential wage-setting power, wages are related to local labour market concentration based on the following equation:[11]

$$w_{ijmt} = \beta_1 HHI_{mt} + \theta_m + \mu_i + \rho_t + \varepsilon_{ijmt} \quad \text{Equation 4.1}$$

where *w* denotes wages; *HHI* the Herfindahl-Hirschman index of local labour market concentration; and ε_{ijmt} the error term. Subscripts *i*, *j*, *m* and *t* denote, respectively, workers, firms, local labour markets and years; and ρ_t year fixed effects. Worker fixed effects μ_i control for all time-invariant, individual determinants of wages, both observable and unobservable. This ensures that the estimated β_1 can be interpreted as the effect of concentration on the wages of similar workers. It further removes any potential endogeneity arising from a correlation between worker characteristics and concentration, such as a higher prevalence of low-qualified workers in highly concentrated regions and industries.[12]

Another econometric concern that needs to be addressed is the possible spurious correlation between concentration and wages at the level of local labour markets. For example, urban areas might attract a larger number of firms – leading to lower concentration – and may at the same time be more productive, for instance due to agglomeration effects (Glaeser, 2010[26]). The inclusion of local labour market fixed effects θ_m allows controlling for time-invariant omitted factors that may be correlated with both wages and concentration at the local labour market level. In other words, labour market fixed effects allow isolating the pure market power effect of labour market concentration from the effect of other factors that may be correlated with concentration and also affect wages, such as average productivity or average firm size in the local labour market.

By construction, the inclusion of local labour market fixed effects cannot address endogeneity issues related to time-varying omitted factors, such as productivity shocks (rather than productivity levels) that may be correlated with both concentration and wages at the local labour market level. For instance, an unobserved positive productivity shock in a local labour market may lead to market entry of new firms, reduce concentration and raise wages. This would bias the estimated coefficient on local labour market concentration down, leading to an estimated coefficient that is more negative than the true wage effect of concentration and thus overstating the effect of concentration on wages.

The potential bias from unobserved productivity shocks is addressed by using an instrumental variable for local labour market concentration. Following seminal studies in the academic literature (Martins, 2018[9]; Marinescu, Ouss and Pape, 2020[6]; Azar et al., 2019[18]), the average inverse number of firms in the same year and industry but in other regions, weighted by industry-employment shares of each region, is used as an instrumental variable. The rationale is that the number of firms in a market is strongly and inversely related to concentration but unrelated to productivity shocks to individual firms. Unlike potential instrumental variables that are a function of firm size (such as average concentration in the same industry but other regions), this variable has the advantage of being invariant to productivity shocks to individual firms.[13]

The analysis is conducted separately on individual-level data for each country in a distributed micro data approach. In contrast to individual-level data that are subject to strict confidentiality restrictions in many countries, aggregate and semi-aggregate descriptive statistics and regression results based on the micro data can generally be distributed. Country-level estimates are averaged following established procedures for the statistical aggregation of regression estimates.[14]

4.3.2. Data

The analysis in this paper is based on a newly created harmonised cross-country dataset based on linked employer-employee data that provide information on employees and the firms where they work. The data cover the universe of workers (or a large representative sample) in each country and are of very high quality (Criscuolo et al., 2020[27]), which allows calculating precise measures of labour market concentration. The availability of employee information furthermore allows controlling for worker characteristics when estimating the effect of concentration on wages. In particular, linked employer-employee data allow accurately measuring concentration not only in employment but also in hiring, which is not possible with firm-level data alone.[15] New hires are identified from workers switching firms for their main job. All country datasets contain a core set of comparable information on workers (wage, gender, age and location) and firms (industry and size). Most datasets also contain a number of additional relevant variables, such as hours worked, occupation and education, but there are large differences in availability and detail. The main results presented in this paper rely on the core set of comparable characteristics. Additional analysis as well as a large set of robustness checks exploit the more detailed information for different subsets of countries.

The analysis requires making a number of data harmonisation choices. A basic prerequisite for measuring labour market concentration in a specific local labour market is the availability of information on the firm's industry (at the 3-digit level) and information on the location of the worker at the level of TL3 regions, corresponding roughly to provinces (e.g. *provincias* in Spain or *départements* in France) or groups of smaller units such as counties or districts (e.g. in Austria).[16] The wage regressions are based on monthly wages.[17]

The main analysis based on the local labour market definition at the 3-digit industry and TL3 region level covers seven countries over a period from the early 2000s up to 2017.[18] Where these detailed levels are unavailable, a number of descriptive results are reported at a coarser level of aggregation (2-digit industry or TL2 region) for a maximum of 11 countries.[19] The analysis covers dependent employees in all sectors of the private economy other than agriculture, mining and utilities. This covers on average 97% of total private sector employment.[20] Industries are classified according to the International Standard Industrial Classification (ISIC), revision 4. TL3 regions are classified into rural and urban according to a harmonised classification by Fadic et al. (2019[28]).[21]

4.4. Results

4.4.1. A snapshot of labour market concentration across countries

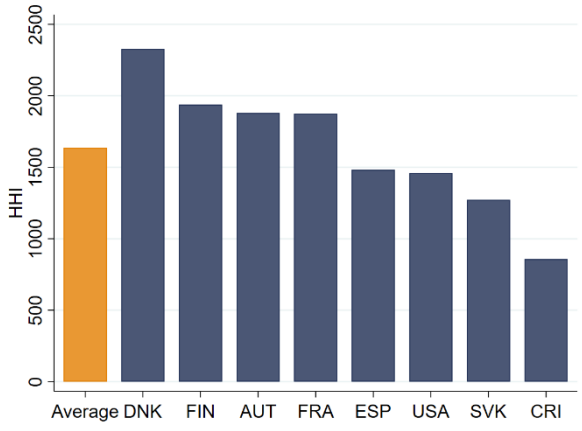
On average across countries, local labour markets are moderately concentrated but around 20% of workers are employed in markets with high levels of concentration (Figure 4.2). The cross-country average of local labour market concentration for the average worker as measured by the employment-weighted HHI is around 1600 (Panel A), which is the threshold conventionally used in merger reviews to indicate moderate sales concentration (US Justice Department and the Federal Trade Commission, 2010[29]). Moreover, around 20% of workers are employed in highly concentrated labour markets (based on the conventional threshold of an HHI above 2500). This share is substantially higher in Austria, Denmark, Finland and France (Panel B).

Figure 4.2. Local labour market concentration across countries

Employment-weighted HHI, 2015

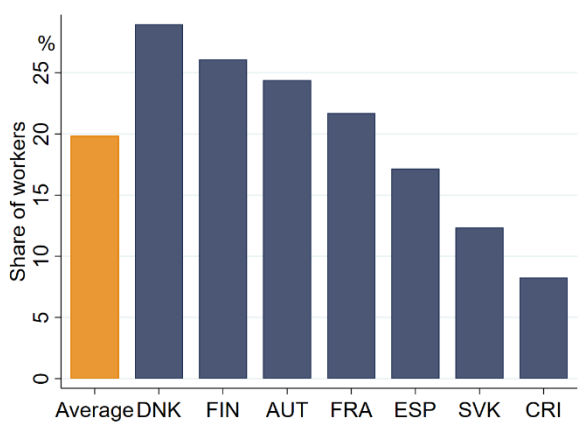
Panel A.

Hiring concentration, employment-weighted, 2015



Panel B.

Share of workers with HHI above 2,500 in 2015



Note: The Figure shows statistics based on the HHI in hiring in 2015 at the level of local labour markets defined by 3-digit industries and TL3 regions. Panel A shows the average employment-weighted HHI. Panel B shows the share of workers in markets with an HHI above 2,500. The primary and utilities sectors, public administration and defence are excluded. Data for the USA refer to the weighted average HHI of employment concentration in local labour markets defined by 4-digit NAICS industries and commuting zones. The share of workers with HHI above 2,500 is not available for the United States.

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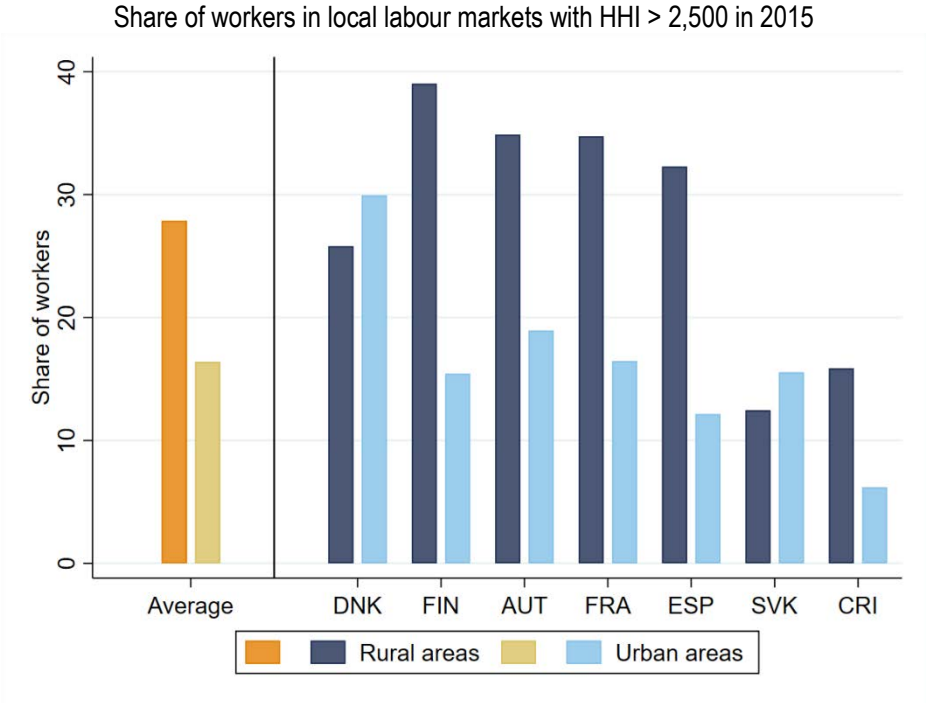
Cross-country differences in local labour market concentration can reflect structural differences between countries, but may also be due to differences in the average size of TL3 regions. For instance, in some countries, such as Austria and Finland, average employment of TL3 regions is lower than in other European countries; whereas in Costa Rica, it is higher. This may introduce an upward bias in measured concentration in Austria and Finland relative to the other countries. Given the measurement challenges characterising cross-country comparisons of concentration levels, the remainder of the paper focuses on within-country differences in concentration across geographical areas, industries, worker groups and over time rather than on cross-country differences in local labour market concentration.

The share of workers exposed to high local labour market concentration in rural areas (around 30%) is twice as large than in urban ones (around 15%) (Figure 4.3). In rural areas, there are fewer job opportunities for workers in any given industry due to a limited number of potential employers. In urban areas, there are significantly more job opportunities, as firms generally tend to locate close to large population centres to access a larger pool of workers and consumers and benefit from agglomeration economies (Glaeser, 2010[26]). In some industries, firms also tend to co-locate with firms in the same or closely related industries, generally in urban areas, thereby expanding job opportunities for workers with industry-specific skills (Moretti, 2013[30]). While the rural-urban differential in local labour market concentration holds for most countries covered by the analysis, in Denmark and in the Slovak Republic concentration is lower in rural than urban areas. This may reflect the fact that in these countries a number

of very large employers, in particular multi-national firms, account for a very large share of employment in the capital region.

Figure 4.3. A high share of workers in rural areas is exposed to high concentration



Note: Local labour markets are defined by new hires in 3-digit industries and TL3 regions. The urban vs. rural classification follows Fadic et al. (2019[28]). The primary and utilities sectors, public administration and defence are excluded.

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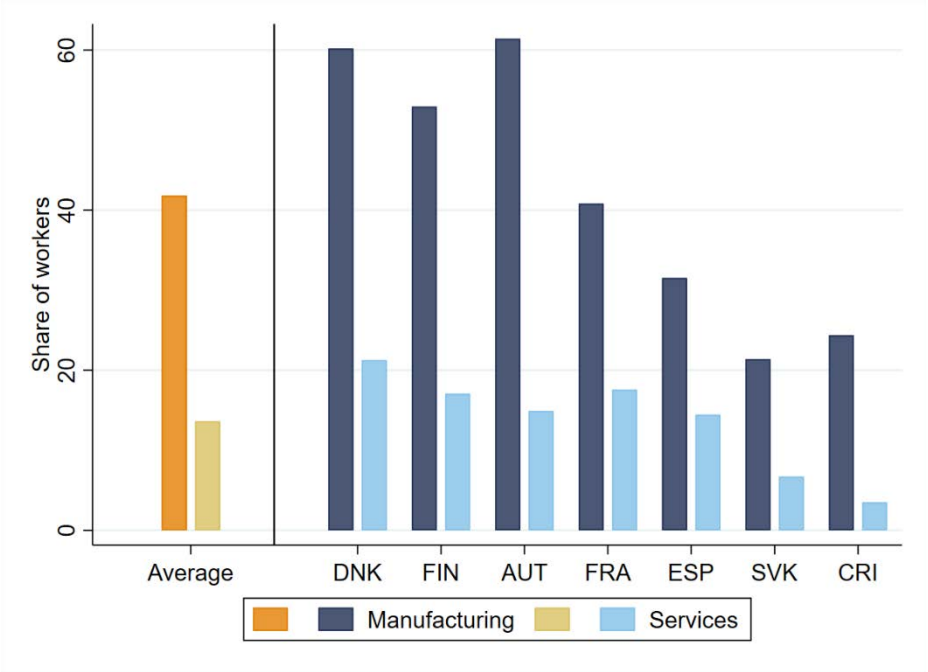
A significantly higher share of manufacturing workers (around 40%) than services workers (around 15%) is employed in highly-concentrated labour markets (Figure 4.4). Manufacturing is generally more geographically concentrated than services, which can be explained by larger scale economies in manufacturing and higher tradability (Gervais and Jensen, 2019[31]). For instance, the benefits for an automobile firm to locate close to its customers is small since scale economies are large and automobiles can be shipped to the location of final demand at low cost. By contrast, even though in some digitally-intensive services sectors economies of scale are becoming increasingly important and remote provision is becoming more feasible, in many services sectors economies of scale remain limited and provision still requires physical presence.[22]

The rural-urban differential in local labour market concentration holds within industries and the manufacturing-services differential holds within regional groups (Annex Figure 4.A.1). This suggests the concentration differentials reported above cannot be explained by a higher tendency of manufacturing firms to locate in rural areas with higher levels of concentration.

Figure 4.4. A high share of manufacturing workers is exposed to high concentration

Share of workers in local labour markets with HHI > 2,500 in 2015



Note: Local labour markets are defined by new hires in 3-digit industries and TL3 regions. The primary and utilities sectors, public administration and defence are excluded.

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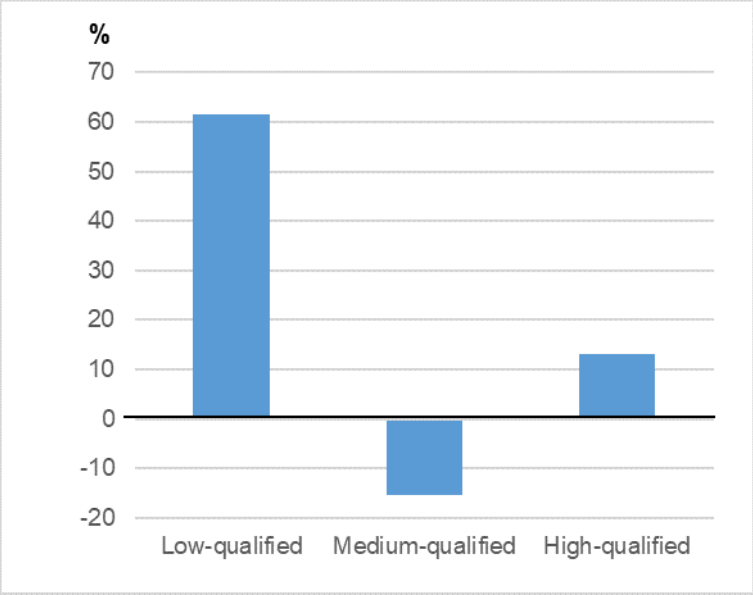
Low-qualified workers tend to face significantly higher concentration within their local labour markets (Figure 4.5).[23] The lack of a link between a local labour market's workforce composition and its degree of employer concentration partly reflects the fact that a high share of low-qualified workers are employed in low-concentrated urban services sectors. By contrast, within their local labour markets, i.e. within a given industry and geographical area, low-qualified workers generally have a smaller number of job options than their medium and high-qualified peers. Exposure to local labour market concentration appears to be lowest for medium-qualified workers. The ratio of concentration for low-qualified workers relative to the mean reported in Figure 4.5 implies that the average low-qualified worker is employed in a moderately concentrated labour market with an HHI of around 2400, whereas the average medium-qualified worker is employed in a low-concentrated local labour market with an HHI of around 1300.[24]

Figure 4.5. Low-qualified workers are exposed to higher concentration than medium and high qualified workers

Deviations from average local labour market concentration, in %, 2015



Note: For the purpose of this analysis, local labour markets are defined at the 2-digit industry by TL3-level by worker qualification level, i.e. bars can be interpreted as deviations from the employment-weighted average of hiring concentration *within* local labour markets defined at the 2-digit industry by TL3-level. Deviations due to differences in employment shares of different qualification groups *between* local labour markets, i.e. workforce composition effects, are around one order of magnitude smaller and reported in Annex Figure 4.A.6.The analysis cannot be conducted at the 3-digit industry by TL3 by worker qualification level due to confidentiality restrictions related to excessively small 3-digit-TL3-qualification cells in a number of countries. Qualification groups are based on occupation or education. Included countries: Costa Rica, Finland, Spain, France and Slovakia (Information on worker qualification is unavailable for Austria).

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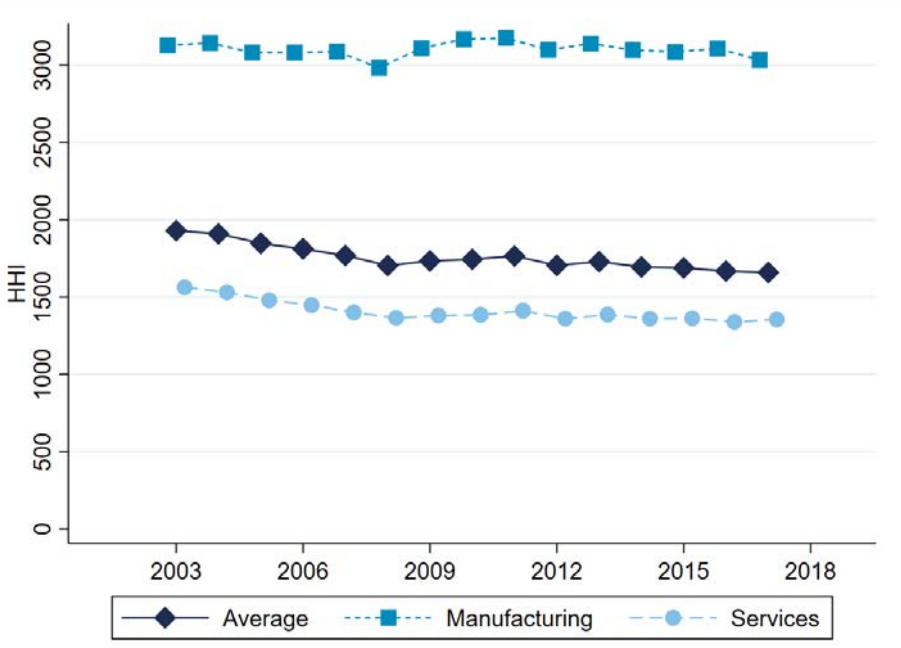
The patterns in local labour market concentration documented at the 3-digit industry by TL3 region local labour market level are robust to alternative definitions. Defining local labour markets in terms of employment rather than hiring has no quantitative effect of at the level of concentration (Annex Figure 4.A.5). Data available for less detailed aggregations of industry and/or region for a larger sample of 11 countries are reported in Annex Figure 4.A.6. While the cross-country pattern of concentration documented above is broadly similar to the one in Figure 4.2, the measured levels of the HHI decrease at this more aggregate local labour market definition, reflecting a mechanical increase in the number of firms when regions or industry boundaries are expanded.

4.4.2. Trends in labour market concentration

There is no evidence of an increase in local labour market concentration over the period 2003-2017. Averaging across countries, there is a slight decline until 2008 and a broadly stable trend since (Figure 4.6). The initial decline in local labour market concentration is mainly driven by Finland and Spain, which may partly be explained by the rapid shift from manufacturing to lower-concentrated services in these countries in the run-up to the global economic crisis of 2008-09. But changes in industry composition do not appear

to be the sole explanation for this initial decline, given that concentration has declined even within services.[25]

Figure 4.6. Local labour market concentration has tended to decline



Note: The lines are based on the simple average of country-level growth rates in the HHI (rather than levels) to account for changes in country composition over time. Local labour markets are defined by new hires in 3-digit industries and TL3 regions. Included countries: Austria, Denmark and Spain (2003-17); Costa Rica (2007-17); Finland (2005-16); France (2003-16); United States (2003-15). The Slovak Republic is not included in the figure due to insufficient year coverage (2014-2017). For detailed definition in the USA, see note of Figure 4.2.

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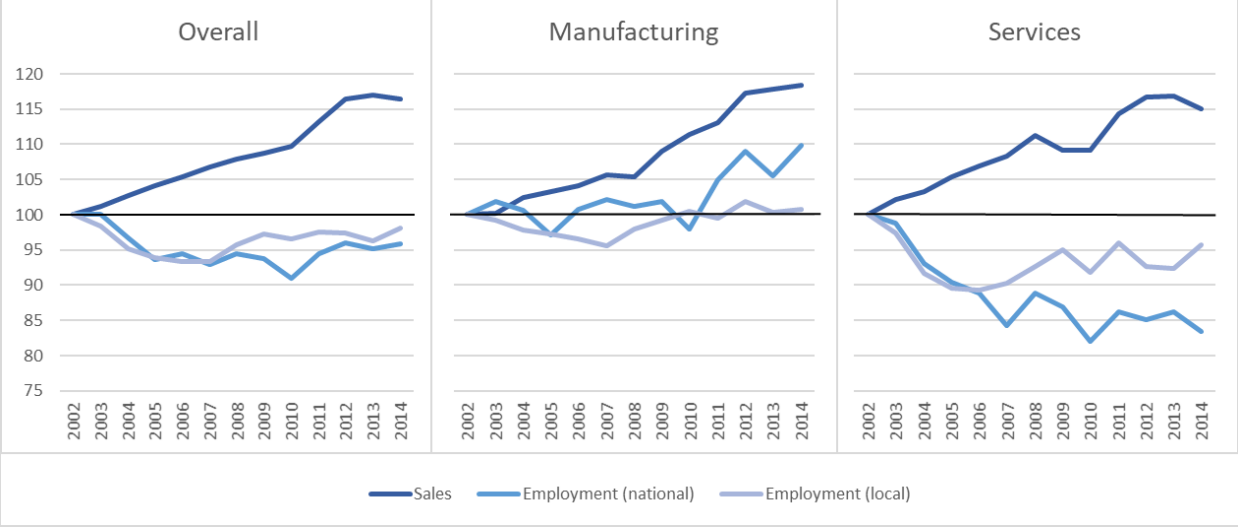
The trend decline in local labour market concentration has occurred despite an increase in sales concentration over the past two decades. Available measures of sales concentration typically refer to industry sales at the national level, whereas local labour market concentration is measured as hiring or employment. This suggest that there are two possible explanations for the observed decoupling of local labour market concentration from national sales. Firstly, national employment concentration may have decoupled from national sales concentration if firms are increasingly able to scale up production without increasing employment, including through domestic and international outsourcing. Secondly, local employment concentration may have decoupled from national employment concentration, which may for instance be the case if large national employers increasingly enter each other's local labour markets (Rinz, 2020[4]).[26] Box 4.2 suggests that the main explanation is the decoupling of national employment concentration from national sales concentration.

Box 4.2. Links between sales and employment concentration

The evidence reported above suggests that local labour market concentration has tended to decline over the past 20 years despite existing evidence of an increase in sales concentration (Bajgar et al., 2019[1]). There are several possible explanations for this decoupling.

One possible explanation is that sales concentration is typically measured as a concentration ratio at the *national* level, e.g. the ratio of sales of the eight largest firms in an industry relative to all firms, whereas employment concentration in this chapter is measured as the HHI at the *local* labour market level. However, re-expressing labour market concentration as a concentration ratio and distinguishing between national and local concentration suggests that the decoupling has mainly occurred at the national level, especially in services (Figure 4.7, Panel A).

Figure 4.7. Trends in national sales and employment concentration (2002=100)



Note: Sales and employment concentration are measured by the CR8, i.e., the concentration ratio measuring the sum of the market share (in sales and employment) held by the largest eight firms in an industry. The CR8 is measured at the 2-digit industry level (2-digit industry by TL3 region for local labour market concentration) to maintain consistency in measurement between employment and sales concentration, for which other measures of concentration are unavailable. The data are unweighted averages across industries and countries (local labour market concentration has been averaged across regions using employment weights within industries in a first step). Time series have been normalised to 100 in 2002. Included countries: Denmark, France, Hungary, Italy, Portugal and Spain.
Source: Bajgar et al. (2019[1]).

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The decoupling of employment concentration from sales concentration at the national level could reflect the fact that the top eight firms in terms of employment are not necessarily the same as the top eight firms in terms of sales. High-sales firms tend to have higher labour productivity and thus smaller workforces at any given level of sales (Autor, Katz and Van Reenen, 2020[32]; Andrews, Criscuolo and Gal, 2016[33]). Consequently, an expansion of sales of the top eight firms in terms of sales does not necessarily translate into an expansion of employment of the top eight employers, especially in sectors where sales can be scaled up without expanding employment, which tends to be the case in a number of intangible- and digitally-intensive services industries.

Another possible explanation of the decoupling of national employment concentration from national sales concentration is related to the degree to which leading firms may domestically or internationally outsource activities to other firms. Removing labour-intensive tasks from firms' production processes effectively decouples developments in sales from employment.

Sales and employment concentration are more closely linked in manufacturing than in services (Figure 4.7, Panels B and C). This is consistent with evidence of a robust productivity-size premium in manufacturing despite increased domestic and international outsourcing but a weaker (and weakening) productivity-size premium in services (Berlingieri, Calligaris and Criscuolo, 2018[34]).

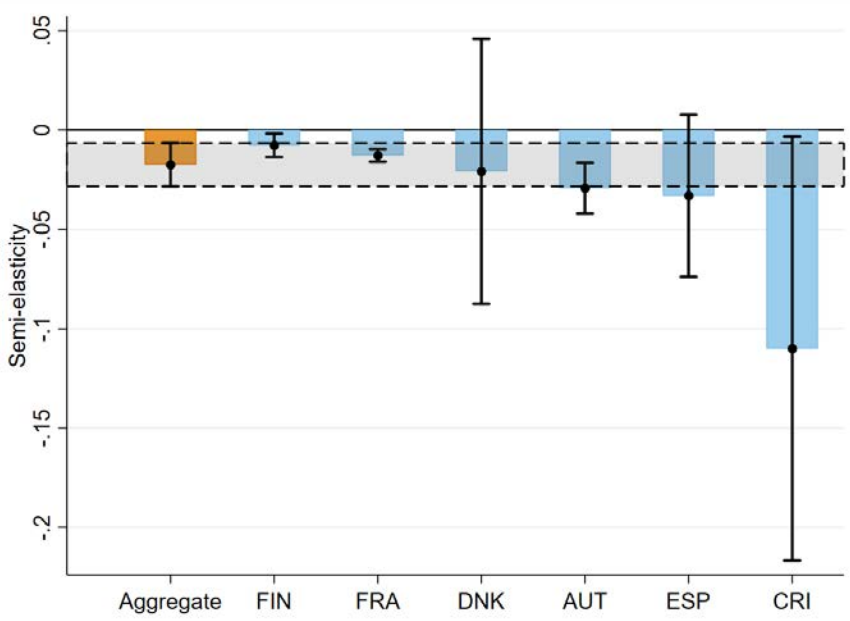
4.5. The effect of labour market concentration on wages

Local labour market concentration has a significantly negative effect on wages, even after accounting for differences in workforce composition and productivity across local labour markets (Figure 4.8). In other words, a worker employed in a highly-concentrated local labour market earns a significantly lower wage than a worker with similar characteristics in a low-concentrated market with similar average productivity. On average across countries, the mean reduction in wages from a 1,000 point increase in the HHI is around 2%, which is broadly in line with existing estimates from country-level studies relying on occupation-by-region based local labour market definitions (Martins, 2018[9]; Marinescu, Ouss and Pape, 2020[6]).[27] While all country-level coefficients estimated from Equation 4.1 are negative as predicted by theory, some of them are estimated with large error, which precludes direct cross-country comparisons.[28] Consequently, the remainder of the section focuses on the average cross-country effect.

Based on the estimated average cross-country effect of concentration, wages at the 90th percentile of employment-weighted local labour market concentration (i.e. the 90th percentile of workers rather than the 90th percentile of local labour markets) are 7% lower than at the 10th percentile (Annex Table 4.A.2). On average across countries, for workers at the 90th percentile the value of the HHI is about 4000, whereas for workers at the 10th percentile it is around 150. Based on the average wage effect reported in Figure 4.8, this difference in labour market concentration translates into an economically significant wage difference of 7%. The implied wage difference would be even larger (around 16%) between workers at the 90th and 10th percentiles of the unweighted concentration distribution, given that concentration is typically highest in small markets with low employment.

Figure 4.8. Local labour market concentration significantly reduces wages

Effect of a 1,000 point increase in the HHI, based on Equation 4.1, 2000-2015



Note: Light blue bars represent country-level point estimates of an instrumental variables regression of log wages on local labour market concentration (Equation 4.1). Preferred estimates correspond to column 3 (AUT), column 7 (CRI), column 11 (ESP), column 16 (FIN), column 19 (FRA) and column 23 (DNK) of Annex Table 4.A.1. The Slovak Republic is not included in the wage regressions due to insufficient year coverage (2014-2017). All estimated models include local labour market, worker fixed and year fixed effects. The estimated model for Finland additionally includes firm fixed effects to control for omitted firm-level factors that may be correlated with concentration even after controlling for market fixed effects, such as firm-level productivity (in the other countries, including firm fixed effects yields virtually identical estimates as excluding them). The aggregate coefficient (-0.018) is a weighted average of the individual country-level estimates, with weights taking into account both the estimation error within each country, and the between-country variation in estimates (Stanley, 2001[35]). The whiskers correspond to 95% confidence intervals, the horizontal grey band corresponds to the 95% confidence interval of the aggregate coefficient [-0.028 -0.007]. The aggregate coefficient implies that a 1,000 point increase in the HHI reduces wages by 1.8%.

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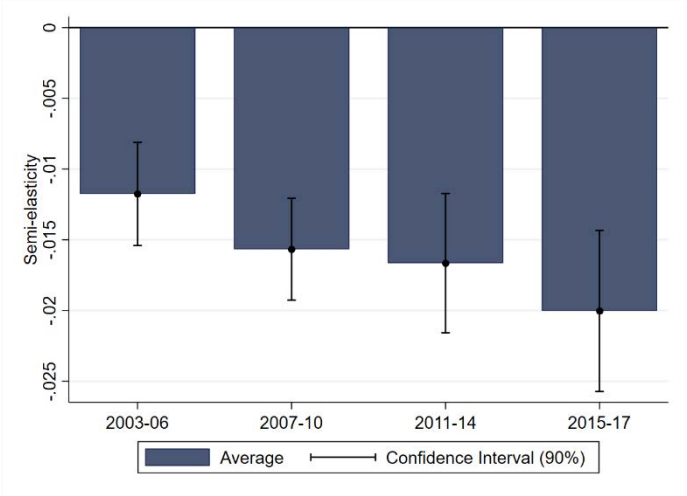
The wage effects of local labour market concentration tend to be driven by low-qualified workers (Annex Table 4.A.3). On average across the three countries for which disaggregated coefficients by skill group can be estimated, the wage effect for low- and medium- qualified workers of a 1,000 point increase in the HHI is about 2% whereas the effect for high-skilled workers is close to zero.[29] At the same time, low-qualified workers face about 40% higher local labour market concentration than high-qualified ones. Combining the effects on low-qualified workers' wages from the stronger wage response to concentration with the higher exposure to concentration suggests that labour market concentration reduces low-qualified workers' wages by around 6% relative to those of high-skilled ones.

The negative wage effect of labour market concentration has tended to become stronger over time (Figure 4.9). The estimated wage effect is about twice as strong in 2015-2017 than in 2003-2005, with the difference being statistically significant at the 5% level. The increasingly negative wage response to concentration suggests that firms are increasingly exercising their wage-setting power. To some extent, this could reflect the weakening of workers' bargaining position due to changes in wage-setting institutions

such as minimum wages and collective bargaining, or increased exposure to domestic and international outsourcing (Abel, Tenreyro and Thwaites, 2018[7]).

Figure 4.9. The negative wage effect of concentration has tended to strengthen over time

Effect of a 1,000 point increase in the HHI, based on Equation 4.1



Note: Each bar represents the average of year-by-year country level estimates of the semi-elasticity of concentration on wages, for a block of four years each (3 years for the final block). The aggregate coefficient is a weighted average of the individual country-level estimates, with weights taking into account both the estimation error within each country, and the between-country variation in estimates (Stanley, 2001[35]). Each regression uses a cross-section of worker-firm data and controls separately for region, industry and year fixed effects. The 90% confidence intervals take into account both the estimation error within each country, and the between-country variation in estimates. Included countries: Austria, Costa Rica, Denmark, Finland, France and Spain.

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4.6. Policy implications and concluding remarks

The analysis in this chapter covers the degree of labour market concentration, the extent to which it varies across different segments of the labour market and over time, as well as its effects on wages. The main results are that (1) on average across the covered countries a significant share of workers (around 20%) are employed in highly-concentrated labour markets, especially in manufacturing and rural areas; (2) labour market concentration has negative effects on wages; (3) wage effects from labour market concentration tend to be particularly negative for low-qualified workers; and (4) wage effects have tended to become more negative over time. These results can potentially inform a range of public policy areas.

The high degree of labour market concentration for a significant share of workers and the increasingly negative effect of concentration on wages suggest that wage-setting policies may play a useful role in counter-balancing wage-setting power. In a labour market where firms have a high degree of wage-setting power, statutory or collectively-bargained wage floors can increase wages without reducing employment by limiting firms' scope to reduce wages below workers' reservation wages (Card and Krueger, 1994[36]; Manning, 2020[16]; OECD, 2019[37]; OECD, 2018[38]).[30] In a number of OECD countries, the real value of the minimum wage and the share of workers covered by collective bargaining agreements have tended to decline over the past decades, suggesting room for policy action.

Wage-setting policies may become particularly relevant in the context of the emergence of digital platforms that have gained dominant positions in some local labour markets. Many digital platforms, including in ride-hailing, food delivery and retail, rely mainly on low-skilled self-employed workers for whom the wage effects of local labour market concentration are particularly negative.[31] Collective bargaining over wages and working conditions on the part of these self-employed workers should not be prevented by the undue application of non-collusion clauses in competition law (OECD, 2020[23]).

A high degree of wage-setting power may also indicate the need for public policies to directly address labour market concentration, especially in a context where collective bargaining is under pressure, trade union density is declining and "winner-takes-most" dynamics are emerging in some sectors of the economy. In many jurisdictions, competition authorities already have the legal mandate to include labour market power as a consideration in reviews of mergers and acquisitions (OECD, 2020[23])). One way to operationalise labour market power in merger reviews is to define a threshold above which a labour market is considered to be highly concentrated, which would then trigger further investigation (Marinescu and Hovenkamp, 2019[22]). Even though the analysis in this chapter suggests that increasing product-market concentration does, on average, not imply higher labour market concentration, anecdotal evidence nonetheless suggests that, in some sectors of the economy, increased product market concentration has been associated with increased labour market concentration. For instance, large digital platforms in the transport and retail sectors have become dominant employers in some local labour markets.

Excessive wage setting power may further be tackled by policies to promote voluntary job mobility, which would increase the job options effectively available to workers. While job mobility is partly determined by individual preferences over non-wage job characteristics, monetary costs to mobility can be influenced by public policies. Such costs could, for instance, be reduced by strengthening active labour market policies; improving the portability of benefits; regulatory action that reduces legal or contractual barriers to job mobility (occupational licensing, non-compete and non-poaching agreements, portability of workers' ratings across digital platforms); and through housing and transport policies. The uptake of telework has effectively expanded the geographical boundaries of worker's job options but teleworkable jobs and occupations are typically located at the top of the skill distribution (OECD, 2021[39]; Espinoza and Reznikova, 2020[40]). While policies to support telework would thus tend to raise average wages, they may further widen the gap between workers at the top and the rest of the wage distribution.

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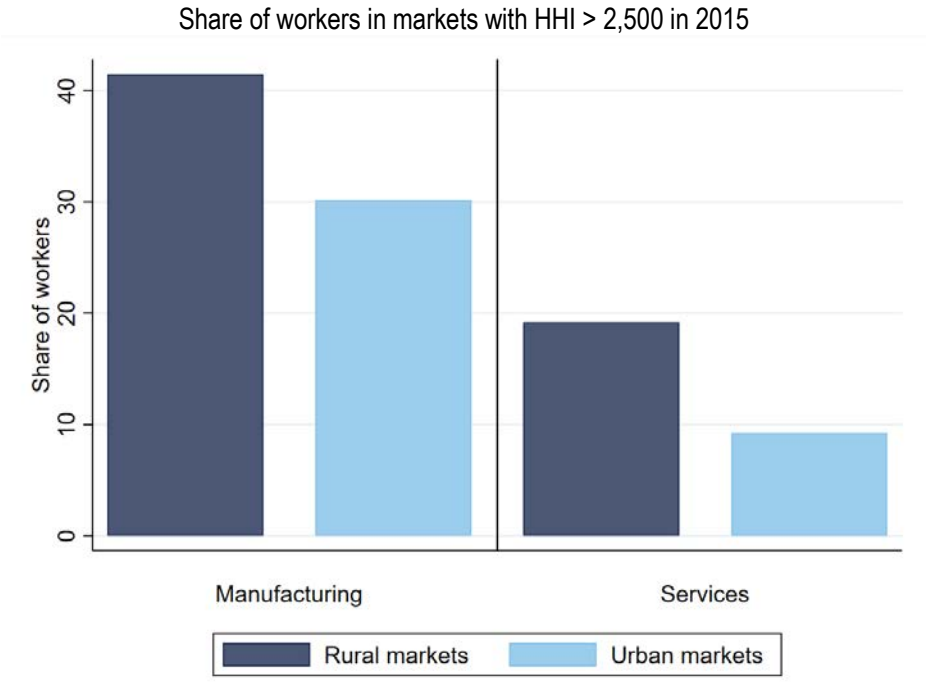
Annex 4.A. Labour market concentration in OECD countries: Implications for wages and inequality

Additional Figures

Annex Figure 4.A.1. Local labour market concentration across sectors and regions



Note: The Figure shows the share of workers in local labour markets with an HHI above 2,500. Local labour markets are defined by 3-digit industries and TL3 regions. Markets are grouped by the broad sector to which the underlying 3-digit industry belongs, and by the rural/urban status of the region the market is located in. Average across six OECD countries: Austria, Costa Rica, Finland, France, Spain, Slovakia. Denmark is not included as data at the industry-by-region level are unavailable due to confidentiality restrictions. The primary and utilities sectors, public administration and defence are excluded.

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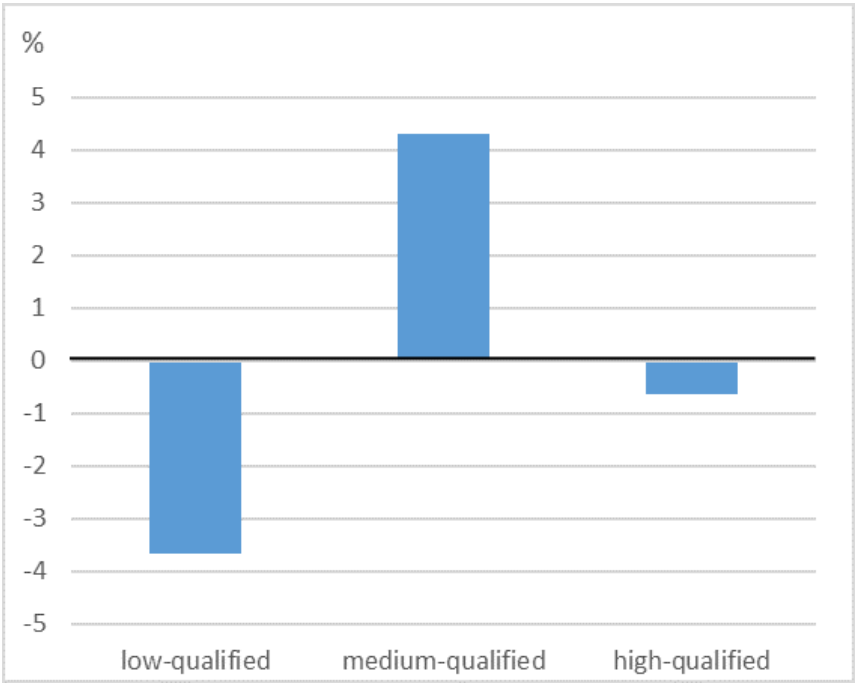
Annex Figure 4.A.2. Low-qualified workers do not systematically worker in higher-concentrated local labour markets

Deviations from average local labour market concentration, due to differences in concentration between local labour markets, %



Note: The bars show deviations from average local labour market concentration that are due to differences in employment shares of different qualification groups between local labour markets (3-digit industry by TL3 region) assuming that there are no differences in concentration within local labour markets. In this sense, they can be interpreted as the between local labour market component of differences in exposure to concentration between skill groups. The within component is reported in Figure 4.5. Included countries are Costa Rica, Finland, France, Slovakia and Spain (Information on worker qualification is unavailable for Austria).

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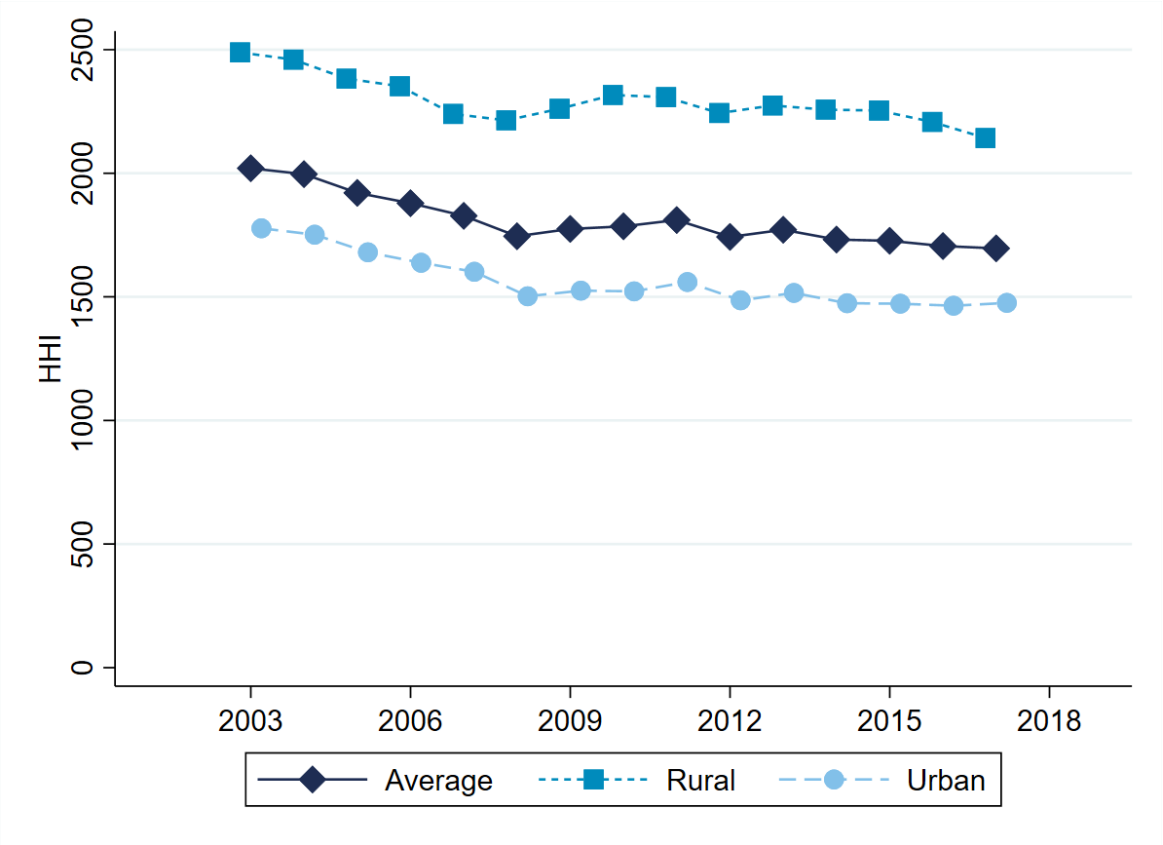
Annex Figure 4.A.3. No diverging trends in concentration across geographical areas

Trend in hiring concentration in the average country, 2003-2017



Note: This Figure shows the average evolution between 2006 and 2015 of the HHI in hiring across 5 countries where concentration at the 3-digit industry by TL3 region level is available by sector and region: Austria, Costa Rica, Denmark, Finland, France, and Spain. Each diamond shows the HHI in a synthetic country where concentration follows the same time trend and has the same 2015 average as this group of countries. Rural and urban regions are defined as in Figure 4.2. Data for Austria, Denmark and Spain cover the whole period; Costa Rica is 2007-2017, Finland 2005-2016, France 2003-2016. The Slovak Republic is not included in the figure due to insufficient year coverage (2014-2017); the United States are not included because labour market concentration has not been disclosed at the level of individual regions for all years.

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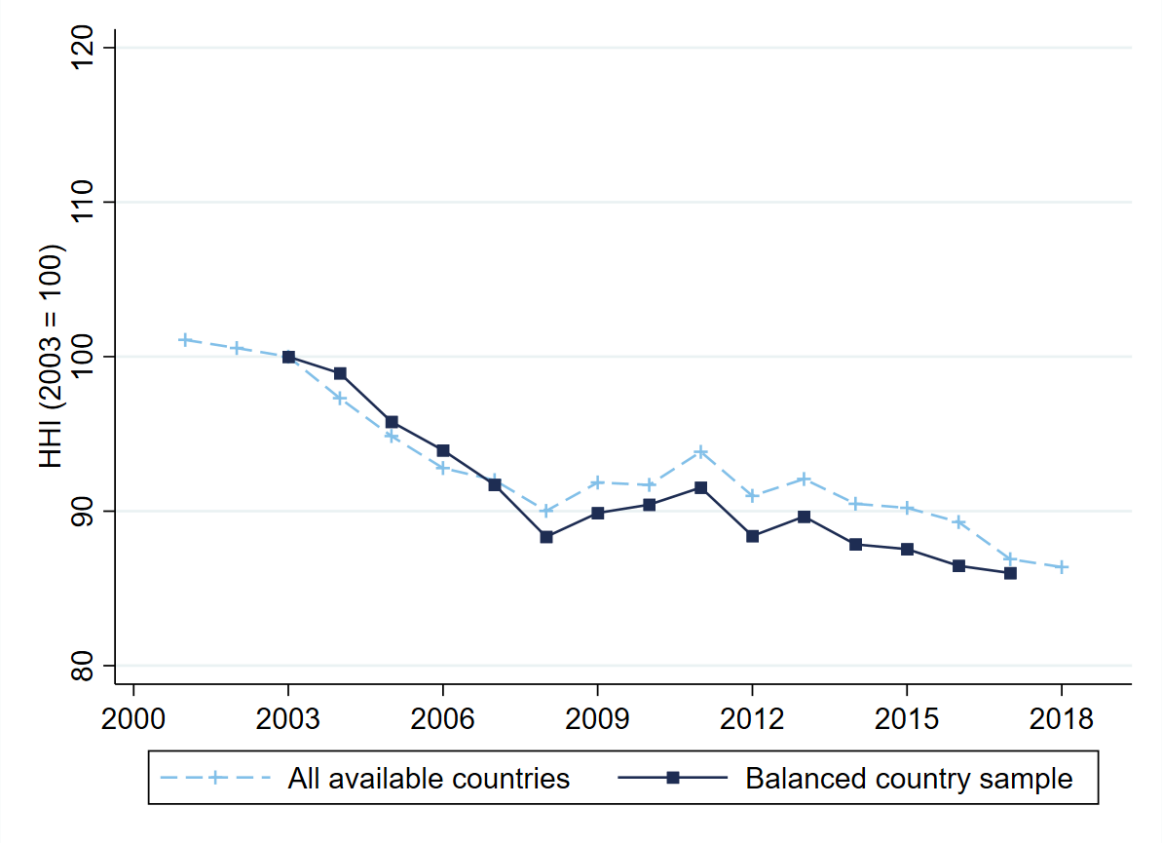
Annex Figure 4.A.4. Trends in labour market concentration in a larger country sample

Trend in hiring concentration in the average country, 2003-2017



Note: This Figure shows the average evolution between 2001 and 2015 of the HHI in hiring across all countries where data are available, and for the balanced country sample shown in Figure 4.5. Each time series is normalised in 100 in 2003 to facilitate comparison of trends. Periods covered: 2001-2018 (Austria), 2007-2018 (Costa Rica), 2003-2017 (Denmark), 2005-2016 (Finland), 2002-2017 (France), 2003-2017 (Portugal), 2002-2018 (Spain), 2015-2018 (Slovak Republic), 2001-2015 (United States).

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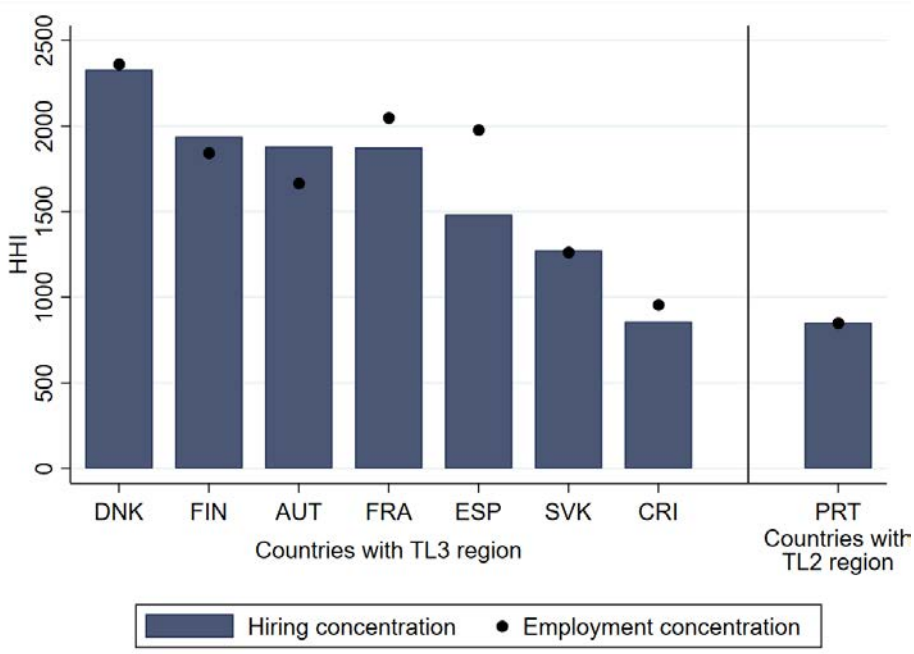
Annex Figure 4.A.5. Hiring and employment HHI are identical in almost all countries

Levels of hiring and employment concentration, 2015



Note: This Figure shows the average of the HHI in hiring and employment across all countries where data are available. In Portugal, only large TL2 regions are available. Data for Austria, Costa Rica, Denmark, Finland, Portugal and the Slovak Republic comprise the population of all workers and hires; representative samples of workers are drawn in France (8.4% random sample) and Spain (4%).

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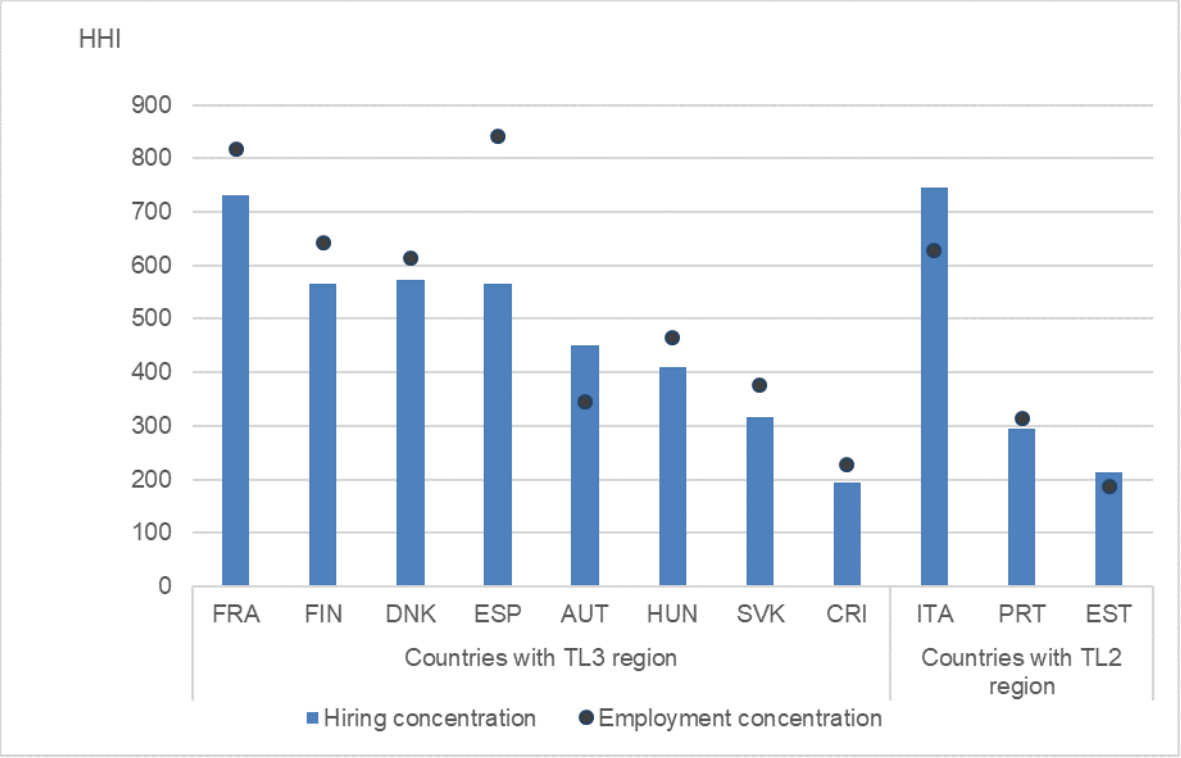
Annex Figure 4.A.6.Coarser definitions of local labour markets exhibit similar patterns

Hiring and employment concentration, local labour markets at the 2-digit industry by region level, 2015



Note: This Figure shows the average of the HHI in hiring and employment across all countries where data are available, for local labour markets defined by 2-digit industries and regions. For countries where the more detailed regional grid (TL3-level) is unavailable (Estonia, Italy, and Portugal), concentration is calculated over the smallest regional grid available in the data. This is the TL2-level for Portugal, Italy, and Estonia (where the TL2 level corresponds to the national level).

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Additional Tables

Annex Table 4.A.1. Results from wage regression estimation

Results from country-level instrumental variables fixed effects regressions on worker-firm micro data

Dependent variable	Log monthly wage											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Country	**AUT**				**CRI**				**ESP**			
Beta	-0.177***	- 0.131	**-0.313*** **	-0.292***	-0.435***	-0.157	**-1.100** **	-0.880*	-0.487***	-0.047	**-0.332**	-0.204
Standard error	(0.048)	(0.087)	**(0.074)**	(0.065)	(0.167)	(0.485)	**(0.544)**	(0.467)	(0.138)	(0.194)	**(0.211)**	(0.249)
Observations	43.5M	43.5M	**43.5M**	43.5M	6.2M	6.2M	**5.9M**	5.9M	5.9M	5.9M	**5.7M**	5.6M
Industry fixed effects	Yes	No	**No**	No	Yes	No	**No**	No	Yes	No	**No**	No
Region fixed effects	Yes	No	**No**	No	Yes	No	**No**	No	Yes	No	**No**	No
Year fixed effects	Yes	Yes	**Yes**	Yes	Yes	Yes	**Yes**	Yes	Yes	Yes	**Yes**	Yes
Industry-region fixed effects	No	Yes	**Yes**	Yes	No	Yes	**Yes**	Yes	No	Yes	**Yes**	Yes
Worker fixed effects	No	No	**Yes**	Yes	No	No	**Yes**	Yes	No	No	**Yes**	Yes
Firm fixed effects	No	No	**No**	Yes	No	No	**No**	Yes	No	No	**No**	Yes
First-stage Kleibergen-Papp statistic	69	48	**41**	57	31	8	**9**	9	115	126	**41**	57

[TABLE CONTINUED ON NEXT PAGE]

[CONTINUED]	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Country	FIN				FRA				DNK			
Beta	0.235	-0.027	0.112**	**-0.078*** **	-0.158***	-0.142***	**-0.128*** **	-0.179***	0.046	-0.090	**-0.209**	-0.443
Standard error	(0.169)	(0.028)	(0.053)	**(0.030)**	(0.020)	(0.02)	**(0.016)**	(0.030)	(0.096)	(0.233)	**(0.340)**	(0.617)
Observations	13.8M	13.8M	13.5M	**13.5M**	18.5M	18.5M	**18.5M**	18.0M	20.1M	20.1M	**19.8M**	19.8M
Industry fixed effects	Yes	No	No	**No**	Yes	No	**No**	No	Yes	No	**No**	No
Region fixed effects	Yes	No	No	**No**	Yes	No	**No**	No	Yes	No	**No**	No
Year fixed effects	Yes	Yes	Yes	**Yes**	Yes	Yes	**Yes**	Yes	Yes	Yes	**Yes**	Yes
Industry-region fixed effects	No	Yes	Yes	**Yes**	No	Yes	**Yes**	Yes	No	Yes	**Yes**	Yes
Worker fixed effects	No	No	Yes	**Yes**	No	No	**Yes**	Yes	No	No	**Yes**	Yes
Firm fixed effects	No	No	No	**Yes**	No	No	**No**	Yes	No	No	**No**	Yes
First-stage Kleibergen-Papp statistic	8	159	198	**259**	520	1641	**1269**	561	6	2	**3**	1

Note: This table shows the results from instrumental variables regressions of log monthly wages on local labour market concentration (the HHI in hiring of 3-digit industries and TL3 regions) using the regression model in equation (1). Concentration is instrumented with the inverse average number of firms in the same industry but in other regions. Reported are specifications with different fixed effects structures which are detailed in the table. Robust standard errors are clustered at the local labour market (industry-by-region) level. ***, ** and ** denote statistical significance at the 1%, 5% and 10% levels of significance, respectively. Columns with the preferred specification for each country are highlighted in bold

Note on preferred specifications: In general, the preferred specification corresponds to Equation 4.1 which controls for worker, year, and industry-region (market) fixed effects, and is shown as the 3rd column for each country. For comparison, two specifications with a less demanding fixed effects (FE) structure are shown on its left; and a specification with an additional firm FE is shown on its right. In most cases, adding firm FE in addition to industry-region, worker and time FE makes little difference, since industry-region FE already should capture most pay and productivity differences between establishments. Additional inclusion of firm FE will only matter for multi-establishment firms (since FE of single-establishment firms are already nested in industry-region FE). Only in Finland there is a material difference, which suggests that market FE are not sufficient to capture all relevant productivity differences on the firm side, possibly owing to the influence of multi-establishment firms. For this reason, the preferred specification in Finland includes firm FE. However, the result in Figure 4.8 is robust to choosing the specification that includes firn FE as preferred specification for all countries.

Annex Table 4.A.2. Economic wage effects of concentration

Implied wage difference between the 10th and 90th percentile of concentration, employment-weighted, 2015

	AUT	CRI	DNK	ESP	FIN	FRA	SVK	Average
Difference between 10th and 90th LLM	9387	9480	9623	9547	8997	9169	9389	9370
Implied wage difference	-16%	-17%	-17%	-17%	-16%	-16%	-16%	-16%
Difference between 10th and 90th worker	4179	2105	6426	4179	4283	4358	2758	4041
Implied wage difference	-7%	-4%	-11%	-7%	-7%	-8%	-5%	-7%

Note: This table shows the implied wage effects of moving from the 10th to the 90th percentile of concentration, based on the aggregate semi-elasticity reported in Figure 4.8. The upper part shows the effects of moving between points in the unweighted distribution of concentration (local labour markets), the lower part shows the effects of moving between respective points in the employment-weighted concentration. Concentration in all countries refers to 3-digit industry by small TL3 region for all countries.

Annex Table 4.A.3. Different wage effects for different skill groups

Results from country-level instrumental variables fixed effects regressions on worker-firm micro data

Dependent variable	Log monthly wage				
	(1)	(2)	(3)	(4)	(5)
Country	ESP	FIN	FRA	CRI	**Aggregate Coefficient**
HHI / 10,000	-0.386*	-0.120***	-0.222***	-1.208**	**-0.195*** **
Standard Error	(0.214)	(0.033)	(0.016)	(0.530)	**(0.051)**
(HHI / 10,000) x High skilled	0.213***	0.178***	0.189***	0.349***	**0.225*** **
	(0.034)	(0.010)	(0.005)	(0.040)	**(0.036)**
Observations	5.7M	13.5M	18.5M	5.9M	--
Year fixed effects	Yes	Yes	Yes	Yes	--
Industry-region fixed effects	Yes	Yes	Yes	Yes	--
Worker fixed effects	Yes	Yes	Yes	Yes	--
Firm fixed effects	No	Yes	No	No	--
First-stage Kleibergen-Papp statistic	58	125	640	5	--

Note: This table shows the results from instrumental variables regressions of log monthly wages on local labour market concentration (the HHI in hiring of 3-digit industries and TL3 regions), where concentration is interacted with a dummy for high skilled workers (the omitted category pools low and medium-qualified workers). Concentration is instrumented with the inverse average number of firms in the same industry but in other regions. Reported are specifications with different fixed effects structures which are detailed in the table. Robust standard errors are clustered at the local labour market (industry-by-region) level. ***, ** and ** denote statistical significance at the 1%, 5% and 10% levels of significance, respectively. Column 5 contains the aggregate coefficients, obtained using a random effects meta-aggregation procedure (Stanley, 2001[35]).

Annex Table 4.A.4. Concentration-induced wage differentials between qualification groups

Relative to high-qualified workers, 2015

	Total	Due to differential wage effect of concentration	Due to differential exposure to concentration
Low-qualified	-5.7	-4.2	-1.3
Medium-qualified	-3.3	-4.2	0.8

Note: The simulations assume that the concentration differentials between qualification groups observed at the 2-digit industry*TL3-region are similar at the 3-digit industry*TL3 level. The estimated wage effect for low- and medium-qualified workers is constrained to be equal (see Table 4.A.4.). Included countries: Costa Rica, Spain, Finland, France, and Slovakia (Information on worker qualification is unavailable for Austria).

Annex 4.B. Estimates of the labour supply elasticity to the individual firm

The labour supply elasticity to the individual firm can be obtained empirically by estimating the elasticity of job separations to wages, where wages relate to the component of wages that is due to pay differences between firms for similar workers (Manning, 2011[14]). Following Bassier, Dube and Naidu (2021[15]), the labour supply elasticity is estimated in two stages. The first stage isolates the firm component of wages from other worker-related components by estimating a two-way fixed effects model based on Abowd, Kramarz and Magnolis (1999[41]):

$$\ln(w_{ijt}) = x'_{it}\beta + \varphi_j + \mu_i + \epsilon_{ijt}$$

Equation 4.2

where w_{ijt} is the wage of individual *i* in firm *j* in year *t*; φ_j is a firm fixed effect; μ_i is a worker fixed effect; ϵ_{ijt} is the error term; and x'_{it} are time-varying worker control variables.[1] Based on the results from the first stage, the second stage then estimates the elasticity of worker separations to the firm component of wages:

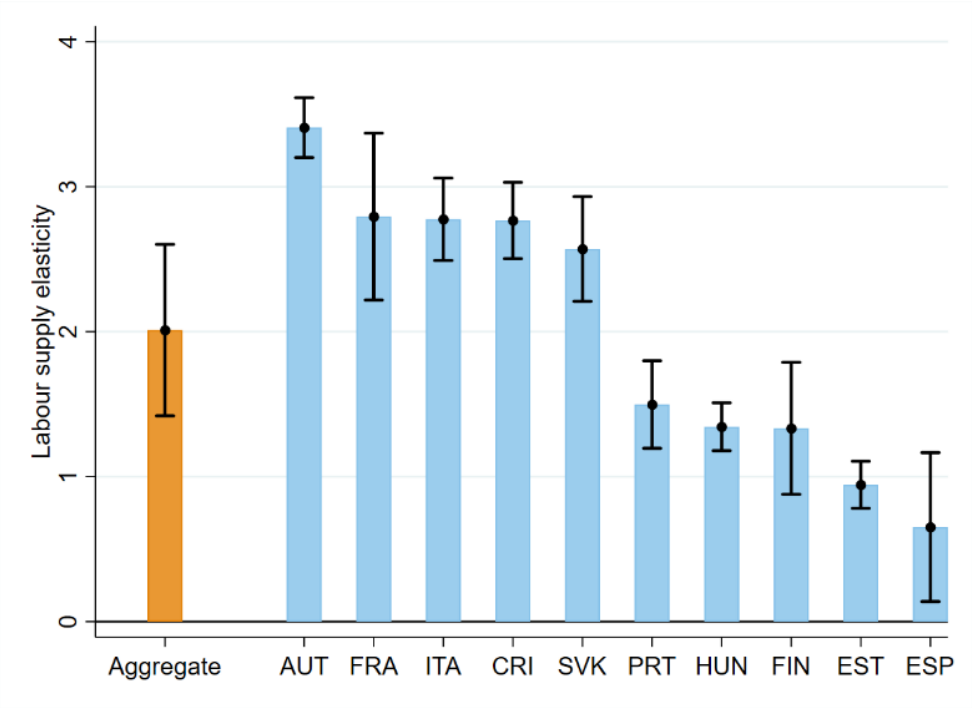
$$\ln(s_{ijt}) = \gamma\hat{\varphi}_j + \nu_{ijt}$$

Equation 4.3

where s_{ijt} is a dummy indicating separation of worker i from firm j in year t; $\hat{\varphi}_j$ is the estimated firm fixed effect; γ is the elasticity of separations to wages; and ν_{ijt} is the error term.[2] The fact that separations are estimated using only the component of wages that corresponds to firm pay premia (see Chapter 2) and not the component that corresponds to worker characteristics mitigates concerns of endogeneity of wages to the quit rate.[3]

On average across the covered countries, of which only Costa Rica is non-European, the estimated labour supply elasticity is around 2 (Annex Figure 4.B.1). This translates into a potential wage loss of about 30% compared to a worker's market wage in the absence of wage-setting power.[4] To some extent, the cross-country pattern of the estimated labour supply elasticity may reflect structural differences, e.g. related to cross-country differences in job mobility. But it may also be explained by differences in measurement error or the severity of endogeneity issues related to omitted factors that influence both wages and quit rates. For instance, higher-paying firms may be more likely to offer better non-wage working conditions (e.g. flexible hours, telework) that would have a direct effect on the quit rate. But firms may also pay higher wages to compensate workers for difficult or harsh working conditions. The severity, direction, and relative importance of such endogenous non-wage determinants of quits could additionally vary across countries, implying that care needs to be taken when interpreting the cross-country pattern in Annex Figure 4.B.1.

Annex Figure 4.B.1. On average across countries, the labour supply elasticity is around 2



Note: The aggregate coefficient is a weighted average of the individual country-level estimates, with weights taking into account both the estimation error within each country, and the between-country variation in estimates (Stanley, 2001[35]). Since no information on workers' location is needed to estimate the labour supply elasticity, the analysis can be conducted on a somewhat broader country sample than the analysis of labour market concentration. Included countries: Austria, Costa Rica, Estonia, Finland, France, Hungary, Italy, Portugal, Spain, and Slovak Republic.

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Overall, these results suggest a substantial degree of potential wage-setting power. However, they do not address the question of the extent to which firms actually exercise their power. This question is addressed using local labour market concentration as a partial indicator of wage-setting power.

Notes

[1] This chapter has been written by an OECD team consisting of Michael Koelle, Nathalie Scholl and Cyrille Schwellnus with contributions of: Antoine Bertheau (University of Copenhagen, DENMARK), Chiara Criscuolo (OECD), Antton Haramboure (OECD), Alexander Hijzen (OECD), Balazs Murakőzy (University of Liverpool, HUNGARY), Satu Nurmi (Statistics Finland/VATT, FINLAND), Vladimir Peciar (Ministry of Finance of the Slovak Republic, SLOVAK REPUBLIC), Kevin Rinz (US Census Bureau, UNITED STATES), Catalina Sandoval and Jonathan Garita (Costa Rica Central Bank, COSTA RICA). Matej Bajgar, Chiara Criscuolo and Jonathan Timmis kindly provided the sales concentration data. For details on the data used in this chapter please see the standalone Data Annex and Disclaimer Annex.

[2] The seven OECD countries that form the core of the analysis are Austria, Costa Rica, Denmark, Finland, France, Slovak Republic, and Spain. Comparable labour market concentration measures from the United States (based on establishment-level employment data) are additionally available for part of the descriptive analysis. Data for the Slovak Republic are available only for a short timespan (2014-2017), precluding any analysis which relies on the time series dimension of the data (including wage regressions).

[3] Early studies on labour market concentration studied particular non-standard market niches, such as postings on online job boards (Azar, Marinescu and Steinbaum, 2019[42]; Azar et al., 2020[19])

[4] A notable exception is ongoing work by Bassanini et al. (2022[25]) that analyses labour market concentration in a number of European countries.

[5] Firms may also refrain from exercising wage-setting power because of costs related to setting optimal wages. Dube, Manning and Naidu (2018[43]), for instance, find strong evidence for bunching of wages at round numbers, suggesting the presence of optimisation costs.

[6] Estimating the labour supply elasticity at the level of a narrowly defined local labour market is challenging due to the limited number of worker transitions observed in smaller partitions of the data. A sufficiently high number of separations – i.e., workers switching between different firms – is crucial for the precise estimation of firm pay premia and the elasticity of separations to cross-firm wage differences. Previous work relating wages to estimated labour supply elasticities did so either for larger labour markets (such as the entire US state of Oregon (Bassier, Dube and Naidu, 2021[15])) or for elasticities of online job applications to wages rather than actually observed separations (Azar, Marinescu and Steinbaum, 2019[42]).

[7] However, trade costs may also imply that product markets, at least in some industries, are local (Rossi-Hansberg, Sarte and Trachter, 2021[44]).

[8] A third approach to measure firms' wage-setting power that is not further explored in this chapter relies on firm-level data and the estimation of firm-level production functions to infer the mark-down of wages below marginal costs (Yeh, Macaluso and Hershbein, 2021[52]). The drawback of this approach is that firm-level data generally do not allow to control for workforce composition and the inference of mark-ups relies on a set of theoretical assumptions.

[9] The HHI consists in the sum of the squared market shares (in percent) of individual firms: $HHI = \sum_{i=1}^{k} S_i^2$.

[10] When reporting the average of local labour market concentration at the national or industry level, each local labour market is weighted by its employment, such that national averages reflect the concentration faced by the average worker in the economy rather than concentration in the average local labour market.

[11] The analysis is done at the preferred level of local labour markets, i.e. 3-digit industry by TL3-region, but is tested on a smaller subset of countries also for alternative labour market definitions for robustness.

[12] Such sorting could arise either as an optimal worker response to wage penalties from concentration – with high-skill, high-wage workers more likely to overcome costs to mobility – or it could be driven by a third factor, such as the sorting of high-skilled workers to cities, where concentration is lower because of the higher density of markets. In some alternative specifications reported in Annex Table 4.A.1, observable worker characteristics (flexible gender-age interactions and a dummy for marginal workers) substitute for worker fixed effects.

[13] This instrumental variable identifies the causal of effect of concentration under the assumption that changes in the average number of firms in other regions affect wages only through their effect on concentration, which may for instance be the case of changes in regulatory barries to entry.

[14] Aggregation of estimates of single studies follows the methodology of "meta analysis" that is commonly used in economics (Stanley, 2001[35]; Nordhaus and Moffat, 2017[51]). It follows long-established statistical procedures that originate from applications in public health, medical science and adjacent fields (DerSimonian and Laird, 1986[50]). The aggregate coefficient is a weighted average of the individual country-level estimates, with weights taking into account both the estimation error within each country, and the between-country variation in estimates (so-called random effects meta analysis).

[15] It is not possible to study labour market concentration from worker-level data, such as labour force surveys (LFS), due to lack of information that would allow grouping workers in the same firm. Firm-level data provide information on total employment at the firm level, which allows measuring firm-level employment concentration if sufficiently large and representative samples are available. But firm-level data lack information on individual workers, which precludes the measurement of concentration in hiring for different types of workers. Firm-level data also lack information on individual wages.

[16] If a dataset does not provide information on worker location, establishment location is used instead.

[17] Wages can be harmonised to the hourly level in about half of all countries where information on hours worked or equivalent (e.g. full-time equivalent rates) is available, which allows checking the robustness of the results obtained with monthly wages.

[18] In many countries, the first year of observation is 2002, which implies that hiring concentration (which requires observing worker transitions between firms) is available from 2003.

[19] The seven countries for which local labour market concentration is available at the 3-digit industry and TL3 region level are: Austria, Costa Rica, Denmark, Finland, France, Spain and Slovakia. Partial data based on national US classifications (4-digit NAICS industries and Commuting Zones) are available for the United States. Additional countries for which labour market concentration is available only at higher levels of aggregation (2-digit industry or TL2 region) are: Estonia, Hungary, Italy and Portugal.

[20] The public sector (public administration and defence) is, by definition, not part of the market economy and not subject to market competition, and is therefore excluded from the analysis. The geographical distribution of agriculture and mining, and to some extent utilities, depends on natural geography, which large differences across countries and little relation to policy and economic structure.

[21] Urban regions are equivalent to those classified as metropolitan regions in Fadic et al. (2019[28]). A metropolitan region is a TL3 region which contains a functional urban area – a single agglomeration or a group of agglomerations with strong cross-commuting patterns – of at least 250,000 people.

[22] The cross-sectional differences in concentration levels may partly also be explained by the smaller size of the average manufacturing industry compared with the average services industry.

[23] However, low-skilled workers do not systematically work in local labour markets where employer concentration is high Annex Figure 4.A.6.

[24] Due to data confidentiality issues, local labour market concentration by skill group could not be obtained at the 3-digit industry by TL3 region level for a sufficient number of countries. The ratios of local labour market concentration by skill group relative to the mean reported in Figure 4.5 are therefore obtained at the 2-digit industry by TL3 region level, with the calculations to obtain skill group-specific HHIs assuming that the ratios are similar across different levels of industry aggregation.

[25] By contrast, the evolution of concentration in rural and urban markets is very similar, suggesting no increasing divergence across geographical areas (Annex Figure 4.A.3).

[26] A number of studies for the United States suggest that local sales and employment concentration decrease despite increasing national concentration (Rossi-Hansberg, Sarte and Trachter, 2021[44]). In this case, local sales and employment may be closely linked despite the apparent disconnect between national sales concentration and local labour market concentration.

[27] Estimates using a measure of local labour market concentration based on 3-digit occupation by TL3 region yield similar results where this alternative measure of concentration is available. In France, Marinescu et al (2020[6]) find an effect of occupation-region concentration on hourly wages equivalent to a semi-elasticity of -5%; Martins (2018[9]) estimates a semi-elasticity of -1% on monthly wages in Portugal. This suggests that definitions based on 3-digit industry and 3-digit occupation by TL3 region provide similarly-performing approximations of local labour market concentration.

[28] In the case of Costa Rica, the estimate is almost one order of magnitude larger (in absolute terms) than in other countries, but also comes with very large standard errors and a low Kleibergen-Papp (KP) first stage statistic of around 9. A similar combination of large standard errors and low KP statistic of around 3 is observed for Denmark. Since the critical value of the KP statistic is around 16, this indicates that the instrumental variable is weak in the case of Costa Rica and Denmark, which could bias the estimate in addition to rendering them imprecise (Bound, Jaeger and Baker, 1995[49]). The procedure to aggregate coefficients across countries preserves these country-level estimates instead of completely removing them, but assigns a very low weight to each of them (1-2%) to reflect the lower quality and precision. Alternatively, results obtained removing the coefficients from Costa Rica and Denmark are very similar to those reported in the main text.

[29] For the purpose of this analysis, low and medium-skilled workers are grouped together since differences in the estimated wage effect of concentration between these groups are statistically insignificant.

[30] In the limiting case of a monopsonist that chooses wages in order to maximise profits, both equilibrium wages and employment are below the social optimum (Manning, 2020[16]). Raising wages from the monopsonistic wage reduces the monopsonist's profits (the mark-down relative marginal productivity) but raises employment by drawing workers unwilling to work at the monopsonist's wage into the labour market.

[31] Gig economy workers are found by Caldwell and Oehlsen (2018[10]) to have a fairly low labour supply elasticity, despite the absence of institutional constraints to hours worked.

[1] The flexible controls consist in age group dummies, interacted with gender. Any time-constant worker characteristics are, by construction, controlled for through the worker fixed effects.

[2] The estimated elasticity of separations to wages can be translated into the labour supply elasticity to the individual using the formula $LSE = -2 \cdot \gamma/(1/n \sum_i s_{ijt})$.

[3] An endogenity probem could arise due omitted worker characteristics that determine both wages and quit rates. However, the two-way fixed effects model of Abowd, Kramarz and Magnolis (1999[41]) allows isolating the firm-level component of wages, which mitigates some of the endogeneity concerns. A different econometric concern concers measurement error in the estimated firm fixed effects, which could be addressed using a split-sample instrumental variables strategy (Bassier, Dube and Naidu, 2021[15]). However, unreported empirical analysis suggests that such estimates are very similar to the OLS estimates presented here.

[4] In a simple monopsony model, the wage is marked down from the worker's marginal product (MRPL) as a function of the labour supply elasticity ϵ: w= 1/(1+ϵ) MPRL.

5 Is it where you work, what you do, or what you get? Unpacking the gender wage gap and its evolution over the life-course

This chapter contributes to a better understanding of the gender wage gap over women's professional career by focusing on the gap in pay between similarly-skilled women and men within and between firms at each age. Using linked employer-employee data for sixteen OECD countries, it is shown that about three quarters of the gender wage gap reflects pay differences within firms, due to differences in tasks and responsibilities as well as differences in pay for work of equal value (e.g. bargaining and discrimination). The remaining one quarter reflects differences in pay between firms, due to the concentration of women in low-wage firms. The gender wage gap within and between firms tends to increase over the working life. This reflects gender differences in opportunities for upward mobility between and within firms and the role of career breaks at the age of childbirth for the career progression of women. Tackling the gender wage gap crucially requires promoting access of women to high-wage jobs and firms.[1]

In Brief

This chapter contributes to a better understanding of the gender wage gap over women's professional career by focusing on the gap in pay between similarly-skilled women and men within and between firms at each age. The between-firm component captures the role of differences in firm wage-setting practices between firms due to the concentration of women into low-wage firms. The within-firm component captures differences in tasks, responsibilities or pay for work of equal value (e.g. bargaining and discrimination). The chapter provides new cross-country evidence on the gender pay gap within and between firms and its evolution over the working life using linked employer-employee data for sixteen OECD countries (Austria, Costa Rica, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Japan, the Netherlands, Portugal, the Slovak Republic, Spain, Sweden and the United Kingdom). Its main findings are as follows:

- On average across countries, the gap in average wages (including bonuses and overtime pay) between similarly skilled women and men amounted to 22% on average over the period from the mid-2000s and the mid-2010s.
  - About three quarters of the gender wage gap reflects differences in pay within firms, with the bulk of the gender wage gap within firms reflecting differences in tasks and responsibilities, and the remaining part - about one-nineth - differences in pay for work of equal value (e.g. bargaining, discrimination).
  - About one quarter of the gender wage gap reflects the concentration of women in low-wage firms, with somewhat more than half of the between-firm gap reflecting the concentration of women in low-wage firms within industries, and the remaining part their concentration in low-wage industries.
  - The concentration of women in low-wage firms to some extent results from the tendency of such firms to offer more flexible working-time arrangements (e.g. part-time).
- In the majority of countries, the gender wage gap between and within firms tends to increase throughout the working life (e.g. France, Germany, Japan, Netherlands), while in most others it increases up to age of 35 but then gradually declines (e.g. Estonia, Hungary, the Slovak Republic). The age-profile of the gender wage gap reflects to an important extent gender differences in opportunities for career advancement between and within firms due to the role of motherhood.
  - The bulk of the increase in the gender gap *within* firms up to the age of 45 (about 75% of the overall gap) is driven by gender differences in the probability of being promoted. This largely reflects the fact that workers in part-time jobs are less likely to be promoted and women are more likely to work part-time.
  - A substantial part of the increase in the gender wage gap *between* firms up to age 45 (about 20% of the overall gap) is driven by gender differences in the extent and nature of job mobility across firms. Women are not only less likely to move between firms than men, but when they do, this is less likely to be associated with significant wage increases.
- Career breaks around the age of childbirth account for an important fraction of the "motherhood penalty", i.e. the shortfall in wage growth following childbirth, and as a result play an important role in determining the evolution of the gender wage gap over the working life.

- There are important differences in the incidence and duration of career breaks across countries. In Northern European countries, career breaks are most common, whereas they are least common in Western European countries. In Central and Eastern European countries, they are quite common and often last for more than one year.
- Career breaks carry significant wage losses (about 4% for career breaks of one year). Wage losses arise as a result of missed experience or human capital depreciation and contribute to larger gender wage gaps within firms. As most women return to their previous employer after a break, there is not much of an effect on the gender wage gap between firms.

- Tackling the gender wage gap crucially requires promoting access of women to high-wage jobs and firms. This involves a range of policies including:
  - Family policies can contribute to a more equal sharing of family responsibilities between men and women and hence enable women to take advantage of opportunities for career progression in their current firm or other firms. This is particularly important in countries that exhibit strong and persistent increases in the gender wage gap as workers age (e.g. Western Europe, Japan).
  - To make good jobs more accessible to women, the use of flexible work arrangements across occupations and firms, including telework and part-time work, should be offered to all workers. Good management practices and measures promoting diversity in leadership of private companies (e.g. voluntary targeting, disclosure requirements, etc.) can also help promote access for women to quality jobs, while fostering social norms that support gender equality.
  - Pay transparency rules can help close the gender pay gaps in countries with significant pay gaps for work of equal value (e.g. Estonia) by raising awareness of discrimination and making it easier to enforce equal pay legislation.
  - Investing in Science, Technology, Engineering and Mathematics (STEM) and addressing stereotypes that drive the educational choices of girls and boys are particularly important in countries with high levels of gender segregation across industries (e.g. Italy, Portugal).

5.1. Introduction

To provide a better understanding of the gender wage gap, it is important to take account of two key stylised facts. First, a significant gender wage gap persists even among similarly-skilled women and men in all OECD countries (Goldin, 2014[1]; Blau and Kahn, 2017[2]). Indeed, the gender wage gap tends be larger and more persistent when focusing on similarly-skilled women and men than when focusing on the raw gender wage gap. This reflects the fact that the gender gap in education has largely closed and that in many countries young women now have higher levels of education than men on average. Second, the gender wage gap tends to increase over the life-course in most countries. This is likely to reflect to an important extent the role of childbirth in shaping the career progression of women across occupations and firms (Kleven et al., 2019[3]; OECD, 2018[4]). Both stylised facts suggest that a better understanding of the gender wage gap requires paying more attention to the firms in which women and men work ("where they work"), their tasks and responsibilities in those firms ("what they do") and the way they are rewarded for them ("what they get"). Since the importance of these elements depends in part on the role of childbirth, a life-cycle perspective is needed that allows following women and men across jobs and firms throughout their careers.

The objective of this chapter is to contribute to a better understanding of the gender wage gap over women's professional career by focusing on the gap in pay between women and men with equivalent skills - defined in terms of their level of education and potential experience - within firms and between firms at each age. The between-firm component captures the role of differences in wage premia ("wage-setting practices") between firms in the gender wage gap due to the sorting of women into low-wage firms. The within-firm component captures differences in pay between women and men within firms related to differences in tasks and responsibilities, or differences in pay for work of equal value (e.g. bargaining and discrimination). Previous studies have typically found mixed results with respect to the importance of pay differences within and between firms and their evolution over the working life – see a.o. Masso, Merikull and Vahter (2020[5]) for Estonia, Coudin et al. (2018[6]) for France, Casarico and Lattenzio (2019[7]) for Italy, Card et al (2016[8]) for Portugal, Bruns (2019[9]) for Germany, Goldin et al (2017[10]) and Barth et al. (2021[11]) for the United States. It is a priori unclear to what extent these differences are genuine or reflect differences in data treatment and empirical methodology.

The chapter provides new cross-country evidence on the gender pay gap within and between firms at each age based on a harmonised approach using linked employer-employee data for sixteen OECD countries.[2] It is shown that, on average across the countries covered by the analysis, the bulk of the gender wage gap between similarly skilled women and men is related to pay differences within firms due to differences in tasks and responsibilities ("what you do"), but that differences in firm wage-setting practices between firms ("where you work") and differences in pay for work of equal within the same firm ("what you get") also can play a significant role. The gender wage gap within and between firms tends to increase over the working life due to the role of motherhood. This reflects to an important extent unequal opportunities for upward mobility between and within firms and the effect of career breaks at the age of childbirth on the career progression of women. Consequently, bringing down the gender wage gap crucially requires policies that promote opportunities for career advancement within and between firms, while policies that tackle pay discrimination also have a role to play, particularly in some countries.

The remainder of this chapter is structured as follows. Section 2 presents a number of key stylised facts to motivate the analysis. Section 3 lays out the conceptual and empirical framework that will be used to analyse the gender wage gap between similarly-skilled women and men within and between firms over the working life. Section 4 provides the results. Section 5 concludes with a discussion of the policy implications.

5.2. Key stylised facts

A better understanding of the gender wage gap requires taking account of two important stylised facts: i) the presence of large and persistent wage gaps between similarly qualified women and men; ii) the tendency for the wage gap to increase over the working life.

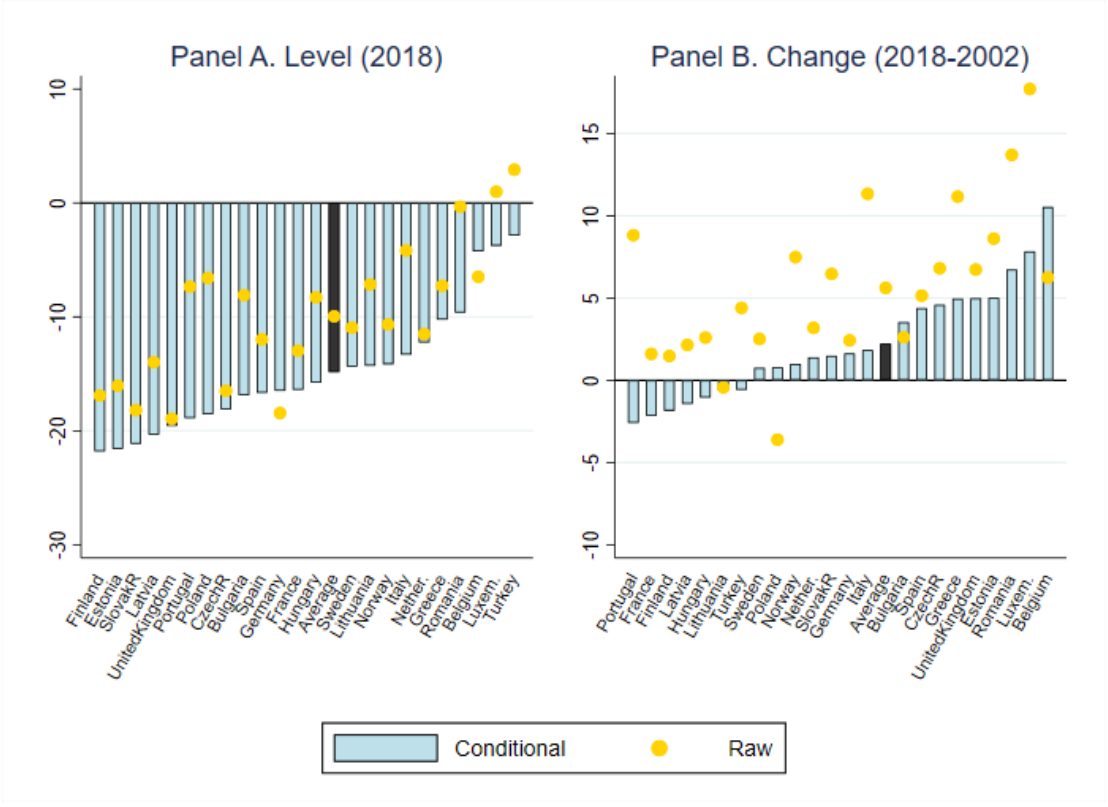
5.2.1. Large and persistent gender wage gaps tend to reflect differences in the characteristics of firms and jobs rather than those of workers

On average across European countries, women earned about 10% less per hour than men in 2018 (Figure 5.1, Panel A). Controlling for skills - in terms of education and potential experience – tends to *increase* the gender wage gap to about 15% as working women tend to be better educated than working men on average (18% for the European countries analysed in Section 4).[3,4] The gender wage gap therefore reflects differences in the firms for which women and men work, differences in tasks and responsibilities in those firms and differences in pay for work of equal value rather than differences in their skills. Controlling for skills also renders the gender wage gap more persistent, as educational attainment has increased more quickly for women than for men (Panel B). The raw gender wage gap

declined by about 35% between 2002 and 2018 on average across countries (from almost 16% to 10%), while the conditional gender wage gap that controls for differences in skills declined by less than 15% over the same period (from 17% to 15%).

Figure 5.1. Large and persistent gender wage gaps reflect differences in the characteristics of jobs and firms rather than those of workers

Difference in average hourly wages between women and men as a share of the average hourly wages for men (level in %, change in p.p.), without and with controlling for education and potential experience (raw and conditional)



Note: Data for 2014 instead iof 2018 Turkey and the United Kingdom and 2006 instead of 2001 for Germany and Sweden. Controlling for cohort effects does not significantly change the picture shown.
Source: OECD calculations based on Eurostat Structure of Earnings Survey

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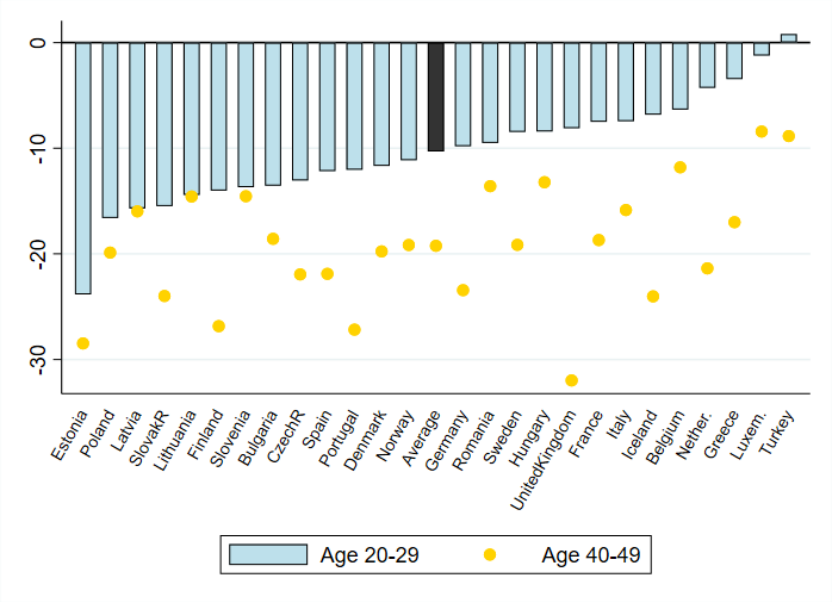
5.2.2. The gender wage gap tends to increase over women's careers in most countries due to barriers to upward mobility

In most countries, the gender wage gap increases over women's professional careers as the wages of women tend to grow less quickly than those of men (Figure 5.2).[5] This points to the presence of barriers to upward mobility related to the scope for learning on the job, promotions to better jobs in the same firm, or job switches to better paying firms. To a large extent, the more limited scope for career advancement for women is likely to reflect the role of childbirth and the uneven distribution of household responsibilities between mothers and fathers (Kleven et al., 2019[3]). This may have important implications for the incentives of mothers to look for jobs in firms offering short and/or flexible working

hours and those of firms, where long and unpredictable working hours are common, to disproportionately hire men (Goldin, 2014[1]; OECD, 2017[12]; OECD, 2019[13]). This not only reduces the scope for upward mobility to better paying firms and occupations of women, but also potentially weakens their bargaining position by reducing the number of alternative job opportunities.

Figure 5.2. The gender wage gap increases over the working life in most countries

Difference in average hourly wages between women and men as a share of average hourly wages for men (%), controlling for education and potential experience, 2018



Note. Last year refers to 2014 for Turkey and the United Kingdom. Controlling for cohort effects does not significantly change the picture shown.
Source: OECD calculations based on Eurostat Structure of Earnings Survey.

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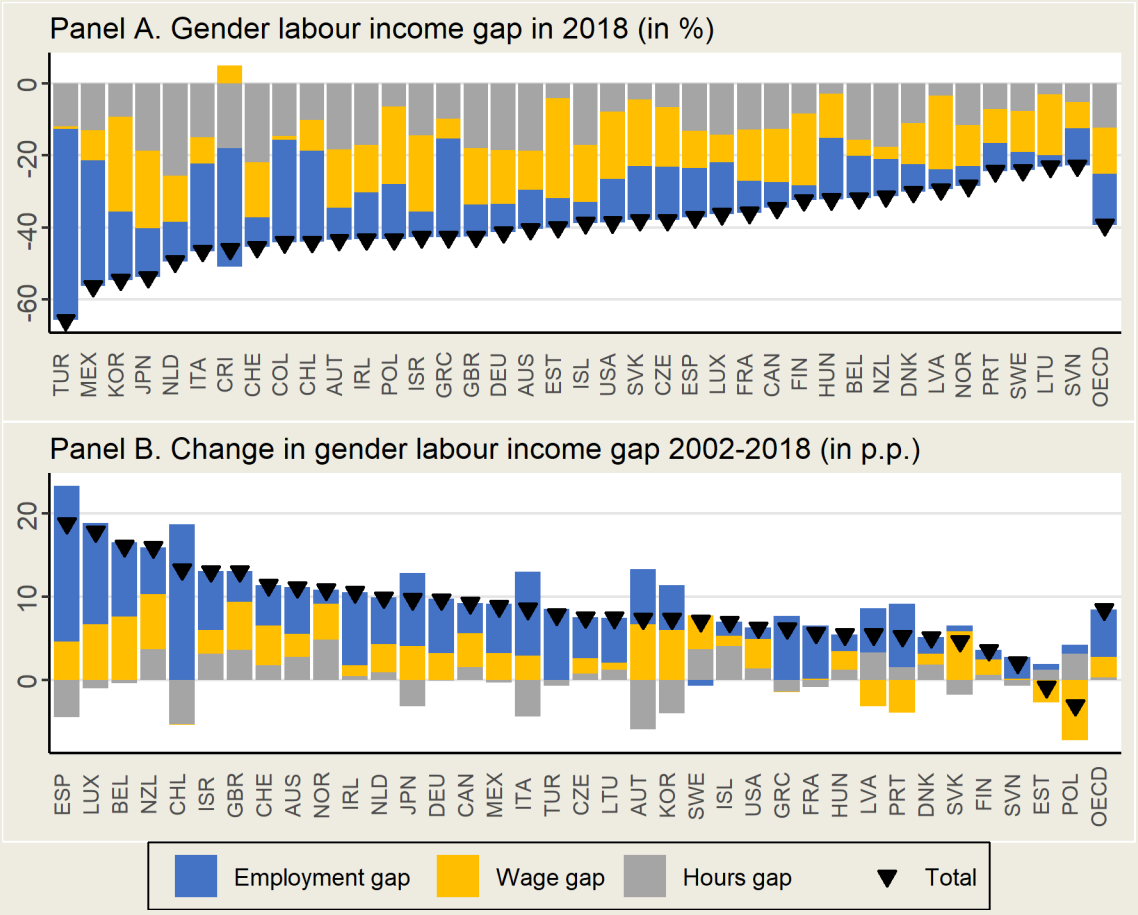
Box 5.1. The role of the gender wage gap for overall labour market inequality between women and men

A more comprehensive picture of gender inequality in the labour market can be obtained by focusing on the gender gap in labour income, which captures not only the wage gap but also gaps in employment and working time (Figure 5.3).

On average across OECD countries, female labour income was about 40% lower than that of men in 2018 (or the latest year available), with differences in pay, working time and employment accounting each for about a third of the overall gap in labour income. However, there are large differences across countries in terms of the size of the overall gap and the relative size of its components.

On average across OECD countries, the gap in labour income has declined by 8 percentage points, or about 15%, between 2002 and 2018. This was largely driven by declines in the employment gap, due to the rise in female labour force participation, while the gap in hourly wages declined more modestly and the gap in working time remained broadly constant.

Figure 5.3. Gender gap in labour income



Note: Panel A: The gender labour income gap is calculated using the employment gap, the wage gap for full-time employees and the gap in weekly hours worked in the main job
Panel B: Change in the gender labour income gap and its different components between 2002 and 2018 (or latest year available). No data in 2002 for Costa Rica and Colombia
Source: OECD Employment Database.

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5.3. Framework, methodology and data

This section describes the conceptual framework for analysing the wage gap between women and men with equivalent skills within and between firms, the empirical approach and the data that will be used.

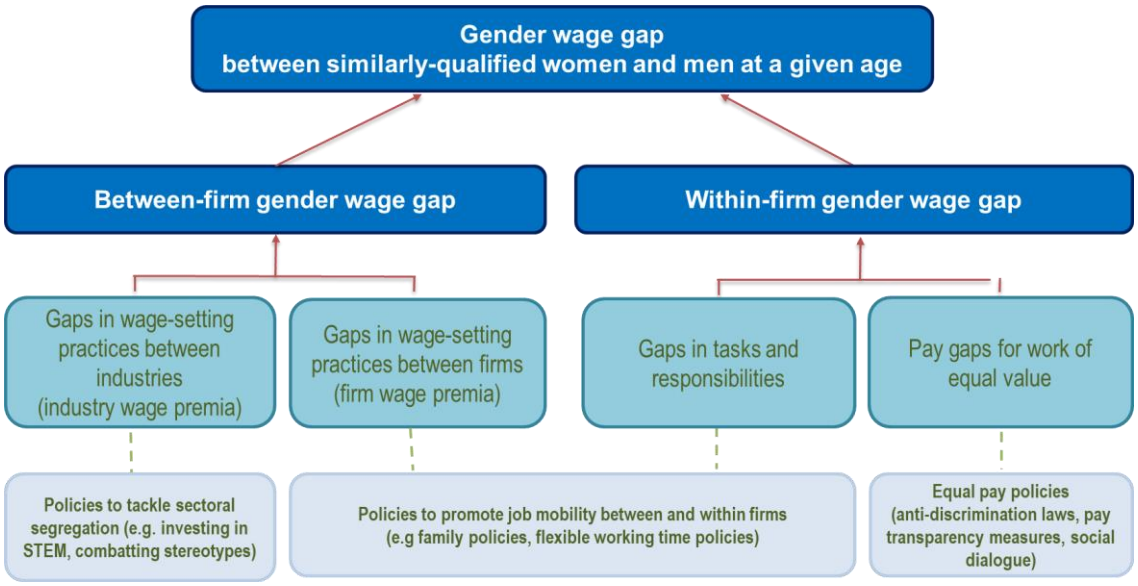
5.3.1. Conceptual framework

The gender wage gap at each age can be decomposed into a between-firm and a within-firm component. The between-firm component captures the role of differences in firm wage premia (or "wage-setting practices") between firms in the gender wage gap between similarly-skilled women and men due to the sorting of women into low-wage firms and industries. Firm wage premia refer to the component of wages that is determined by the characteristics of the firm and not the characteristics of workers. The within-firm component captures differences in pay between similarly-skilled women and men within firms related to either differences in tasks and responsibilities or differences in pay for work of equal value. The present analysis abstracts from the role of skill composition, which can also contribute to differences in average pay between firms as well as differences in pay by gender within firms. Public policies can help to reduce gender wage gaps between similarly-skilled women and men within firms as well as those arising from the sorting of women in low-wage firms. A schematic representation of the decomposition is presented in Figure 5.4.

Differences in wage premia between firms contribute to the gender wage gap when women are more likely to be employed in low-wage firms. Descriptive evidence in Chapter 2 already showed that, despite recent progress, women are still much more likely to be employed in low-wage firms than men. Differences in the gender composition across firms, in principle, may reflect demand-side factors, due to discriminatory hiring practices by employers (see below) or supply-side factors, due to the preferences of women to work in certain economic activities (industries), the skills these activities require or the way they are organised. However, this does not explain why women are more likely to work in low-wage firms, even within narrowly-defined economic activities. Gender complementarities in production provide one such explanation (Goldin, 2014[1]). To the extent that women are less available for jobs requiring long or unpredictable working hours, due to unequal sharing of household responsibilities, and such jobs are more common in high-wage firms, men are more likely to be hired in high-wage firms.[6]

Differences in pay within firms contribute to the gender wage gap when women and men with equivalent skills are rewarded differently within the same firm. Systematic differences in pay between similarly-skilled women and men within firms reflect differences in tasks and responsibilities, which may result from unequal opportunities for career progression, or differences in pay for work of equal value, which may result from bargaining or discrimination by employers. Employer discrimination may be rooted in conscious or unconscious biases against women ("taste-based discrimination"), may reflect the perceptions of employers that women are on average less productive than men ("statistical discrimination") or be based on profit considerations by paying lower wages to women with limited outside options and a weak bargaining position (monopsonistic discrimination).[7] Unequal opportunities for career progression within firms may result from a broad range of factors, including discrimination in hires and promotions by employers and the individual circumstances of women and men, related to the unequal sharing of family responsibilities, that may constrain career choices and shape preferences for non-wage working conditions (e.g. flexible hours, short commuting times).

Figure 5.4. Framework



5.3.2. Empirical approach

To empirically implement the within and between-firm decomposition of the gender wage gap between similarly-skilled women and men, this chapter builds on Goldin et al. (2017[10]) and Card, Cardoso and Klein (2016[8]). This involves in a first step estimating wage equations with flexible earnings-experience profiles by gender both without and with firm-fixed effects and, in a second step, separately estimating for women and men a wage equation with firm-fixed effects (see Box 5.2 for details).[8] The specification without firm-fixed effects allows documenting the overall gender wage gap at any age conditional on worker characteristics (education). The specification with firm-fixed effects allows documenting the gender wage gap within firms at any age conditional on worker characteristics, while the difference in the gender wage gap between the two specifications captures the between-firm component of the gender wage gap due to the sorting of women and men across firms paying different wage premia. The gender-specific wage equations with (gender-specific) firm-fixed effects allow providing an indication of the role of bargaining and discrimination by comparing the firm-fixed effects for women and men within the same firm.

All specifications control for cohort effects and selection into employment based on observable worker characteristics. Selection effects into employment may induce differences in the composition of employment of women and men, with potentially important consequences for cross-country comparisons of the gender wage gap and its over evolution with age (Olivetti and Petrongolo, 2008[14]). Cohort effects can affect the age profile of the gender wage gap when the composition of women and men in employment varies across birth cohorts due to, for example, gradual improvements in educational attainment of women relative to men or rising female labour force participation. The present analysis controls for cohort effects through the inclusion of decade-of-birth fixed effects by gender (Barth, Kerr and Olivetti, 2021[11])[9] and for selection into employment by focusing on women and men with observationally equivalent skills (conditional on flexible earnings-experience profiles by education and gender). To get a sense of the possible role of selection on the unobservable characteristics of workers, the evolution of the gender gap with age is analysed after including worker fixed effects as a robustness check (Abowd, Kramarz and Margolis, 1999[15]; Dostie et al., 2020[16]).

Previous studies have typically found mixed results for the role of differences in pay within and between firms in the wage gap between similarly-skilled women and men as well as their evolution over the

working life – see a.o. Masso, Merikull and Vahter (2020[5]) for Estonia, Coudin et al. (2018[6]) for France, Casarico and Lattenzio (2019[7]) for Italy, Card et al (2016[8]) for Portugal, Bruns (2019[9]) for Germany, Jewell et al for the UK (2019[17]), Goldin et al (2017[10]) and Barth et al. (2021[11]) for the United States. All these studies except that by Goldin et al (2017[10]) focus on the role of sorting on the one hand and bargaining and discrimination on the other in the gender wage gap, while abstracting from differences in tasks and responsibilities. Evidence for France and Germany suggests that the role of firms exclusively reflects differences in wage premia between firms due to differential sorting, whereas evidence for Estonia and to a lesser extent also Portugal suggests that bargaining and discrimination are also important. Moreover, the role of sorting in the gender pay gap tends to increase over the working life and particularly with childbirth in some countries (e.g. Germany), but not in others (e.g. Estonia). It is a priori unclear to what extent these differences are genuine or reflect differences in data treatment and empirical methodology.

Box 5.2. Decomposing the gender wage gap between and within firms at each age

Basic decomposition of the gender wage gap

The decomposition of the gender wage gap at each age within and between firms for workers with similar skills is implemented following Goldin et al. (2017[10]) by estimating the following pair of wage equations without and with firm fixed effects:

$$\ln(w_{ijt}) = A_i F_i \gamma_a + A_i \theta_a + x_{it}\beta_t + \varepsilon_{ijt} \quad \text{Equation 5.1}$$

$$\ln(w_{ijt}) = A_i F_i \gamma_a + A_i \theta_a + x_{it}\beta_t + \varphi_{j(i,t)} + \varepsilon_{ijt} \quad \text{Equation 5.2}$$

where w_{ij} denotes the wage of worker *i* in firm *j* at time t, x_i denotes a vector of observable worker characteristics (education or occupation dummies, decade-of-birth dummies); β denotes the estimated returns to these characteristics (restricted to be the same for women and men); A_i denotes a full set of age dummies, θ_a denotes the returns to age for men, F_i denotes a gender dummy that equals one for women and zero otherwise, γ_a denotes the gender wage gap at each age and $\varphi_{j(i,t)}$ in Equation 5.2 denotes a full set of firm fixed effects. Equation 5.1 is used to get the overall gender wage gap at each age, while Equation 5.2 is used to get the gender wage gap at each age within firms. The difference captures the gender wage gap at each age that is due to sorting.

Extended decomposition of the gender wage gap

The decomposition of the gender wage gap at each age within and between firms can be extended for workers with similar skills, tasks and responsibilities following Card, Cardoso and Klein (2016[8]) by estimating the following wage equation with worker and firm-fixed effects separately for women and men:

$$w_{it} = \alpha_i + \varphi^{M,F}_{J(i,t)} + \gamma_t + X'_{it}\beta^{M,F} + \varepsilon_{it} \quad \text{Equation 5.3}$$

where α_i denote worker fixed effects, $\varphi^{M,F}_{J(i,t)}$ denote gender-specific firm fixed effects, which capture differences in firm wage premia between firms as well as between women and men within firms, γ_t denote year fixed effects, X'_{it} denotes time-varying worker characteristics, and more specifically a third-order polynomial in potential experience and $\beta^{M,F}$ denotes gender-specific returns to potential experience (i.e. age).

Since the gender-specific firm-fixed effects are only identified up to a constant, they cannot be directly compared. To address this issue, the gender-specific firm effects are normalised by setting the firm-fixed effects to zero among marginal firms that do not reap any rents and hence do not offer positive firm wage premia. Following Card, Cardoso and Klein (2016[8]), we assume this is the case among firms in the hotels and restaurants sector (the industry with the lowest average firm wage premia for both women and men). The normalisation not only allows comparing the gender-specific firm-fixed effects in the same firms, but also removes any remaining differences in average firm wage premia between women and men that are due to differences in tasks and responsibilities after controlling for worker characteristics in the reference sector. To the extent that these remaining differences are similar in the hotels and restaurants sector as in the labour market as a whole, this mitigates concerns that differences in the gender-specific firm wage premia within firms capture to some extent average

differences in tasks and responsibilities. Consequently, the average difference in the normalised gender-specific firm-fixed effects is attributed to bargaining and discrimination.[1]

The extended decomposition of the role of firm wage premia– as measured by the gender-specific firm fixed effects - in the gender wage gap can be represented as follows:

$$E\left[\varphi^{F}_{J(i,t)}|F\right] - E\left[\varphi^{M}_{J(i,t)}|M\right] = \underbrace{E\left[\varphi^{F}_{J(i,t)} - \varphi^{M}_{J(i,t)}|F\right]}_{bargaining\ and\ discrimination} + \underbrace{E\left[\varphi^{F}_{J(i,t)}|F\right] - E\left[\varphi^{F}_{J(i,t)}|M\right]}_{sorting} \quad \text{Equation 5.4}$$

The first part on the right hand side captures the role of differences in firm wage premia between women and men within firms (bargaining/discrimination effect), or put differently, how much the gender wage gap would change if women earned the same firm premium as men in the same firm. The second part on the right hand side captures the role of differences in firm pay wage premia between firms (sorting effect), or put differently, how much the gender wage gap would change if women worked in the same firms as men, weighted by male firm effects.

1. If differences in tasks and responsibilities in reality are larger (smaller) in hotels and restaurants than the labour market as whole, the component associated with bargaining and discrimination will be downward (upward) biased and the component associated with tasks and responsibilities upward (downward) biased.

5.3.3. Data

The decomposition of the gender wage gap within and between firms is implemented based on a harmonised data treatment and methodology using linked employer-employee data for 16 countries (Austria, Costa Rica, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Japan, Netherlands, Portugal, the Slovak Republic, Spain, Sweden and the United Kingdom) (see the standalone Data Annex for details). The linked employer-employee data used in this chapter are mostly based on administrative records designed for tax or social security purposes, and consequently tend to be very comprehensive (covering the entire population of workers and firms in most countries) and of very high quality, notably with respect to information on wages, given the potentially important financial or legal implications of reporting errors and extensive administrative procedures for quality control. Importantly, these data allow measuring gender wage gaps with great precision, decomposing them within and between firms and analysing what the determinants of wage and employments gaps within individual firms.

A limitation of these data, particularly in a cross-country context, is that wage definitions may differ, notably due to differences in the availability of information on working time (see the standalone Data Annex for details). To allow for meaningful comparisons of the gender wage gap across the largest number of countries the gender wage gap refers to hourly wages (including bonuses and overtime payments) where available and monthly earnings otherwise, adjusted for gender differences in working time using external data sources (this concerns Austria, Costa Rica, Estonia, Finland and the Slovak Republic).[10] Consequently, cross-country differences in the overall gender wage gap should not be driven by differences between women and men in working time. For countries for which no information on working time is available, it is further assumed that differences in the between and within components of the gender wage gap or their evolution over the life-course are not influenced by differences in working time. The analysis is restricted to individuals aged 25-60 and excludes workers in mini-jobs earning less than 20% of the full-time minimum wage or, if no minimum wage exists, 10% of the median, as well as all firms that do not employ at least one woman and one man.[11]

The resulting gender wage gaps are generally close to those contained in the OECD Earnings Distribution database (Annex Figure 5.A.1).[12] If anything, there is a tendency for the gender wage gap

to be higher in the present data. This reflects in part the focus of the OECD Earnings Distribution database on full-time workers, whereas the measure of the gender wage gap used in this chapter also comprises part-time workers, which typically receive lower wages and are more likely to be female. Another difference is that the OECD Earnings Distribution focuses on differences in base wages and does not take account of bonuses and overtime payments, which tend to be more important for men, understating the true gender wage gap.[13]

5.4. Results

This section discusses, respectively, differences in the gender wage gap within and between firms across countries, its evolution over women's professional careers and the implications of motherhood by focusing on the role of career breaks for the wage growth of women.

5.4.1. The gender wage gap within and between firms

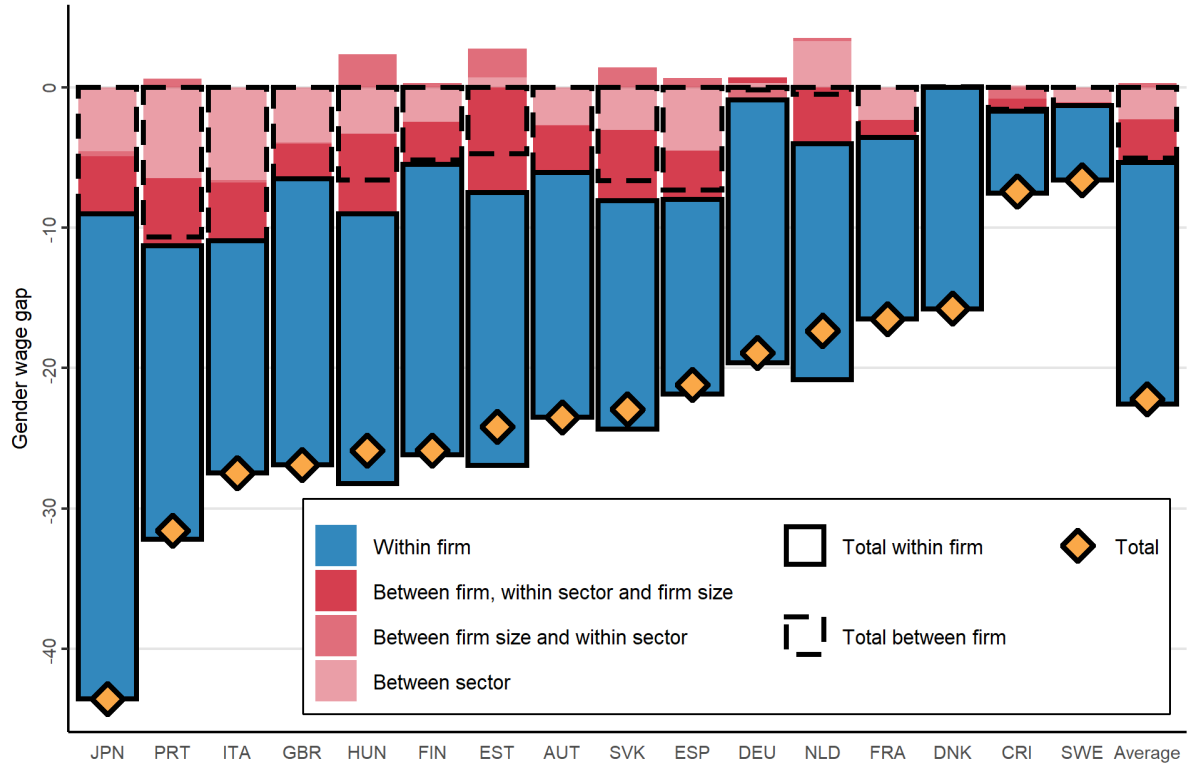
On average across the sixteen countries considered here, the gender wage gap between similarly skilled women and men amounted to 22% over the period from the mid-2000s and the mid-2010s. As noted previously, this is somewhat higher than that reported in the OECD Earnings Distribution database because the gender wage gap is measured here in terms of the mean rather than the median, is not limited to full-time workers and includes overtime pay and bonuses. The gender wage gap is particularly high in Japan. This may be related to the tendency of women to move into lower paid non-regular or part-time jobs after returning from maternity leave. By contrast, the gender wage gap is particularly low in Costa Rica and Sweden. While in the case of Sweden, this is likely to reflect relatively low levels of gender inequality in the labour market in general, in Costa Rica this is at least in part likely reflect the above-average gap in labour force participation and the fact that women tend to be positively selected in employment, even after controlling for differences in education and age (experience). The wage gap between women and men with similar skills is decomposed below into the components related to sorting of women into low-wage firms, differences in tasks and responsibilities within firms, and differences in pay for equal work within firms due to amongst others discrimination.

About three quarters of the gender wage gap is concentrated within firms, while about one quarter reflects the sorting of women in low-wage firms

On average across the countries covered by the analysis, one-quarter (23%) of the wage gap between women and men with similar skills reflects the sorting of women in low-wage firms (Figure 5.5).[14] More than half of the gender wage gap between firms is due to the sorting of women into low-wage firms within sectors (55%). Differences in firm size do not play much of a role, with the exception of the three Central and Eastern European countries (Estonia, Hungary and the Slovak Republic). This suggests that in general women are less likely to work in high-productivity high-wage firms irrespective of their size and sector.[15] The remaining part of the gender wage gap between firms is due to the tendency of women to work into low-wage sectors (45%).[16] The sorting of women into low-wage firms may reflect differences in non-wage working conditions, as women may be constrained to opt for firms with flexible working time arrangements due to childcare responsibilities and unpaid homework as well as discriminatory hiring practices by employers (Box 5.3). The sorting into low-wage sectors also is likely to reflect the tendency of women to sort into economic activities that are compatible with their past educational choices (e.g. privileging literacy over mathematical skills), driven by gendered socialisation processes earlier in life, stereotypes and social norms (OECD, 2017[18]).

Figure 5.5. The gender wage gap between and within firms

Difference in average wages between similarly-skilled women and men as a share of average hourly wages of men, early-2000s to mid-2010s



Note: Decomposition of gender wage gap between similarly-skilled women and men within firms and between firms. The between-firm component is further decomposed in a component between sectors, between firms of different size within sectors and between similarly sized firms within sectors. The wage gap between similarly-skilled women and men is obtained from a regression of log wages on a gender dummy, education/occupation dummies (education/occupation is not available for Austria and Estonia), flexible earnings-experience profiles by gender and decade-of-birth dummies to control for cohort effects. Monthly earnings instead of hourly wages are used for Austria, Costa Rica, Estonia, Finland and Slovak Republic. Reference period: 2001-2013 for Japan; 2002-2017 for Portugal; 1996-2015 for Italy; 2002-2019 for the United Kingdom; 2003-2017 for Hungary; 2004-2016 for Finland; 2003-2018 for Estonia; 2000-2018 for Austria; 2014-2019 for Slovak Republic; 2006-2018 for Spain; 2002-2018 for Germany; 2010-2019 for Netherlands; 2002-2018 for France; 2001-2017 Denmark; 2006-2017 for Costa Rica; and 2002-2017 for Sweden.

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Box 5.3. Firms offering flexible working time arrangements not only employ more women but also tend to pay lower wages

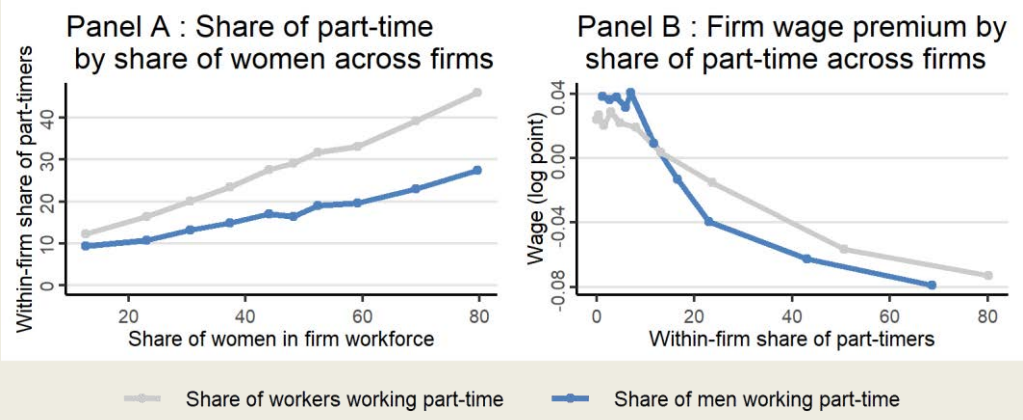
To shed light on the role of non-wage working conditions for the sorting of women into low-wage firms, Figure 5.6 relates the incidence of part-time work within firms on the one hand to the corresponding share of women in employment (Panel A) and the firm wage premium (Panel B) on the other. The figure provides two key insights:

- *Women are more likely to work in firms where part-time is widespread*. This is not just because women are more likely to work part-time. When focusing on the share of part-time among *men* only, the relationship is largely unchanged. In firms with a high share of women (80%) about 25% of employees work part-time, while in firms with a low share of women (20%) only about 10% work part-time.[17] Hence, differences in non-wage working conditions across firms, at least in relation to part-time status, along with gendered "preferences" for non-wage working conditions contribute to gender segregation across firms.
- *The prevalence of part-time is associated with lower firm wage premia.* Consequently, the sorting of women across firms that differ in the scope of working part-time contributes to the between-firm component of the gender wage gap. This may suggest that workers are willing to accept a lower hourly wage in exchange for the possibility of working part-time (consistent with the theory on compensating differentials). Firms where about a 20% of men work part-time tend to offer about 8% lower wages than firms where no men work part-time.

There is only limited evidence in the literature on the sorting of women across firms based on availability of flexible working time arrangements. One exception is a study by Gallen et al. (2019[19]) for Denmark who find that 30% of the gender gap in working time can be attributed to the sorting of women into establishments with low average working hours (conditional on the characteristics of the workforce). To reduce gender segregation across firms and its potential contribution to the gender wage gap, part-time work should be more equally shared between women and men.

Figure 5.6. Women are more likely to work in firms where part-time is more common and wages tend to be lower

Average across France, Italy, the Netherlands and Sweden, mid-2000s to mid-2010s



Reference period: 1996-2015 for Italy; 2010-2019 for Netherlands; 2002-2018 for France; and 2002-2017 for Sweden.

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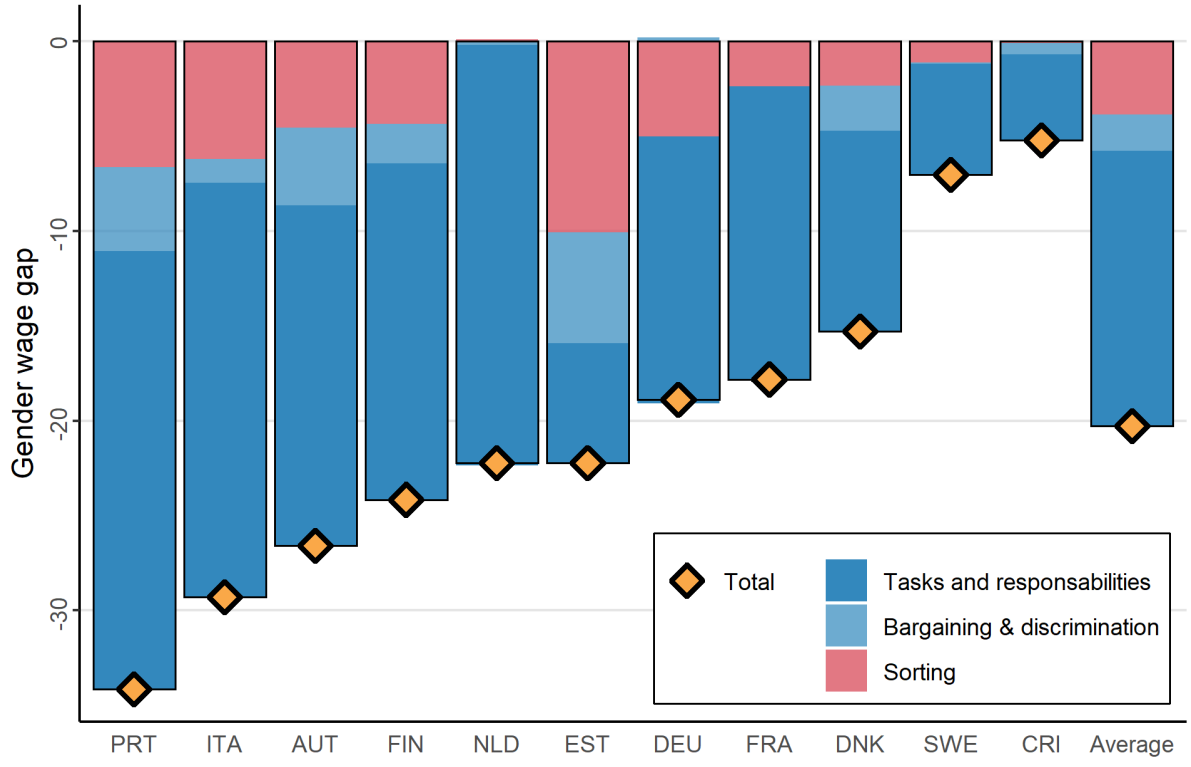
The within-firm gender pay gap largely reflects differences in tasks and responsibilities, but also differences in bargaining and discrimination

About three quarters (77%) of the wage gap between women and men with similar skills reflects differences in pay within firms. The within-firm gender wage gap is likely to reflect to an important extent differences in tasks and responsibilities, but also differences in pay for equal work due to amongst others discrimination. Using the detailed decomposition as proposed by Card, Cardoso and Kline (2016[8]), Figure 5.7 shows that, on average across the countries considered, the bulk of the wage gap between women and men with similar skills (eight-nineths) reflects differences in the work they do (e.g. tasks, responsibilities) and one-nineth differences in pay for work of equal value (e.g. bargaining, discrimination).[18] Moreover, differences in pay for work of equal value are particularly large in some countries, such as Estonia and to a lesser extent Portugal, where it explains respectively 25% and 13% of the gender wage gap between similarly skilled women and men, while it tends to be rather small in the other countries. This pattern is consistent with results from previous studies for those countries (Masso, Meriküll and Vahter, 2020[5]; Card, Cardoso and Kline, 2016[8]; Coudin, Maillard and Tô, 2018[6]; Bruns, 2019[9]; Casarico et al., 2019[7]). Additional evidence for Estonia suggests that differences in pay between firms and differences in pay for work of equal value within firms tend be more pronounced for high-wage women (Box 5.4).

One reason why significant pay differences persist between women and men doing work of equal value in some countries may be that individuals and the broader public often are not aware of such differences. A number of countries have recently introduced pay transparency reforms to raise awareness of systematic pay differences between women and men within firms and make it easier to enforce equal pay legislation.[19] Evaluations of mandatory disclosure or reporting measures in Canada, Denmark and the United Kingdom highlight their potential for narrowing the gender wage gap within firms (Baker et al., 2019[20]; Duchini et al., 2020[21]; Bennedsen et al., 2019[22]). However, not all pay transparency measures are associated with positive evaluations, suggesting that positive outcomes do not come automatically and a good design is key (Böheim and Gust, 2021[23]; Gulyas, Seitz and Sinha, 2021[24]). For an in-depth discussion of the pay transparency measures and their effectiveness, see OECD (2021[25]).

Figure 5.7. The role of differences in tasks and responsibilities, pay for work of equal value and firm wage-setting practices in the gender wage gap

Difference in average wages between similarly-skilled women and men as a share of average hourly wages of men, early-2000s to mid-2010



Note: Decomposition of gender wage gap between similarly-skilled women and men in components related to differences in tasks and responsibilities, pay for work of equal value and firm wage-setting practices (see Box 5.2 for details). The wage gap between similarly-skilled women and men is obtained from a regression of log wages on a gender dummy, education/occupation dummies (education/occupation is not available for Austria and Estonia), flexible earnings-experience profiles by gender and decade-of-birth dummies to control for cohort effects. Monthly earnings instead of hourly wages are used for Austria, Costa Rica, Estonia, and Finland. This may increase the part that is attributed to bargaining and discrimination, particularly in countries with a high incidence of part-time (e.g. Austria). Reference period: 2002-2017 for Portugal; 1996-2015 for Italy; 2000-2018 for Austria; 2004-2016 for Finland; 2010-2019 for Netherlands 2003-2018 for Estonia2002-2018 for Germany; 2002-2018 for France; 2001-2017 Denmark; 2002-2017 for Sweden and 2006-2017 for Costa Rica.

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Box 5.4. The role of sorting and bargaining for high-wage women and men: Evidence for Estonia

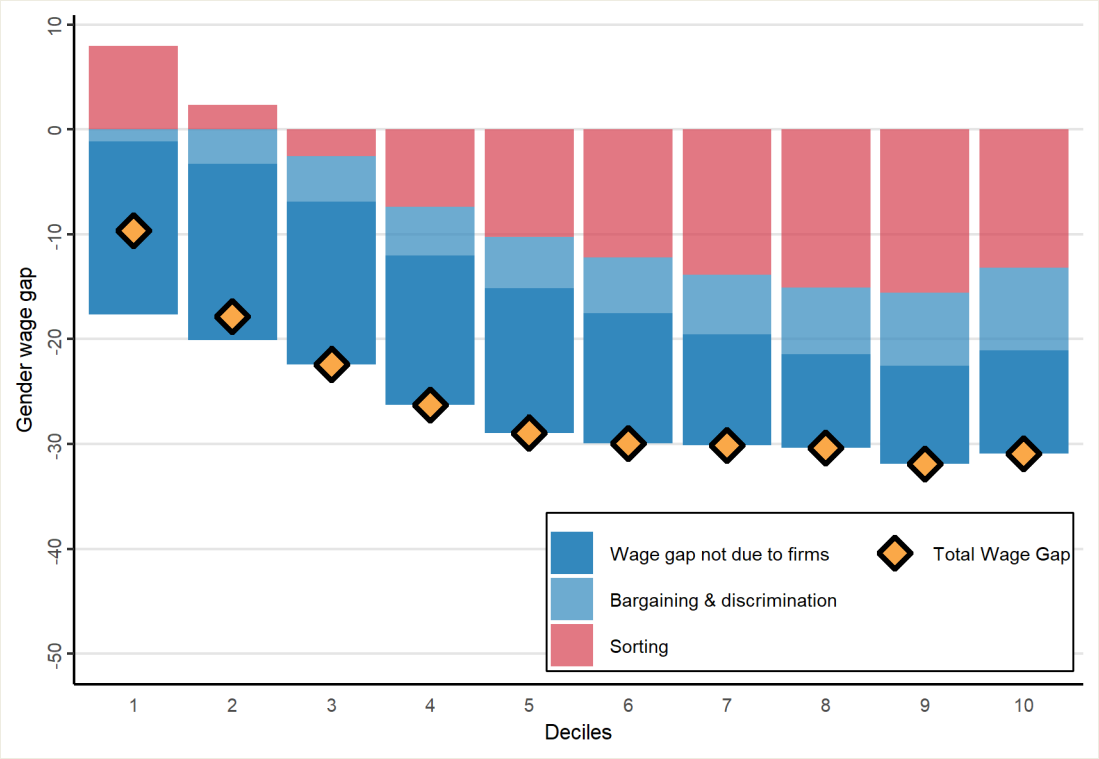
Additional evidence based on the detailed decomposition (see Box 5.2 for details) for Estonia suggests that differences in wage premia between firms are particularly important for the gender wage gap among *high-wage* women and men. Among women and men in the top decile, about 40% of the gender wage gap is explained by differences in wage premia between firms (sorting) and about 30% by differences in wage premia between women and men within firms (bargaining and discrimination). Among women

and men in the bottom decile, women sort into firms paying higher wage premia, while there are no systematic differences in pay between women and men within firms (conditional on skills).

Gender wage gaps are higher for high-wage women because of their difficulty to access top jobs in high-wage firms. Indeed, top jobs in top firms are to a greater extent occupied by men than other jobs in top firms or top jobs in other firms. This may also affect the bargaining position of high-wage women, and thus exacerbate differences in pay for work of equal value within firms. Most other countries also exhibit an increasing gender wage gap along the wage distribution (OECD, 2017[18]). However, the reasons for this pattern are not well understood. Assessing to what extent the findings for Estonia carry over to other countries therefore represents an important avenue for future work.

Figure 5.8. The role of sorting and bargaining in the gender wage gap in Estonia

Difference in monthly earnings between women and men with similar skills, tasks and responsibilities as a share of monthly earnings of men at each decile of the individual earnings distribution, 2002-2018



Note: The figure presents the results from the decomposition of Equation 5.4 for deciles of individual wages. The wage gap not due to firms reflects the role of worker and job characteristics.
Source: OECD calculations based on Estonian Tax and Customs Board Register

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1. Among women and men in the top decile, about 40% of the gender wage gap is explained by differences in wage premia between firms (sorting) and about 30% by differences in wage premia between women and men within firms (bargaining and discrimination). Among women and men in the bottom decile, women sort into firms paying higher wage premia, while there are no systematic differences in pay between women and men within firms (conditional on skills).

5.4.2. The age profile of the gender wage gap within and between firms

The gender wage gap tends to increase with age in most countries particularly during the early years of worker careers

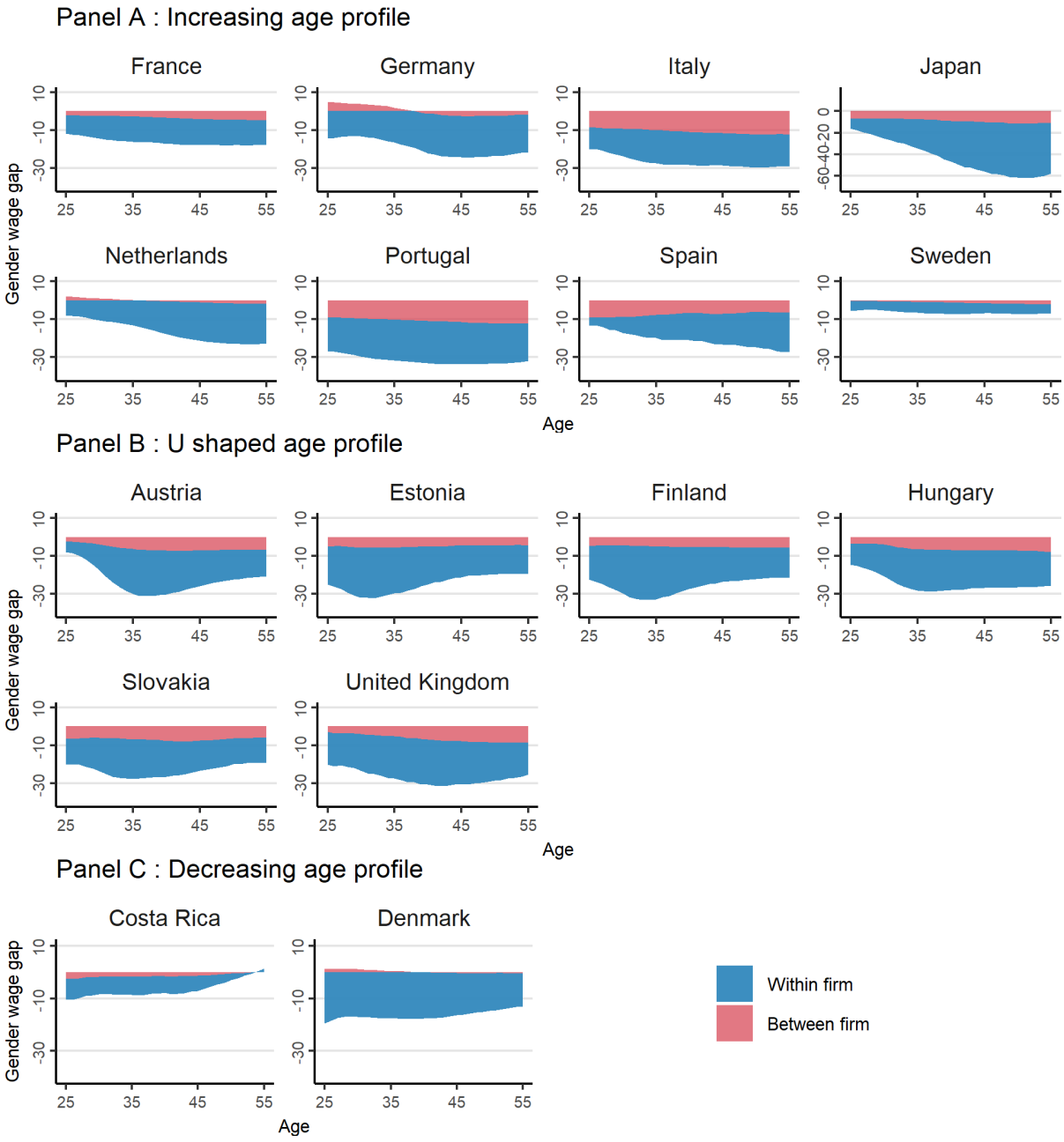
The age profile of the gender wage gap and the firms varies across countries (Figure 5.9).[20] In a number of Western European countries, including France, Germany, Italy, the Netherlands, Portugal, Spain and Sweden as well as Japan, the gender wage gap tends to increase with age (Panel A – countries with an increasing age profile of the gender wage gap). This tends to reflect growing differences in pay both between and within firms. It may indicate that men increasingly sort into high-wage jobs as they advance in their careers, while women stay behind or may even be constrained to move into lower-wage jobs which offer more flexible working time arrangements. In Central and Eastern European countries, including Austria, Estonia, Finland, Hungary and the Slovak Republic, as well as the United Kingdom, the gender wage gap increases between the ages of 25 and 35, but then declines (Panel B – countries with a U-shaped age profile of the gender wage gap).[21] This pattern is mainly driven by differences in pay between women and men within firms, while the role of between-firm differences varies across countries. In Denmark and Costa Rica, the gender wage gap is broadly stable until the age 45 –with only a tiny increase in the mid-thirties – and a more significant decline thereafter (Panel C – stable or declining age profiles). This is largely driven by the within-firm component of the gender wage gap.[22]

The evolution of the gender wage gap within and between firms over the working life is unlikely to be driven by changes in the characteristics of women and men in the workforce in the form of cohort or selection effects. As discussed in Section 5.3.2, the present analysis controls for cohort effects through the inclusion of decade-of-birth fixed effects by gender and controls for selection into employment based on the observable characteristics of women and men (education, age). However, the analysis does not control for selection in employment based on unobservable worker characteristics. To the extent that female labour force participation displays an important life-cycle profile due to the role of motherhood, this could contribute to the age-profile of the gender wage gap. Indeed, and as discussed in the next sub-section, career breaks around the time of childbirth are particularly important in Central and Eastern countries (OECD, 2018[4]; Kleven et al., 2019[3]). However, controlling for possible selection effects due to changes labour force participation over the life-cycle through the inclusion of workers fixed effects as in Abowd et al (1999[15]) and Dostie et al. (2020[16]) does not change the qualitative results presented here (see Annex Figure 5.A.2).

Importantly, in all countries except Costa Rica and Denmark, the gender wage gap increases significantly during the initial phase of professional careers up to the age of 35. This corresponds to a period characterised by both high wage growth and high job mobility in which the long-term careers of women and men are shaped (OECD, 2015[26]; Guvenen et al., 2021[27]; OECD, 2015[26]). However, women may miss out on important opportunities during this period since this also tends to be the period during which many women get their first child. Indeed, motherhood is likely to explain much of the divergence in the gender wage gap due to its implications for career advancement within and between firms (Kleven et al., 2019[28]; OECD, 2017[18]; Barth, Kerr and Olivetti, 2021[11]). The remainder of this sub-section analyses the role of promotions (upward job mobility) for the evolution of the gender wage gap within firms and that of job-to-job mobility for the evolution of the gender wage gap between firms.

Figure 5.9. The role of firms in the evolution of the gender wage gap over the working life varies across countries

Difference in average wages between similarly-skilled women and men as a share of the wages of men by age, %, early-2000s to mid-2010s



Note: Decomposition of gender wage gap between similarly-skilled women and men within firms and between firms by age. The wage gap between-similarly-skilled women and men is obtained from a regression of log wages on a gender dummy, education/occupation dummies (education/occupation is not available for Austria, and Estonia), flexible earnings-experience profiles by gender and decade-of-birth dummies to control for cohort effects. Monthly earnings instead of hourly wages are used for Austria, Costa Rica, Estonia, Finland and Slovak Republic. For the reference period, see the notes below Figure 5.5.

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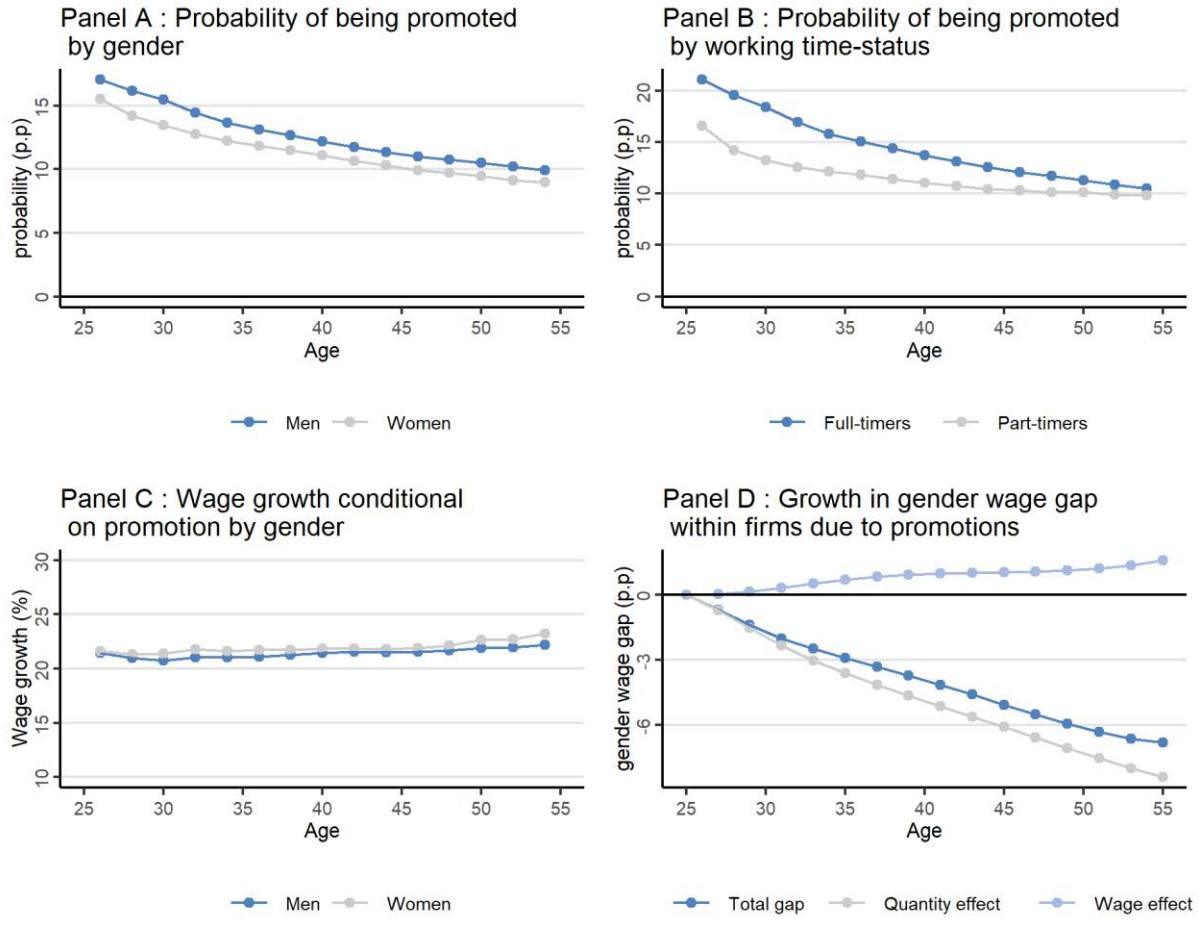
By inducing gender differences in promotions, part-time work plays an important role in shaping the evolution of the gender wage gap within firms

Differences between women and men in the probability of being promoted shape the evolution of the gender wage gap within firms (Figure 5.10).[23] Promotions are analysed by focusing on the probability of experiencing a significant increase in pay (more than 10%). On average across countries, women are less likely to be promoted at any age, but particularly in their thirties (Panel A). The gender gap in promotions largely reflects the role of part-time work, which is associated with a considerably lower probability of being promoted than full-time work (Panel B).[24] Since women are more likely to work part-time, this contributes to the gender gap in the probability of being promoted.[25] Conditional on being promoted, women tend to experience similar or slightly higher higher wage increases than men (Panel C).[26] On average across countries, gender differences in the incidence and nature of promotions account for an increase in the gender wage gap within firms of 5 percentage points at age 45, or about 75% of the *overall* increase of the gender wage gap (Panel D).[27] These findings are similar to those by Bronson and Thoursie (2020[29]) who find that promotions account for 70% of the increase in the gender wage gap by age 45 in Sweden.

Figure 5.10. The role of promotions in the gender gap within firms over the working life

Average across selected countries, mid-2000s to mid-2010s



Note: The probability of being promoted is defined as the share of persons in employment at t-1 experiencing a significant increase in pay between t and t-1 (more than 10%). Average across the following countries: Denmark, France, Hungary, Netherlands, Portugal. Reference period: 2001-2017 Denmark; 2002-2017 Sweden; 2002-2018 for France; 2003-2017 for Hungary; 2010-2019 for Netherlands and 2002-2017 for Portugal.

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The increase in the gender wage gap between firms over the working life is to an important extent driven by gender differences in the extent and nature of job mobility

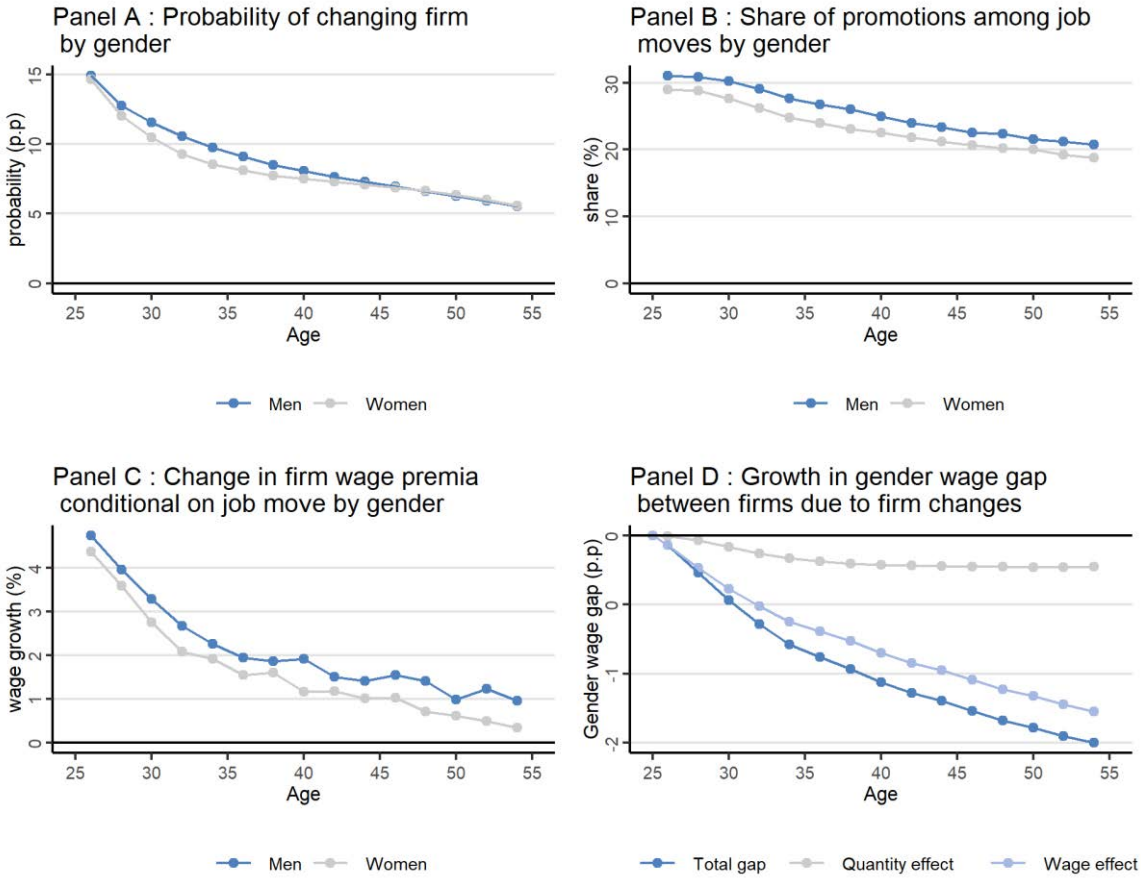
The increase in the gender wage gap between firms over the life course is to an important extent driven by gender differences in the incidence and nature of job mobility. Women are less likely to change firms than men, particularly around the age of childbirth (Figure 5.10, Panel A). On average across the countries considered, the gap in job mobility increases up to the early thirties and then gradually narrows until it closes in the late 40s. Moreover, when women change firms, this is less likely to take the form of promotions, i.e. significant wage increases of more than 10% (Panel B). Since promotions account for a smaller share of overall job moves for women, this results in smaller average increases in firm wage

premia (Panel C). In other words, women appear to change jobs to a lesser extent for wage and career considerations and more often for personal reasons, such as having more flexible working-time arrangements, working closely from home or following a partner. Indeed, it is the *nature* of job moves that explains most of the increase in the gender gap between firms over the working life, while the number of job moves plays a secondary role (Panel D). On average across the countries considered, gender differences in the incidence and nature of job mobility account for about 56 of the increase of the between-firm gender wage gap up to age 45 (20% of the overall gender wage gap), with gender differences in the change in wage premia following a job move accounting for about 80% of the total effect (wage effect) and gender differences in the probability of moving for 20% (quantity effect).

Beyond the direct effects of job mobility for the gender wage gap between firms, job mobility also has potentially important indirect effects for the gender wage gap *within* firms. Indeed, the lower level of job mobility among women and the greater importance of non-wage working conditions for job-mobility decisions results in a lower sensitivity of female labour supply to wage differences between firms. This increases the scope for gender discrimination based on differences in the bargaining position between women and men within the same firms (consistent with the analysis in Chapter 3). The fact that female job mobility is particularly unresponsive to wage differences between firms around the age of childbirth (early thirties) makes young mothers particularly vulnerable to discrimination by employers, in relation to both their wages as well as their probability of being hired. This issue has not received much attention in the policy debate so far.[28]

Figure 5.11. The role of job-to-job job mobility in the gender wage gap between firms over the working life

Average across selected countries, mid-2000s to mid-2010s



Note: Job-to-job mobility rate is defined as the number of workers changing firm between year t and t-1 as a share of employment in year t-1. Average across the following countries: Denmark, France, Hungary, Netherlands, Portugal. Reference period: 2001-2017 Denmark; 2002-2017 Sweden; 2002-2018 for France; 2003-2017 for Hungary; 2010-2019 for Netherlands and 2002-2017 for Portugal

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Policies should be made more supportive of job mobility within and between firms

Systematic gender differences in the extent and nature of job mobility between and within firms reflect important differences in opportunities for career advancement between women and men. Policies and institutions that can support the upward mobility of women within and between firms are therefore key to reduce the gender wage gap. These include family policies that contribute to a more equal sharing of household responsibilities (e.g. incentivising fathers to take more parental leave) as well as a more equal sharing of part-time work (e.g. universal childcare, reducing effective marginal tax rates on second earners) (OECD, 2017[12]; OECD, 2019[13]).

5.4.3. The role of motherhood in the gender gap within and between firms

The evolution of the gender wage gap between and within firms over the life-course is to an important extent determined by the motherhood penalty, i.e. the shortfall in wage growth following childbirth of mothers relative to fathers (OECD, 2017[18]). Kleven et al (2019[3]) provide estimates for selected countries of the long-term motherhood penalty in terms of *labour income* ranging from 21-26% in Denmark and Sweden to 31-44% in the United Kingdom and the United States and 51-61% in Austria and Germany. The motherhood penalty mainly reflects adjustments in working time and wages in the Scandinavian and German-speaking countries, but adjustments in employment in the two English-speaking countries. Bruns (2019[9]) further shows that about a quarter of the long-term w*age* penalty associated with motherhood in Germany results from differences in the sorting of women and men across firms. Similarly, Coudin et al (2018[6]) find for France the motherhood penalty in wages is closely related to the tendency of young mothers to move to firms close to home and firms with flexible working-time policies. Masso et al (2020[5]) suggest that sorting across firms plays no role in Estonia despite a significant motherhood penalty.

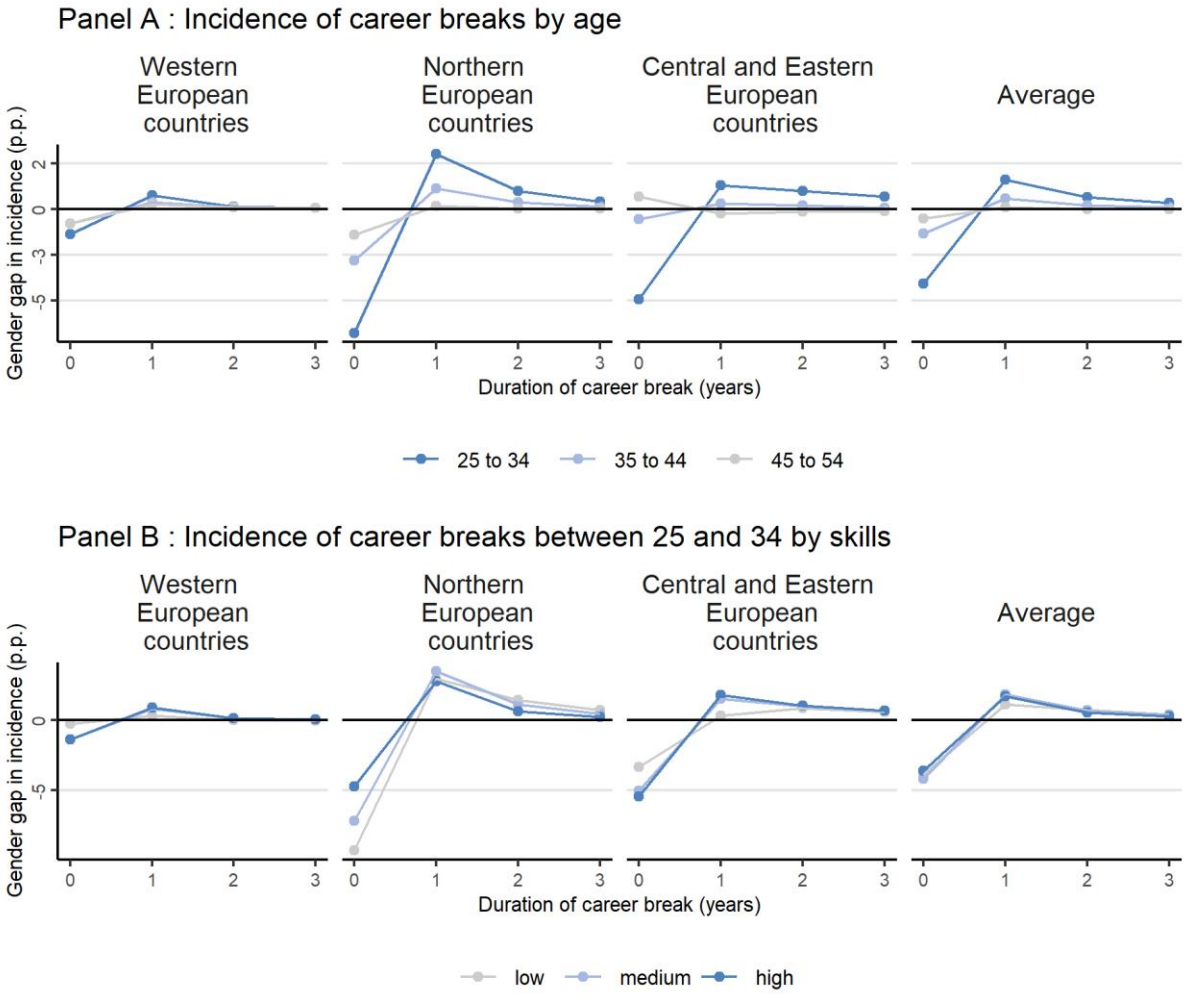
The present cross-country data do not allow looking at the role of motherhood directly due to the absence of information on childbirth. However, the data allow identifying career breaks around the age of parenthood (25-34) by focusing on non-employment spells. Career breaks are likely to account for an important fraction of the motherhood penalty, and as a result, play a potentially important role in determining the evolution of the gender wage gap within and between firms over the life-course. This sub-section documents the incidence of career breaks around the age of childbirth and their consequences for the wage growth of women.

The incidence and duration of career breaks varies significantly across country groups

There are important differences in the incidence and duration of career breaks across countries. Women aged 25-34 are much more likely than men to experience a non-employment spell of one or more years, while there is only small difference between women and men aged 35-54 (Figure 5.12, Panel A). While non-employment spells may reflect many factors, the difference between women and men for workers aged 25-34 is likely to be driven by career breaks of women around the age of childbirth. Such careers breaks are most common in Northern European countries (Denmark, Finland and Sweden), while they are least common in Western European countries (France, Italy, the Netherlands and Portugal). In Central and Eastern European countries (Austria, Estonia and Hungary), they are quite common and often last for more than one year. While differences across skills groups are generally small, there is some indication that career breaks are more common among low-skilled women in Northern European countries and among high-skilled women in other European countries (Panel B).

Figure 5.12. The incidence and duration of career breaks varies across countries

The incidence of non-employment spells by duration, age and skill



Western European countries: France, Italy, the Netherlands and Portugal; Central and Eastern European countries: Austria, Estonia, and Hungary; Northern European countries: Denmark Finland, Sweden. Skill groups are defined based on terciles of the wage distribution.

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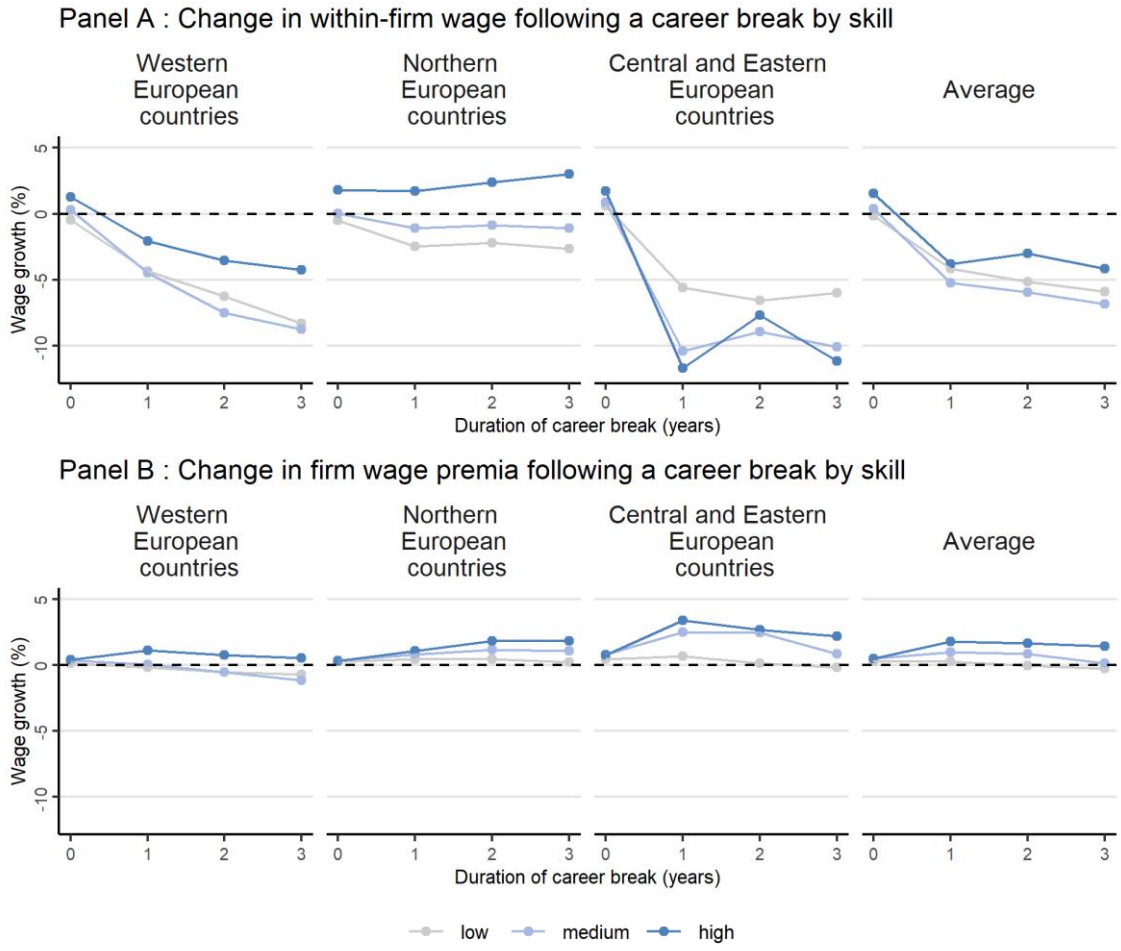
Career breaks around the age of childbirth contribute to the motherhood penalty

Career breaks tend to be associated with significant wage losses (Figure 5.13). Wage losses in principle may reflect the slower upward mobility within firms due to lost experience and the possible depreciation of relevant skills or the sorting of persons following a career break into lower wage firms. To examine this, Panel A documents the percentage difference in wages within firms (conditional on age and education) before and after career breaks of different duration for women, while Panel B shows the percentage difference in firm wage premia between firms.[29] The evidence suggests that wage losses due to missed experience or human capital depreciation can be sizeable, amounting to about 4% for career breaks of one year, and even larger for longer career breaks.[30] In Central and Eastern European

countries, wage losses tend to be largest, and larger for more skilled women, while they do not depend much on the duration of the break. In Western European countries, wage losses follow the average profile across countries, whereas in Northern European countries, wage losses are small and limited to low-skilled women. Women do not tend to move to lower wage firms following a career break (if anything the opposite is observed). This reflects the fact most women return to their previous employer after a career break. Consequently, sorting to lower-wage firms does not significantly contribute to the gender wage gap between firms.

Figure 5.13. Career breaks tend to be associated with significant wage losses

Percentage change in wages for women age 25 to 34 conditional on potential experience and education



Note : Western European countries: France, Italy, the Netherlands and Portugal; Central and Eastern European countries: Austria, Estonia, and Hungary; Northern European countries: Denmark, Finland and Sweden. Skill groups are defined based on terciles of the wage distribution.

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Both policies and institutions and social norms are likely to shape the importance and nature of career breaks

The country patterns documented in this sub-section may be indicative of the role played by policies and institutions in shaping the incidence and duration of career breaks and hence the labour market consequences of childbirth. However, they may also reflect deeply engrained cultural differences between countries in the form of social norms. This is consistent with evidence for Denmark that shows that the motherhood penalty is highly persistent over time and tends to be transmitted across generations (Kleven et al., 2019[28]). This suggests that family policies need to be complemented with other policies that can help change social norms (e.g. school interventions).

5.5. Concluding remarks and policy implications

To analyse the role firms for the gender wage gap over the life-course, this chapter decomposes the gender wage gap between similarly-skilled women and men at different ages into a between-firm component that captures the sorting of women into low-wage firms and a within-firm component that captures systematic differences in pay between women and men in the same firm. On average across the countries covered by the analysis, about three quarters of the gender wage gap reflects pay differences within firms mainly due to differences in tasks, responsibilities, but to a lesser extent also differences in pay for work of equal value. The remaining one quarter reflects differences in wage premia between firms due to sorting. The gender gap tends to increase during to the initial phase of women's professional career due to the role of motherhood. This reflects to an important extent gender differences in mobility between and within firms and the role of career breaks for the career progression of women within firms. Consequently, tackling the gender wage gap crucially requires promoting access of women to well-paying firms and well-paying jobs within firms. This involves a range of policies (OECD, 2017[18]), including:

- **Family policies.** Family policies can contribute to a more equal sharing of household and care responsibilities between men and women and hence enable women to take advantage of opportunities for career progression within their current firms and at other employers. This is particularly important for countries, which see strong and persistent increases in the gender wage gap as workers advance in their careers (e.g. Western European countries, Japan). Key family policies include more equal parental leave policies for men and women, which helps introduce egalitarian norms in parenting when children enter a family; providing universal childcare, out-of-school supports and supports for elder care; and reducing marginal effective tax rates for second earners (OECD, 2017[12]). While there is strong empirical support for the role of parenthood for the gender wage gap and the need for a more equal sharing of household responsibilities (Kleven et al., 2020[30]), concerns have been raised about the effectiveness of family policies for reducing the gender wage gap in a context where preferences and social norms are deeply anchored in society (Kleven et al., 2020[30]). It is important therefore to complement family policies with other policies that can help foster more gender-friendly social norms (e.g. school interventions).
- **Mobility within and between firms**. To make good jobs more accessible to women, the use of flexible work arrangements across occupations and firms, including telework and part-time work, should be supported and offered to all workers – not only parents (OECD, 2019[13]). This would reduce the contribution of compensating wage differentials related to the valuation of working time flexibility by women to the gender wage gap, and the segregation of women and men across firms and jobs with different non-wage characteristics. Voluntary target setting and good management practices that make managers accountable are among the measures that could also help to promote access for women to quality jobs, while at the same time foster social

norms that support gender equality. Gender quotas could in principle also help, but need to be used judiciously to avoid the risk that they undermine firm performance, particularly if targets are set too high given the number of suitably-qualified women in the sector/occupation (Hwang, Shivdasani and Simintzi, 2018[31]). Finely targeted quotas such as those related to company boards seem to hold some promise in this regard. Recent evaluations suggest that although such quotas enhance the representation of women in company boards, they have limited spillover effects on the career progression of other women in those firms (Bertrand et al., 2019[32]; Maida and Weber, 2020[33]).

- **Equal-pay-for-equal-work measures.** A key obstacle to reducing gender wage gaps is that employers and employees are often unaware of them. Pay transparency rules raise awareness of discrimination and make it easier to enforce equal pay legislation. Pay transparency rules come in a variety of forms in OECD countries, and can, for example, provide the right to request information on pay levels by gender within firms, require firms to report information on employment and pay by gender, or incentivise firms to undertake gender pay audits. About half of OECD countries have recently put in place pay transparency measures (e.g. Austria, France, Germany, Sweden). Recent studies have shown that mandatory reporting requirements can help reducing the gender wage gap within firms (Bennedsen et al., 2019[22]; Blundell, 2020[34]; Baker et al., 2019[20]). Equal pay for work of equal value measures are particularly important for certain countries with large initial gender wage gaps early in worker careers (e.g. Estonia).
- **Investing in STEM.** While in most countries women outperform men in terms of the level of education – women are more likely to hold a tertiary degree – fewer women than men complete Science, Technology, Engineering and Mathematics (STEM) degrees (Mostafa, 2019[35]). To some extent educational choices may reflect the possibility that teenage boys still perform better in STEM subjects than girls, but gender stereotypes also play an important role in driving the educational choices of girls and boys. The lower likelihood of women to choose STEM subjects is also likely to contribute to sectoral segregation. Investing in STEM) and addressing stereotypes that drive the educational choices of girls and boys is particularly important in countries with high levels of gender segregation such as Italy and Portugal.

In addition to informing policies to tackle the gender wage gap, the linked employer-employee data used in this chapter can also be employed to contribute to gender pay transparency. Since the data cover the universe of firms and workers in most countries and provide detailed information on the characteristics of workers within firms, they are ideally suited for documenting gender wage gaps within single firms for similarly-skilled women and men. Indeed, a number of countries already have taken steps to mobilise linked employer-employee data to promote gender pay transparency by providing detailed information on reference wages in a specific industry, occupation or region. For example, Statistics Estonia is developing a web application that provides detailed information on reference wages based on administrative data. Moreover, computing firm-specific gender wage gaps, adjusted for differences in skills, from linked employer-employee data, could relief firms from reporting requirements related to pay transparency laws where these exist and ensure that reporting is done in a consistent manner across firms (Breda et al., 2021[36]).

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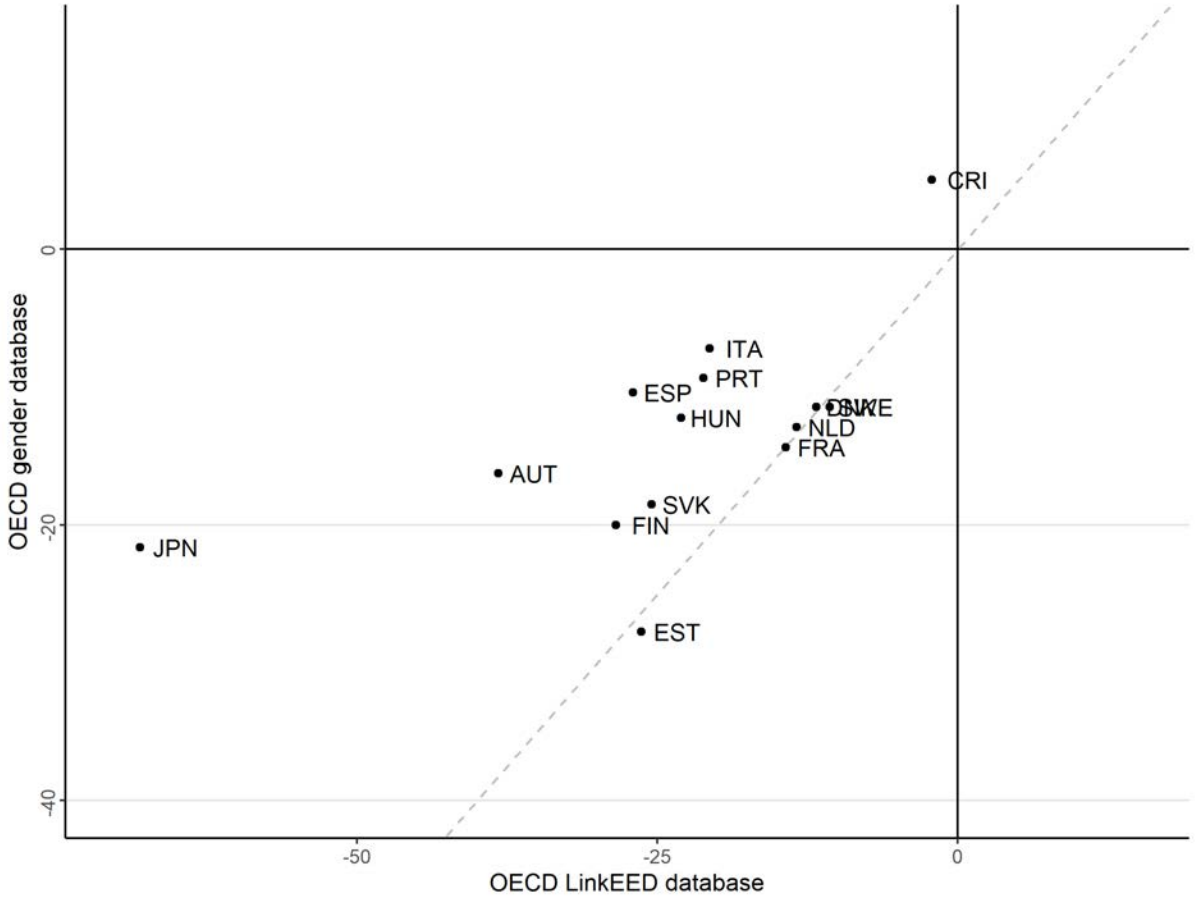
Russo, G. and W. Hassink (2008), "The Part-Time Wage Gap: a Career Perspective", *De Economist 2008 156:2*, Vol. 156/2, pp. 145-174, http://dx.doi.org/10.1007/S10645-008-9087-0. [39]

Annex 5.A. Additional material

Annex Figure 5.A.1. The gender wage gap in the data used for this chapter (LinkEED Database) and as measured using the OECD Earnings Distributions Database (OECD Gender Database).

Difference in wages of women relative to men, %, 2018

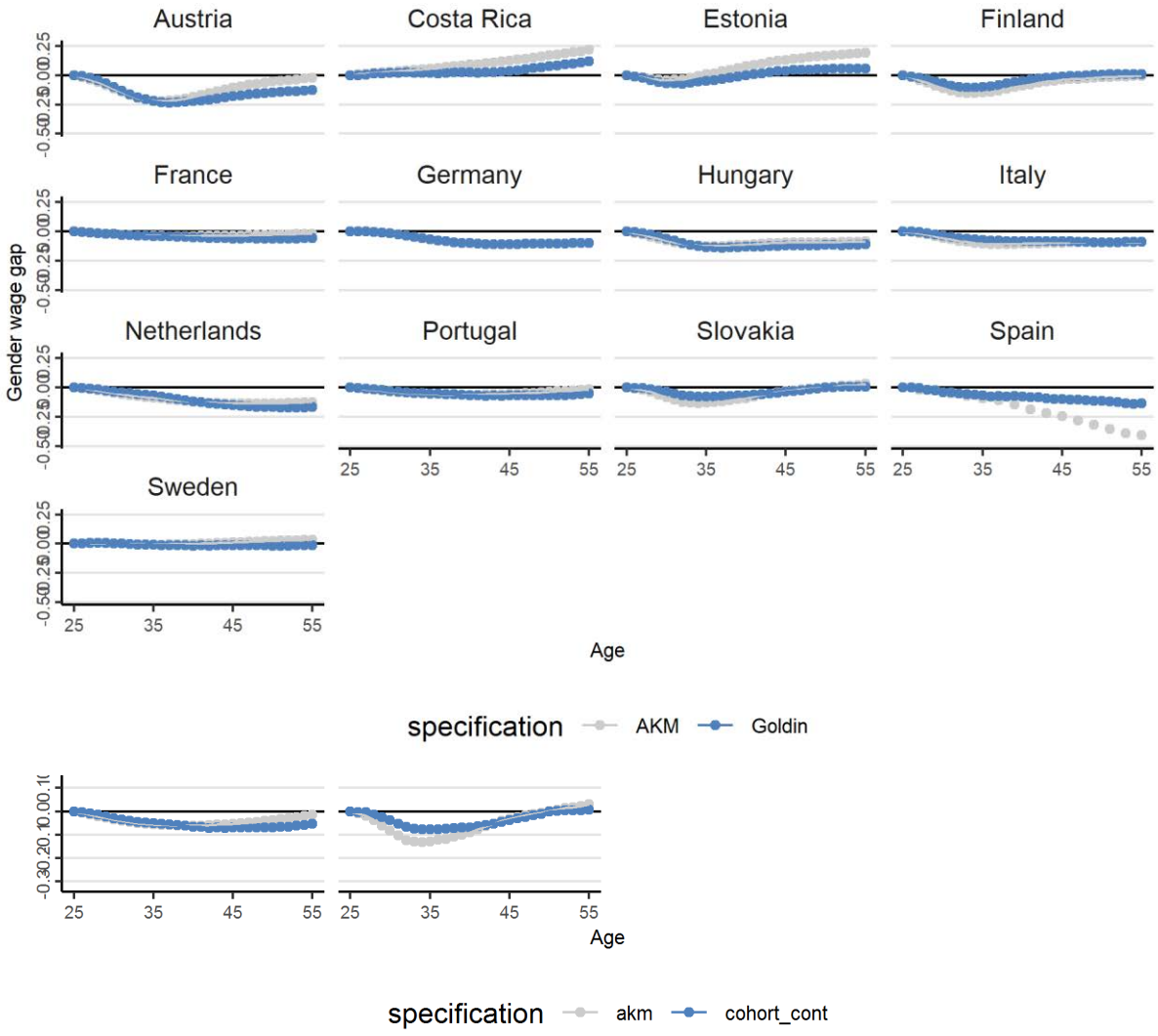


Source: OECD gender database.

StatLink https://stat.link/sd7tca

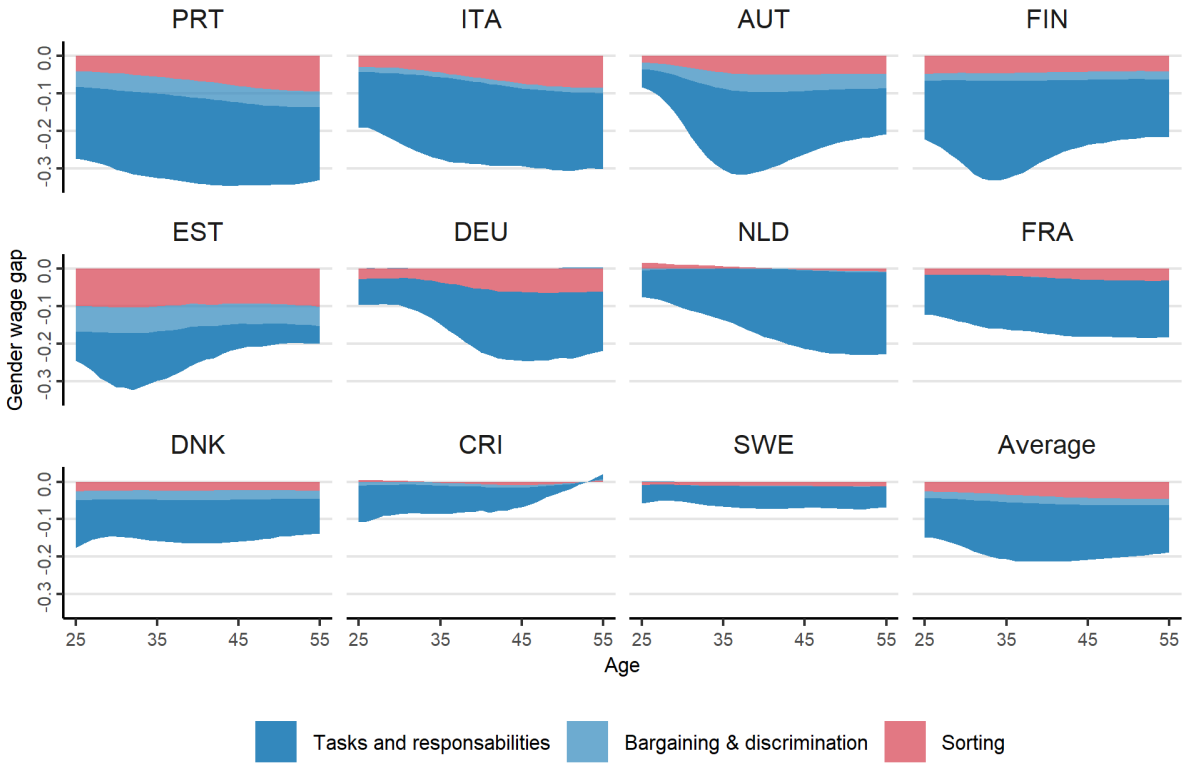
Annex Figure 5.A.2. Selection in employment based on unobservable worker characteristics only marginally affects the age-profile of the gender wage gap

Evolution of the gender wage gap between similarly skilled women and men since age 25, early-2000s to mid-2010s



Annex Figure 5.A.3. The role of differences in tasks and responsibilities, pay for work of equal value and firm wage-setting practices in the evolution of the gender wage gap over the life-course

Difference in average hourly wages between similarly-skilled women and men as a share of average hourly wages of men by age, early-2000s to mid-2010s



Note: Decomposition of gender wage gap between similarly-skilled women and men in components related to differences in tasks and responsibilities, pay for work of equal value and firm wage-setting practices (see Box 5.2 for details). The wage gap between similarly-skilled women and men is obtained from a regression of log wages on a gender dummy, education/occupation dummies (education/occupation is not available for Austria and Estonia), flexible earnings-experience profiles by gender and decade-of-birth dummies to control for cohort effects. Monthly earnings instead of hourly wages are used for Austria, Costa Rica, Estonia, Finland. Reference period: 2002-2017 for Portugal; 1996-2015 for Italy; 2000-2018 for Austria; 2004-2016 for Finland; ; 2010-2019 for Netherlands 2003-2018 for Estonia2002-2018 for Germany; 2002-2018 for France; 2001-2017 Denmark; 2002-2017 for Sweden and 2006-2017 for Costa Rica.

StatLink https://stat.link/tiwqn3

Notes

[1] This chapter has been written by an OECD team consisting of Antton Haramboure and Alexander Hijzen with contributions of: Antoine Bertheau (University of Copenhagen, DENMARK), Gabriele Ciminelli (OECD), Chiara Criscuolo (OECD), Katarzyna Grabska-Romagosa (Maastricht University, THE NETHERLANDS), Ryo Kambayashi (Hitotsubashi University, JAPAN), Michael Koelle (OECD), Balazs Murakőzy (University of Liverpool, HUNGARY), Vladimir Peciar (Ministry of Finance, SLOVAK REPUBLIC), Andrei Gorshkov and Oskar Nordström Skans (Uppsala University, SWEDEN), Satu Nurmi (Statistics Finland/VATT, FINLAND), Catalina Sandoval and Jonathan Garita (Central Bank of Costa Rica, COSTA RICA), Nathalie Scholl (OECD), Cyrille Schwellnus (OECD) and Richard Upward (University of Nottingham, UNITED KINGDOM). For details on the data used in this chapter please see the standalone Data Annex and Disclaimer Annex.

[2] The countries covered in this chapter are Austria, Costa Rica, Denmark, Estonia, Finland, France, Germany, Italy, Hungary, Japan, the Netherlands, Portugal, the Slovak Republic, Spain, Sweden and the United Kingdom.

[3] For the European countries covered in the empirical analysis in Section 4, the conditional gender wage gap is on average between 2002 and 2018 was 18%. The corresponding gap measured using linked employer-employee data amounts to 23% (excluding Costa Rica and Japan). The difference may reflect the inclusion of small firms with less than 10 workers and overtime payments in the calculation of the gender wage gap using linked employer-employee data.

[4] The two exceptions are Germany and Belgium.

[5] In principle, this could also reflect the role of cohort effects, i.e. the possibility that the gender wage gap tends to higher among older birth cohorts. However, controlling for cohort effects through the inclusion of decade-of-birth dummies does not significantly change the pattern shown.

[6] The argument could alternatively be phrased in terms of compensating differentials, when firms offering more attractive non-wage working conditions offer lower wage premia.

[7] Previous studies suggest that the job mobility behaviour of women is much less sensitive to wages than that of men, suggesting that there is considerable scope for gender discrimination (Hirsch, 2016[37]). While this evidence confirms that there is scope for monopsonic gender discrimination, it does not actually show the extent to which employers exploit differences in wage-setting power across men and women to increase profits. However, because of legal constraints or concerns over fairness, employers might not fully exploit their wage-setting power in practice.

[8] Experience is measured in potential terms using age and therefore does not take account of for example career breaks.

[9] Those born in the 1960s are used as the reference group for the analysis.

[10] For Germany, in the absence of information on hourly wages, the analysis is restricted to full-time workers as in Bruns (2019[9]).

[11] Part-time status is defined either on the basis of working time or, if this information is not available, as those earning less than 75% of the full-time minimum wage or, in the absence of a minimum wage, 37.5% of the median.

[12] This allows defining the gender wage gap in terms of average wages as well as median wages. The gender gap in median wages is used for the official OECD measure of the gender wage gap.

[13] Taking account of bonuses and overtime payments significantly increases the measured gender pay gap in Japan.

[14] Applying the approach proposed by Card, Cardoso and Kline (2016[8]) yields broadly similar insights with respect to the importance of sorting in the gender wage gap with the exceptions of Germany (Figure 5.7). Once worker fixed effects are included, the role of sorting in the gender wage gap in Germany increases from being negligeable to being above the average across the sixteen OECD countries considered. This suggests that controlling for unobserved differences in worker composition across firms is important for understanding the role of sorting in the gender wage gap in Germany.

[15] In Estonia, Hungary and Slovak Republic, women are more likely to work in large firms, which tend to pay higher wages, *reducing* the gender wage gap.

[16] The Netherlands is an exception since women disproportionately work in high-wage sectors.

[17] Administrative data such as those used for this paper are not well suited to analyse the incidence of working very long hours. The reason for this is that they record contractual hours or paid overtime, whereas in practice hours beyond the contractual level are often not paid.

[18] The detailed decomposition can only be implemented with for countries with sufficiently long panels. This means it cannot be implemented for Japan and the Slovak Republic. Moreover, the component associated with bargaining and discrimination is likely to be overstated in countries without information on working time. This is particularly an issue in countries such as Austria where the gender gap in working time is relatively large.

[19] Pay transparency measures can cover different obligations (OECD, 2021[25]). Amongst others, these measures can provide the right to request information on pay levels by gender within firms, require firms to report information on employment and pay by gender, mandate or incentivise firms to undertake gender pay audits (which require analysis beyond the gender wage gap), mandate public disclosure of wages and/or the use of gender-neutral job classification systems. Eighteen OECD countries impose regular reporting requirements on private sector firms in relation to the gender wage gap.

[20] These patterns are broadly comparable with those documented in Ciminelli, Schwellnus and Stadler (2021[40]).

[21] In countries without information on working time, including Austria, Estonia and Finland, these patterns may to some extent reflect temporary increases in part-time work among women around the age of women become mothers for the first time. This is likely to be particularly an issue in Austria where female part-time employment displays a pronounced life-cycle profile with a strong increase around the age women become mothers. In Estonia and Finland female part-time employment exhibits a similar life-cycle profile, but part-time is much less common.

[22] The stable profile of the gender wage gap until the age of 45 in Denmark may to some extent be related to the very high degree of female labour force participation throughout the life-course.

[23] Promotions can also affect the gender wage gap between firms. The role of promotions related to moves between firms is analysed separately below.

[24] See also Russo and Hassink (2008[39]) for similar findings based on linked employer-employee data for the Netherlands. Lastly, women's higher rate of part-time work after having children accounts for 21% of the cumulative gap by age 45.

[25] Apart from shaping gender wage gap, the gender gap in promotions also shapes occupational segregation. Evidence by Manning and Petrongolo (2008[38]) suggests that most of the wage penalty associated with part-time work reflects occupational segregation.

[26] This is likely to reflect the possibility that women are positively selected in (full-time) employment. Similar observations have been documented in the literature. For example, Booth et al. (2003[41]) document that full-time women are slightly more likely to be promoted than men.

[27] Differences in the probability of being promoted – keeping constant differences in wage increases - contribute to an increase in the gender wage gap of 6 percentage points at age 45 (quantity effect), whereas differences in the nature of promotions – keeping constant differences in probability - reduce the gender wage gap by 1.4 percentage points (wage effect).

[28] Evidence based on the detailed decomposition of the gender wage gap over the working life does not suggest discrimination varies substantially with age (Annex Figure 5.A.3). However, this only captures changes in discrimination due to sorting of women across firms that differ in their discriminatory wage-setting practices. The analysis does not capture the possible change in discriminatory wage-setting practices within firms based on changes in the bargaining position of women due to, for example, motherhood.

[29] The results for men are very similar to those of women (not reported).

[30] Differences between women and men in the wage losses associated with career breaks tend to be small.

Annex A. Data Annex

Table A A.1. Data Sources

	Name	Earnings data source	Sample structure	Longitudinal	Hourly wages	Worker skills	Firm productivity	Time coverage
Austria	AMS-BMASK Arbeitsmarktdatenbank	Social security administration	Universe	Yes	No	No information	No	2002-2017
Canada	Longitudinal Worker Files (LWF)	Tax administration	Universe	Yes	No	No information	No	1991-2016
	Canadian Employer-Employee Dynamics Database (CEEDD)	Tax administration	Universe	Only workers, not firms	No	No information	Yes	2001-2015
Costa Rica	Register of Economic Variables (REVEC) from the Central Bank of Costa Rica (BCCR)	Social security administration combined with register data	Universe	Yes	No	Occupation	Yes	2006-2017
Denmark	IDA, IDAN, UDDA	Tax administration combined with register data	Universe	Yes	Yes	Education and Occupation	Yes	2001-2017
Estonia	Data from the Tax and Customs Board Register	Tax administration	Universe	Yes	No	No information	No	2003-2017
Finland	FOLK employment data from Statistics Finland, Employer Payroll Report from Tax Administration	Tax adminstration	Universe	Yes	No	Education	Yes	2004-2018

France	Déclaration annuelle des données sociales unifiée (DADS) panel linked with FARE/FICUS	Mandatory employer survey	1/12th random worker sample	Yes	Yes	Occupation	Yes	2002-2017
Germany	LIAB linked with BHP (Linked labour market biographies and establishment panel)	Social security administration	All workers who have ever worked in the ca. 16,000 BHP establishments	Yes	No	Education and Occupation	Yes	1996-2016
	Integrierte Erwerbsbiographien (IEB)	Social security administration	Universe (sampling due to computational constraints)	Yes	No	Education and Occupation	No	1996-2016
	SIEED (Sample of Integrated Employer-Employee Data)	Social security administration	1.5 % random establishments sample	Yes	No	Education and Occupation	Yes	2002-2018
Hungary	ADMIN II - Panel of administrative data (OEP, ONYF, NAV, NMH, OH)	Social security administration	50% random sample of population, taken in 2003.	Yes	Yes	Occupation	Yes	2003-2018
Italy	Longitudinal Sample social security INPS (LoSai)	Social security administration	1/15th random worker sample	Yes	Yes	Limited measure of occupation	No	2002-2015
Japan	Basic Survey of Wage structure, Basic Survey of Japanese Business Structure and Activities	Survey	Sample stratified by prefectures and industry	Only establishment, not worker	Yes	Education	Yes	2001-2016
Netherlands	SPOLIS, POLIS, GBA, ABR and Hoogsteopltab.	Social security administration	Universe	Yes	Yes	Education (for about half of the sample)	Yes	2010-2019

New Zealand	Integrated Data Infrastructure (IDI) – Inland Revenue (IR) & Business Register data	Tax administration	Universe	Yes	No	No	Yes (but currently not available in LinkEED)	2000-2017
Norway	Earnings data (Tax Register), augmented with employment history (National Education database)	Tax administration	Universe	Yes	Yes	Occupation	Yes (but currently not available in LinkEED)	2004-2014
Portugal	Quadros de Pessoal	Mandatory employer survey	Universe	Yes	Yes	Education and Occupation	Yes	2002-2017
Slovak Republic	Slovak Linked Employer-Employee database	Social security administration	Universe	Yes	No	Education	No	2014-2019
Spain	Muestra Continua de Vidas Laborales con Datos Fiscales (MCVL-CDF)	Social security and tax administration	4% random worker sample	Yes	No	Education and Occupation	No	2002-2017
Sweden	RAMS, LISA, Job Register. SES	Tax administration	RAMS: Universe. SES: 100% of the public sector; stratified sample covering 50% of all private sector firms	Yes	No, use of fulltime equivalent	Education and Occupation	Yes (but currently not available in LinkEED)	2001-2015
United Kingdom	Annual Survey of Hours and Earnings (ASHE)	Mandatory employer survey	1% random sample of national insurance records	Yes	Yes	Occupation	Yes (but currently not available in LinkEED)	1997-2019
United States	Longitudinal Business Database (LBD)	Business Register, Economic Census & other surveys	Universe	Only firms, not workers	No	No	No	1976-2015

Table A A.2. Country coverage by Chapter

	Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Austria	✓	✓	✓	✓	✓
Canada	✓	✓	✓		
Costa Rica	✓	✓	✓	✓	✓
Denmark	✓	✓		✓	✓
Estonia	✓	✓			✓
Finland	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	✓
Germany	✓	✓	✓		✓
Hungary	✓	✓	✓		✓
Italy	✓	✓	✓		✓
Japan	✓	✓	✓		✓
Netherlands	✓	✓	✓		✓
New Zealand	✓	✓			
Norway	✓	✓	✓		
Portugal	✓	✓	✓		✓
Slovak Republic	✓	✓		✓	✓
Spain	✓	✓		✓	✓
Sweden	✓	✓	✓		
United Kingdom	✓	✓			✓
United States	✓	✓		✓	

Annex B. Disclaimer annex

France

This work is supported by a public grant overseen by the French National Research Agency (ANR) as part of the “Investissements d’Avenir” program (reference: ANR-10-EQPX-17 - Centre d’acces securise aux donnees – CASD)”

Germany

The data access to the SIEED was provided via on-site use at Centre Secure Data Access Center (CASD) of the National Institute of Statistics and Economic Studies (INSEE) and subsequently remote data access via the Josua platform from the Research Data Centre (FDZ) of the German Federal Employment Agency (BA).

SIEED Citation: Berge, Philipp vom; Schmidtlein, Lisa; Seth, Stefan; Graf, Tobias; Grießemer, Stephan; Kaimer, Steffen; Köhler, Markus; Lehnert, Claudia; Oertel, Martina; Seysen, Christian (2020): "The Sample of Integrated Employer-Employee Data (SIEED): SIEED 7518, Version 1". Research Data Centre of the Federal Employment Agency (BA) at the Institute for Employment Research (IAB). DOI: 10.5164/IAB.SIEED7518.de.en.v1

Japan

Data Citation: Ryo Kambayashi, Satoshi Tanaka, and Shintaro Yamaguchi, "Report of Changes in Wage Inequality Between and Within-Firm: Evidence from Japan 1993-2013," (9th Sep. 2019), mimeograph.

New Zealand

The results in this paper are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Stats NZ. The opinions, findings, recommendations, and conclusions expressed in this paper are those of the author(s), not Stats NZ. Access to the anonymised data used in this study was provided by Stats NZ under the security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this paper have been confidentialised to protect these groups from identification and to keep their data safe. Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from http://www.stats.govt.nz/. The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory

purposes. Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Norway

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United Kingdom

Office for National Statistics (2018). Annual Survey of Hours and Earnings, 1997-2018: Secure Access. 13th Edition. UK Data Service. SN: 6689, http://doi.org/10.5255/UKDA-SN-6689-12

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The Role of Firms in Wage Inequality

POLICY LESSONS FROM A LARGE SCALE CROSS-COUNTRY STUDY

Even though firms play a key role in shaping wages, wage inequality and the gender wage gap, firms have so far only featured to a limited extent in the policy debates around these issues. The evidence in this volume shows that around one third of overall wage inequality can be explained by gaps in pay between firms rather than differences in the level and returns to workers' skills. Gaps in firm pay reflect differences in productivity and wage setting power. To address high wage inequality while fostering high and sustainable growth, worker-centred policies (e.g. education, adult learning) need to be complemented with firm-oriented policies. This involves notably: (1) policies that promote the productivity catch-up of lagging firms, which would not only raise aggregate productivity and wages but also reduce wage inequality; (2) policies that reduce wage gaps at given productivity gaps without limiting efficiency-enhancing reallocation, especially the promotion of worker mobility; and (3) policies that reduce the wage setting power of firms with dominant positions in local labour markets, which would raise wages and reduce wage inequality without adverse effects on employment and output.

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