

3 The German middle class in a changing world of work

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This chapter discusses how labour market trends in Germany since the mid-1990s have affected workers in middle-income households. It sets off by looking at the types of jobs carried out by middle-income workers, analysing changes in occupations and sector of employment and discussing the role of rising female labour force participation. It then provides evidence on the share of middle-income workers in non-standard and low-paid employment. The chapter discusses future trends in middle-class employment, looking at the likely impact of automation on middle-income workers and presenting employment growth forecasts across occupations. The final part provides evidence on the initial impact of the COVID-19 crisis on employment outcomes and incomes of middle-income workers.

3.1. Introduction

The 21st century's megatrends – globalisation, digitalisation, and demographic change – are profoundly changing OECD labour markets, including the types and quality of jobs available and the skills sets in demand. This affects the employment prospects, job security and earnings of middle-class workers. Many traditional middle-class jobs – notably in manufacturing – are disappearing, to be replaced by often lower-quality service jobs or high-skilled positions. The rapid digitalisation and automation of OECD economies is projected to reinforce labour market polarisation: OECD-wide an estimated one-in-six middle-income workers are currently employed in occupations at great risk of being automated. The risk is particularly high in occupations that do not require advanced cognitive skills or complex social interaction (Nedelkoska and Quintini, 2018^[1]). And while OECD analysis suggests that the ongoing transformations are unlikely to cause a net job destruction in OECD economies (OECD, 2019^[2]), they certainly give rise to significant anxiety. Nearly three-in-four people in Germany are worried that “robots and artificial intelligence steal people’s jobs” (European Commission, 2017^[3]).

This chapter presents an analysis of the labour market development for middle-class workers in Germany since the mid-1990s. The analysis uses the same income-based definition of the middle class as in Chapter 2, focusing on people in households living on equivalised disposable incomes between 75 and 200% of median income. As before, the middle-income group is further broken down again into the lower middle (75 to 100% of the median), the mid middle (100-150%) and the upper middle (150-200%). However, unlike Chapter 2, this chapter looks specifically at middle-income *workers*, i.e. at working-age people (18 to 64 years) who have full-time or part-time work as their main activity status and who live in middle-income households.^{1,2}

A large majority of workers are in the middle-income group in Germany: nearly three-in-four (72%) workers lived in middle-income households in 2018 (Figure 3.1, Panel A) – more than the share of people overall who are in the middle-income group (64%, see Chapter 2, Figure 2.2). Compared to the average person in the population, workers are also more likely to be in the high-income group (10% of workers living in households with incomes above 200% of the median) and less likely to live on low incomes (18% living on less than 75% of the median income). Female workers are slightly more likely to live in middle-income households than male workers (73 vs. 71%), while they are less likely to live in high-income households.

Also among workers, the share living in middle-income households has strongly declined since the mid-1990s, mirroring the trend documented for the entire population in Chapter 2. However, workers’ income status has developed very differently for women and men (Figure 3.1, Panel B):

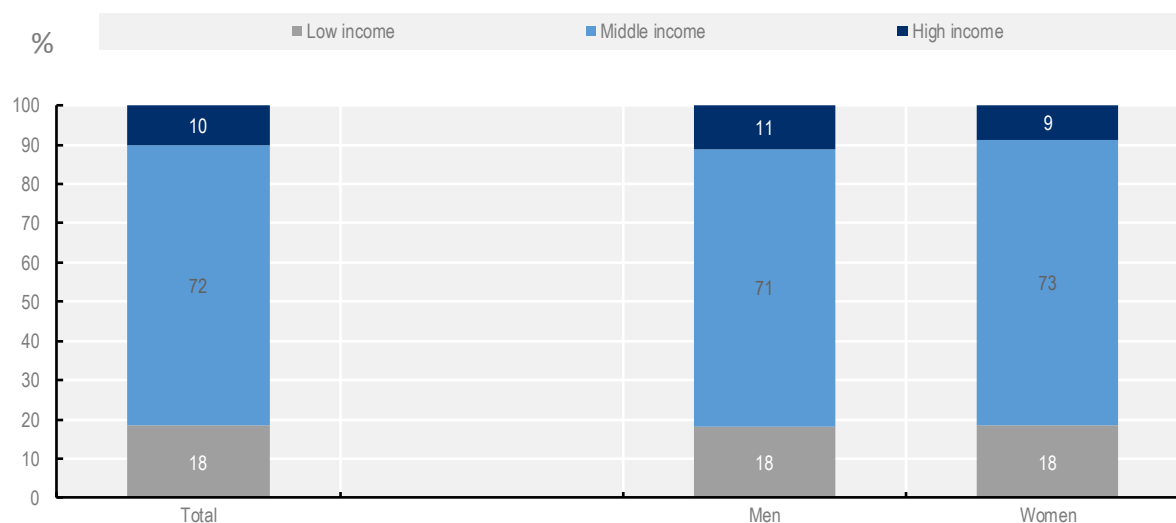
- *Income polarisation among working men:* the marked decline in the share of male workers living in middle-income households (-6.5 percentage points) coincided with a pronounced growth in the share of workers in the low-income group (largely after 2005), and weaker growth in share of workers in high-income households (largely before 2005). Total male employment grew by about 1.1 million workers over the observation period, but most strongly in low-income households. The number of male workers in the middle-income group declined by 650 000.
- *Strong employment growth among women, and relatively more in middle-income households:* The number of working women strongly expanded over the observation period, by about 4.4 million, and over half of these additional working women live in middle-income households (+2.6 million). While also among working women, the relative share living in middle-income households declined, it did to by less among working men (-3.8 percentage points). Similarly, the rise of workers in living in low-income households was smaller among women than among men. However, women did not experience the same rise in workers living in the high-income group as men.

The remainder of this chapter studies the jobs carried out by middle-income workers in Germany. Section 3.2 characterises “typical” middle-class jobs by looking at occupations and sectors of employment of middle-income workers, and at developments in the occupational and sectoral composition of

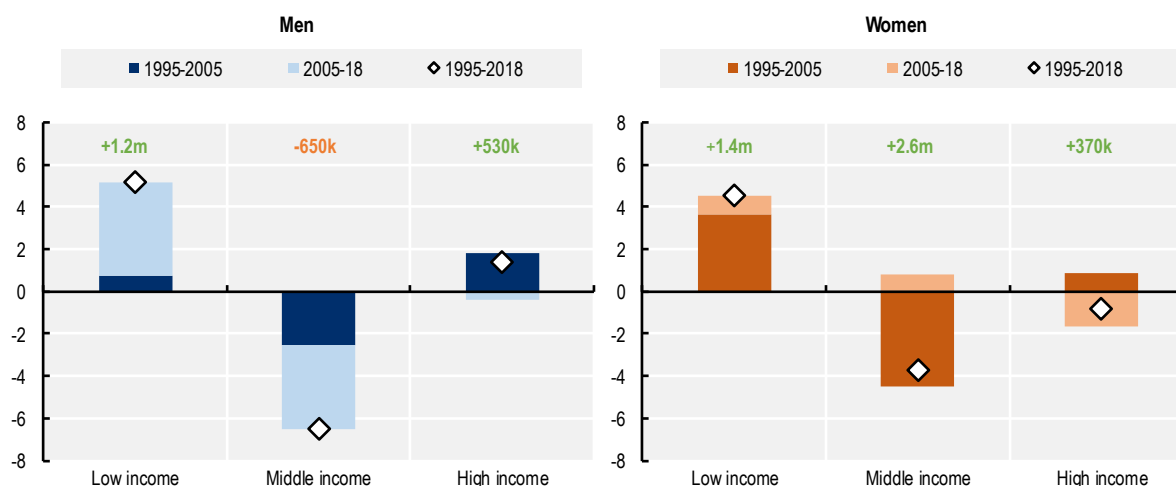
middle-income employment since the mid-1990s. Section 3.3 studies trends in the share of middle-income workers in non-standard jobs (i.e. in part-time or temporary employment or self-employed) and low-paid employment. Section 3.4 ventures an outlook into future changes in middle-income employment in Germany, providing updated evidence on the likely impact of automation on middle-income jobs and presenting growth forecasts across different occupations in Germany. Section 3.5 presents first results on the initial impact of the COVID-19 crisis on employment outcomes and incomes of middle-income workers in Germany.

Figure 3.1. Over 70% of workers live in middle-income households, and rising female labour force participation has bolstered the share of middle-income workers

Panel A. Workers by income group and gender, Germany, 2018



Panel B. Absolute and percentage changes in workers by income group and gender, Germany, 1995 to 2018



Reading note: Among male workers, the share of those living in middle-income households has declined by 6.5 percentage points, an absolute decline by 650 000 workers. Among female workers, the share of those living in the middle-income group has declined by 3.7 percentage points, but in absolute terms the number of female workers in the middle-income group has grown by 2.6 million women. This reflects the risen labour force participation of women in Germany, i.e. the increased number of working women overall.

Source: OECD calculations based on data from LIS Cross-National Data Center.

3.2. Middle-class jobs in Germany: Trends in sectoral and occupational composition

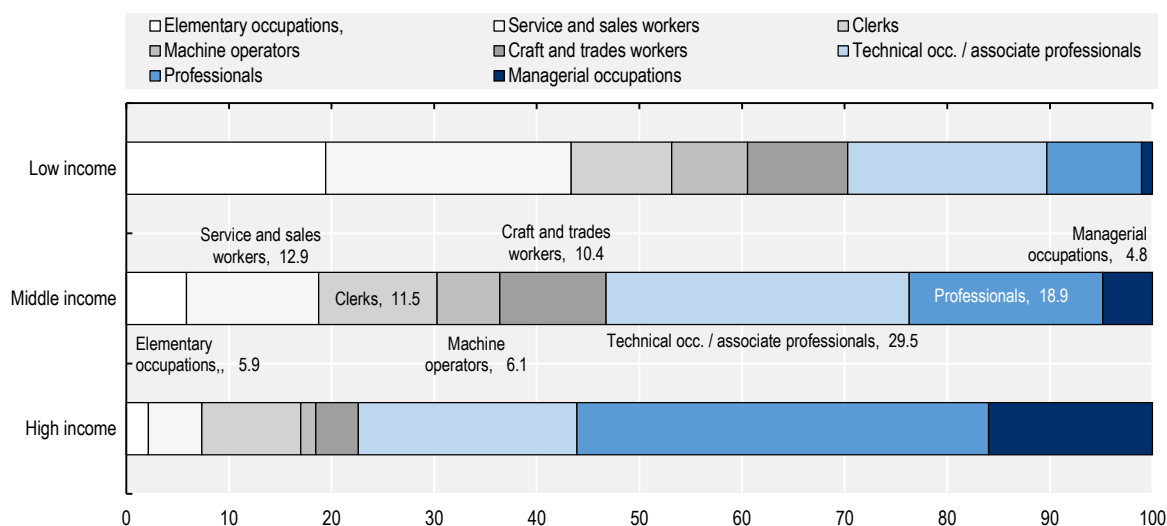
3.2.1. Most middle-income workers are in middle- and high-skilled occupations

Most middle-income workers in Germany work in high-skilled and middle-skilled occupations. In 2018, technical occupations and associate professionals made up the largest occupational group, accounting for nearly 30% of middle-income workers (Figure 3.2). This occupation group includes, for example, people working as manufacturing supervisors, associate professionals in nursing or social work, and commercial sales representatives (see Annex Table 3.A.1 for an overview). High-skilled professionals, such as mechanical engineers, software developers, secondary education teachers, and social work professionals, were the second largest occupational group, accounting for approximately 19% of middle-income workers. Middle-skilled crafts and trades workers, and clerks, each accounted for another about 10% of middle-income workers.

However, also workers in low-skilled occupations accounted for a significant share of middle-income workers in 2018, about 19%. This includes a large group of workers in elementary occupations such as manufacturing labourers, cleaners and helpers in offices, hotels and other establishments or freight handlers (together about 6%, shaded in white), but also services and sales workers (about 13%, shaded in darker white). Among low-income workers, these two low-skilled occupational groups make up over 40% of all workers, while they still make up 7% of all workers in high-income households. In most cases, these workers in low-skilled occupations will have low earnings and only make it into the middle- or even high-income group by living with a better-earning partner or having other sources of income. An implication is that policies that increase earnings of low-skilled workers, whether by helping them develop their skills or by directly raising their wages, have direct positive effects on the financial situation of middle-income households.

Figure 3.2. Most middle-income workers are in middle- and high-skilled occupations

Distribution of workers' occupations by income group, Germany, 2018



Note: Results are for working-age people (aged 18 to 64) in employment. Occupations are classified by ISCO-08 and sorted by average earnings per occupation. Low-skilled, middle-skilled and high-skilled occupations are shaded in white, grey, and blue. See Annex Table 3.A.1 for an overview of occupational classification.

Source: OECD calculations based on data from LIS Cross-National Data Center.

3.2.2. The occupational distribution has become more polarised

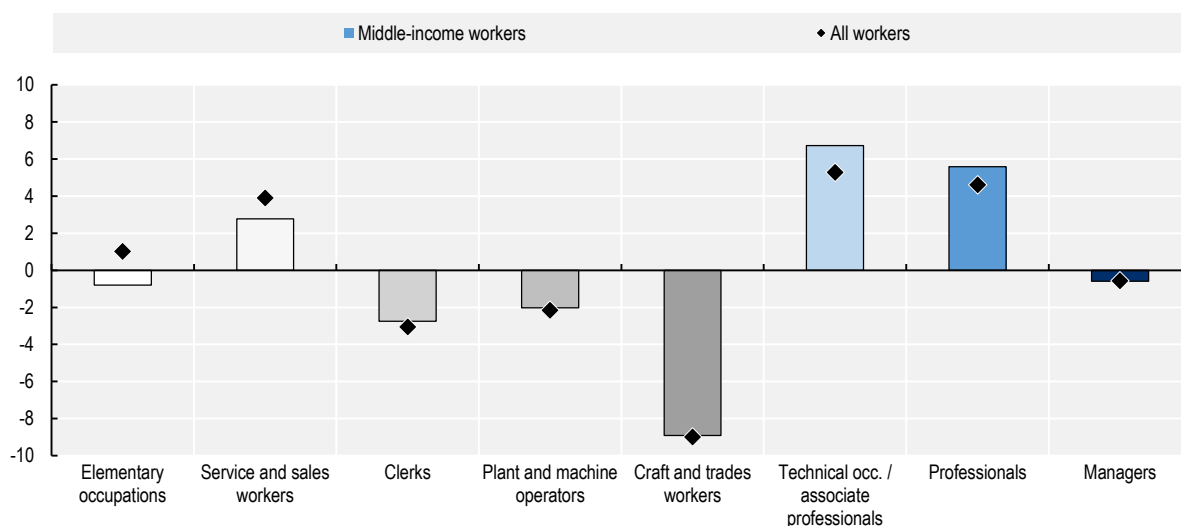
The occupational distribution in Germany has become substantially more polarised since the mid-1990s. Among all workers (Figure 3.3, black diamonds), the employment shares:

- *declined strongly for the three middle-skilled occupational groups*, by 9 percentage points craft and trades workers, 2 percentage points for plant and machine operators, and 3 percentage points for clerks;
- *rose for high-skilled professionals and technical occupations / associate professionals*, by about 5 percentage points each, and they changed little for managers;
- *increased also for low-skilled service and sales workers*, by 4 percentage points, and grew slightly also for elementary occupations.

Those results are in line with existing evidence on labour market polarisation across OECD countries (Autor, Katz and Kearney, 2006^[4]; Goos and Manning, 2007^[5]; Goos, Manning and Salomons, 2009^[6]; OECD, 2017^[7]), even as Germany has been less affected so far than many other OECD countries, including Austria and Switzerland (OECD, 2019^[2]; 2021^[8]).

Figure 3.3. The occupational distribution has gotten more polarised, but not more so for middle-income workers than for workers overall

Percentage-point changes in the distribution of occupations by income group, Germany, 1995-2018



Note: Occupations are classified by ISCO-08 and sorted by average earnings per occupation. High-skilled, middle-skilled and low-skilled occupations are shaded in blue, grey and white. See Annex Table 3.A.1 for an overview of occupational classification.

Source: OECD calculations based on data from LIS Cross-National Data Center.

The same trend towards labour market population is also observed when focusing on middle-income workers more narrowly (Figure 3.3, bars). Also among middle-income workers, the share of those working in middle-skilled occupations declined strongly, while increasing shares work in high-skilled and – again to a less extent – low-skilled occupations. Indeed, middle-income workers have fared slightly better than workers in Germany overall, with a greater expansion in high-skilled occupations and a weaker expansion in low-skilled occupations.

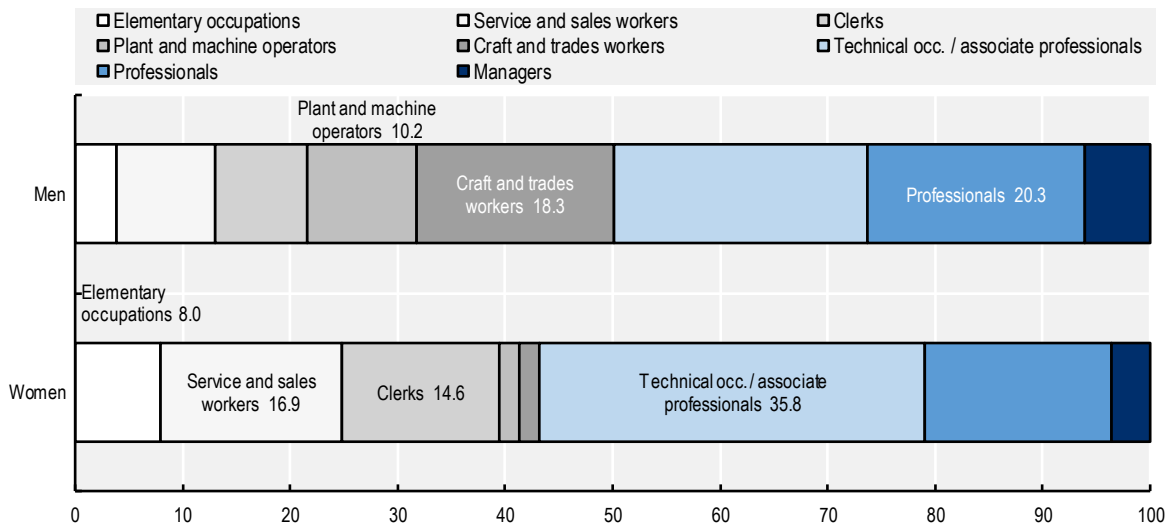
3.2.3. Female middle-income workers have been moving up the occupational ladder

There also exist substantial gender differences in the occupational distribution among middle-income workers (Figure 3.4, Panel A):

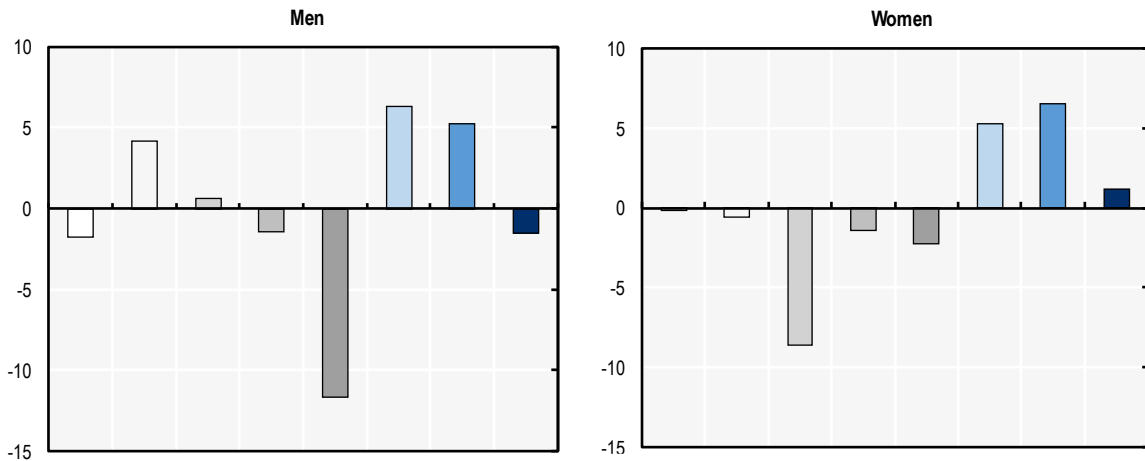
- *Male middle-income workers* are much more strongly represented among high-skilled managers and professionals and among middle-skilled crafts and trade workers and machine operators.
- *Female middle-income workers* are strongly overrepresented among the low- and lower middle-skilled occupations (elementary workers, service and sales workers, and clerks), but also among high-skilled associate professionals.

Figure 3.4. Female middle-income workers remain overrepresented in lower-skilled occupations, but they have been pushing into higher-skilled occupations

Panel A. Distribution of occupations across middle-income workers by gender, Germany, 2018



Panel B. Percentage-point changes in the distribution of occupations for middle-income workers by gender, Germany, 1995-2018



Note: Occupations are classified by ISCO-08 and sorted by average earnings per occupation. High-skilled, middle-skilled and low-skilled occupations are shaded in blue, grey and white. See Annex Table 3.A.1 for an overview of occupational classification.

Source: OECD calculations based on data from LIS Cross-National Data Center.

However, middle-income women have moved up in the occupational distribution over the last decades (Figure 3.4, Panel B). Relative to the mid-1990s, a greater share of working women is now employed in high-skilled occupations as professionals and associated professionals / technicians while the shares of women in middle-skilled occupations, and particularly clerks, declined. Also, women did not experience the same relative expansion in low-skilled occupations as men.

These results illustrate the importance of rising female labour force participation for middle-income employment in Germany. While many of the women who pushed into the labour force in the late 1990s and early 2000s live in low-income households, in many cases working part-time (see Figure 3.7), a majority are in the middle-income group (Figure 3.1). Rising female labour force participation thereby contributed to slowing the decline in the share of workers who live in middle-income households. Meanwhile, women have also been moving up the occupational ladder. While female workers remain overrepresented in low-skilled occupations, most of the employment growth happened in high-skilled occupations. Women in Germany did not experience the same occupational polarisation as men.

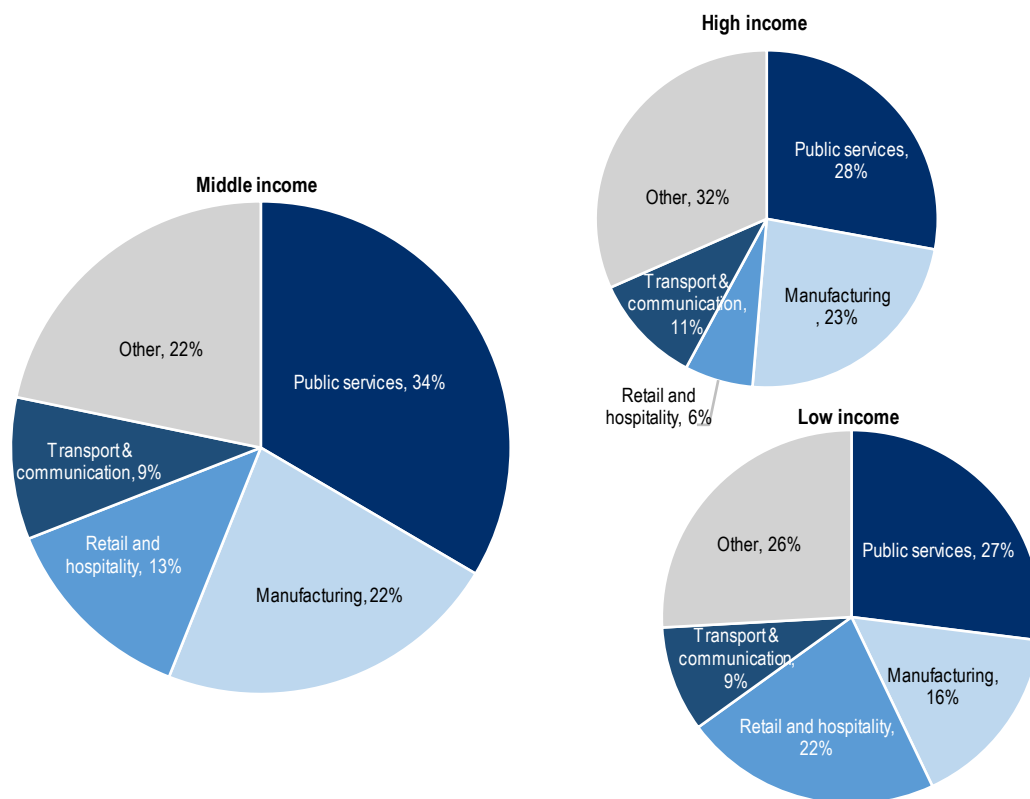
3.2.4. Middle-income workers have shifted out of manufacturing towards public services, which together account for more than half of all middle-income jobs

Workers in public services – i.e. in the public administration, the education sector, and the health and social sector (see Annex Table 3.A.2) – and in manufacturing are the backbone of middle-class employment, as well as of employment in Germany more generally.³ Together, they account for more than half (54%) of all middle-income workers (Figure 3.5, Panel A). Middle-income workers are particularly overrepresented in public services (34% of jobs, compared to 28 and 27% among high- and low-income workers). They are also overrepresented in manufacturing, which accounted for 22% of middle-income workers – much more than for low-income workers (16%) but broadly in line with the share for high-income workers (23%). Workers in retail and restauration account for 13% of all middle-income employment, which makes it much less prominent than among low-income workers (22%).

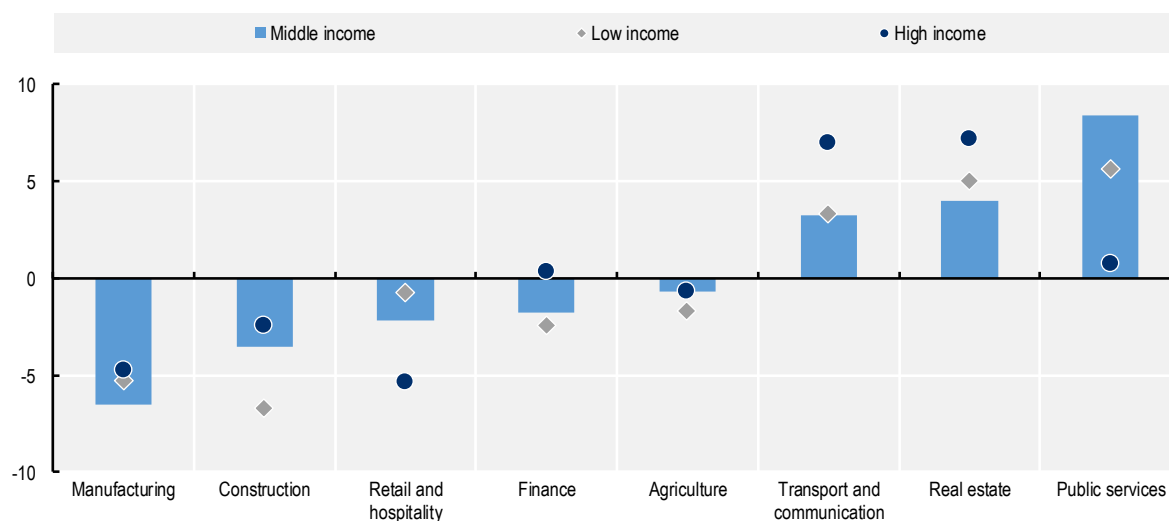
Employment shares in Germany have significantly shifted across economic sectors over the last decades, and middle-income workers have been particularly affected by those shifts (Figure 3.5, Panel B). The manufacturing sector substantially lost in relative importance, accounting for a 7 percentage-point lower employment share in 2018 than in the mid-1990s. Meanwhile, public services greatly increased their total employment share (+7 percentage points). For middle-income workers, who are strongly represented in both of these sectors, the employment shifts were of broadly the same size, at -7 percentage points for manufacturing and +8 percentage points for public services. By contrast, middle-income workers were less strongly affected by the decline in employment shares in construction and retail and hospitality, and by the expansion of the smaller real estate and transport and communication sector.

Figure 3.5. Public services and manufacturing account for half of all middle-income jobs, and the shares of middle-income jobs in manufacturing and construction have declined

Panel A. Employment by sector and income group, Germany, 2018



Panel B. Percentage-point change in the share of workers by sector and income group, Germany, 1995-2018



Note: See Annex Table 3.A.2 for an overview of industrial classification. In Panel A, the employment shares in agriculture, construction, finance, real estate and other sectors are summarised cumulatively as “Other”.
 Source: OECD calculations based on data from LIS Cross-National Data Center.

3.3. Middle-income workers in non-standard and low-paid work

3.3.1. Few middle-income workers are employed on temporary contracts

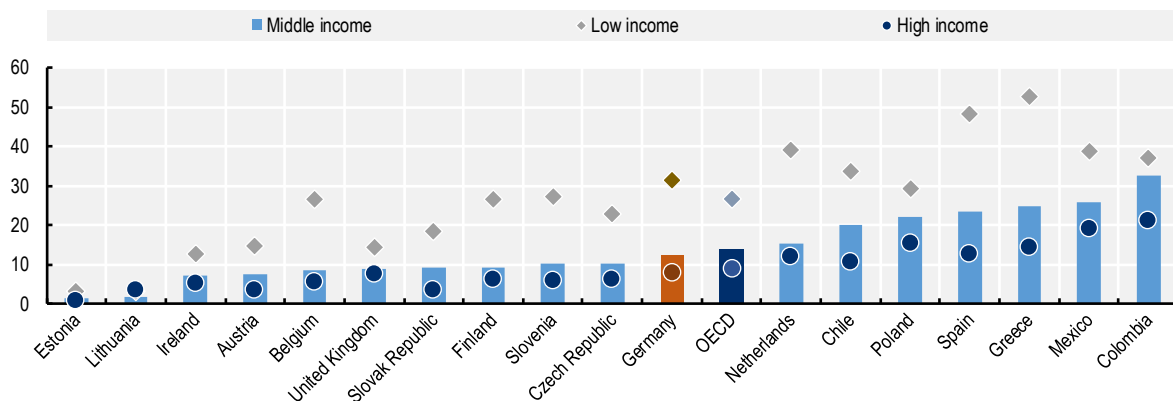
Temporary employment is not particularly widespread in Germany, whether among workers overall or middle-income workers more specifically. About 16% of workers, and 12% of middle-income workers, in Germany were employed on contracts with fixed duration (Figure 3.6, Panel A).⁴ This compares to an average of 15% of workers (14% of middle-income workers) across 18 OECD countries with available data. As in most OECD countries, temporary employment is much more widespread among low-income workers, with nearly one-in-three (32%) workers in Germany employed on fixed-term contracts.

Temporary work has become more frequent in Germany since the mid-1990s mostly for workers living in households with incomes in the lower half of the income distribution. Compared to 1995, the incidence of temporary employment rose by 7 percentage points both for workers in low-income households (i.e. with incomes below 75% of the median) and lower middle-income households (75-100% of the median; Figure 3.6, Panel B). Among middle-income workers more broadly, as among high-income workers, the incidence of temporary employment grew by 3-4 percentage points. However, for workers in all income groups, this growth largely occurred in the late 1990s and early 2000s, while the incidence of temporary employment remained broadly stable or even declined thereafter.

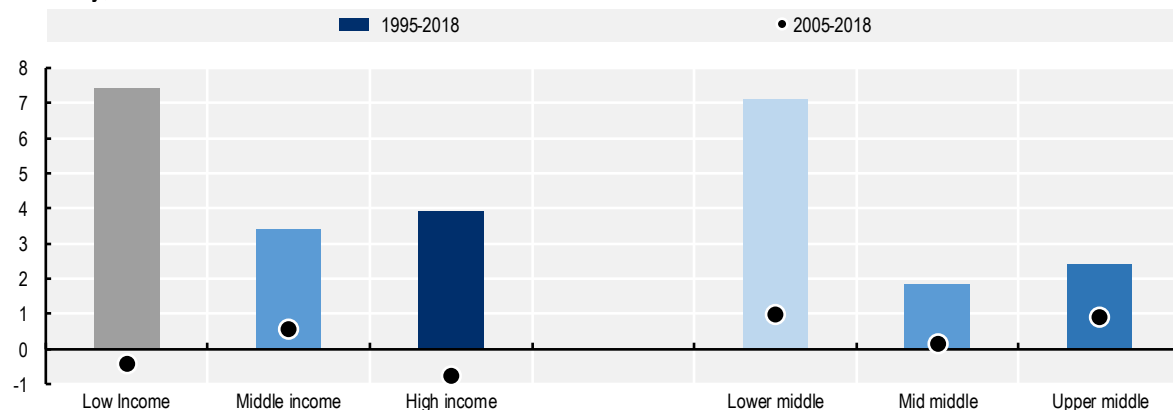
Young workers are much more likely to be employed on temporary contracts than other workers, hence having less job security at the beginning of their careers. Among 18-29 year-olds, close to half (43%) work on temporary contracts. Temporary contracts are again most widespread for young workers on low incomes, at 55%, while reaching 39% and 35% among young workers in middle- and high-income households (Figure 3.6, Panel C). The high incidence of fixed-term contracts among young people is partly driven by young people who report studying while working, a group that likely includes many apprentices. They account for over one-in-three young workers, and nearly 80% of them work on fixed term contracts. Young workers have also been the group most affected by the expansion of fixed-term contracts since the mid-1990s (+20 percentage points), though again these changes occurred before 2005.

Figure 3.6. The share of middle-income workers in temporary employment is relatively low in Germany and has remained largely stable since 2005

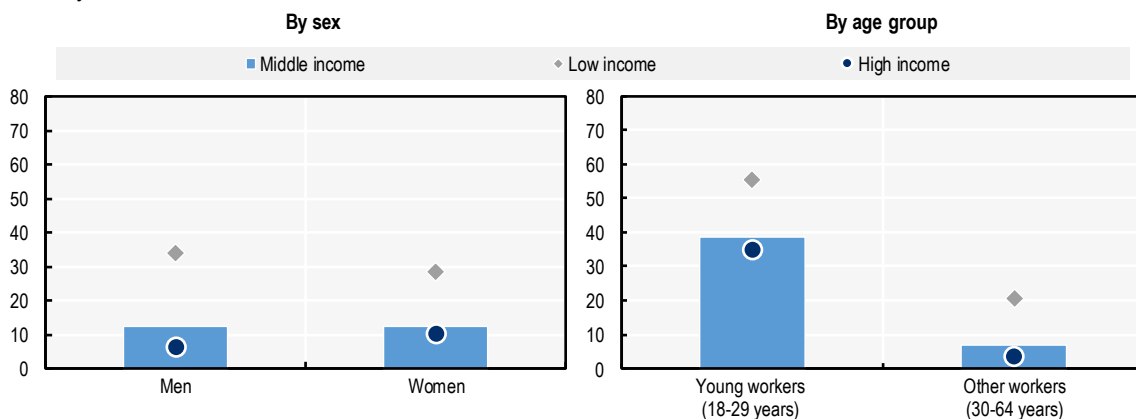
Panel A. Percentage of workers in temporary employment, by income group, selected OECD countries, 2018 or latest



Panel B. Percentage-point change in the share of workers in temporary employment, by income group, Germany, 1995-2018



Panel C. Percentage share of workers in temporary employment, by income group and sex / age group, Germany, 2018



Note: In Panel A, OECD gives the unweighted average of the 18 countries represented in the figure.
 Source: OECD calculations based on data from LIS Cross-National Data Center.

3.3.2. *Part-time work is widespread only among female middle-income workers*

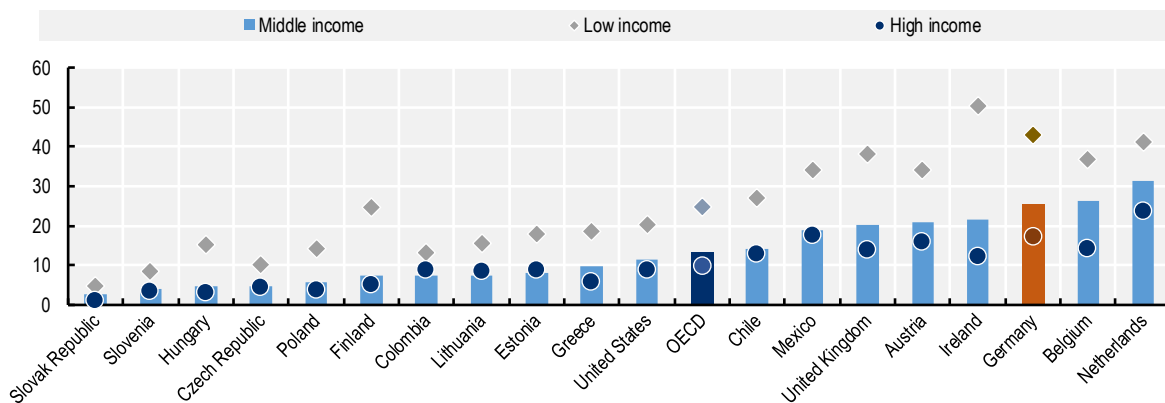
Germany experienced a considerable rise in part-time employment over the last decades, making Germany one of the countries with the highest rates of part-time employment across the OECD. This trend reflects i) growing labour force participation among women, who are much more likely than men to work part-time, and ii) a rising incidence of part-time work *among both working women and men*. A recent study of long-term labour market developments in Germany (Bönke, Harnack and Wetter, 2019^[9]) shows that even as female labour force participation in West Germany nearly doubled between 1973 and 2012, from 6 to 12 million, the number of weekly hours worked by women only increased by 50%. More than one-in-five (22%) workers in Germany worked part-time in 2019 (OECD average of 15%), up from one-in-seven (14%) in 1995. Rates of part-time work were more than three-and-a-half times as high for women as for men (36 vs 10%; (OECD, 2021^[10])).

As in other OECD countries, the incidence of part-time work strongly relates to household income. Part-time employment in Germany is more than twice as frequent among low- as among high-income workers (43 vs 17%; Figure 3.7, Panel A). Among middle-income workers, one-in-four (25%) work part-time. Also the rise in part-time work in Germany over the last decades was most striking among low-income workers (+19 percentage points; Figure 3.7, Panel B). Among middle-income workers, the incidence of part-time work grew by 8 percentage points, and again mostly prior to 2005, while rates of part-time work among high-income workers have remained essentially unchanged since the mid-1990s. Disparities in the incidence of part-time employment by income group are smaller for women than for men: among working women, the incidence of part-time work varies between over one-in-three (37%) high-income women to nearly half (46%) of middle-income women and two-in-three (61%) low-income women (Figure 3.7, Panel C). Among working men, more than one-in-four (28%) low-income workers, but only very few middle- and high-income workers are employed part-time.⁵

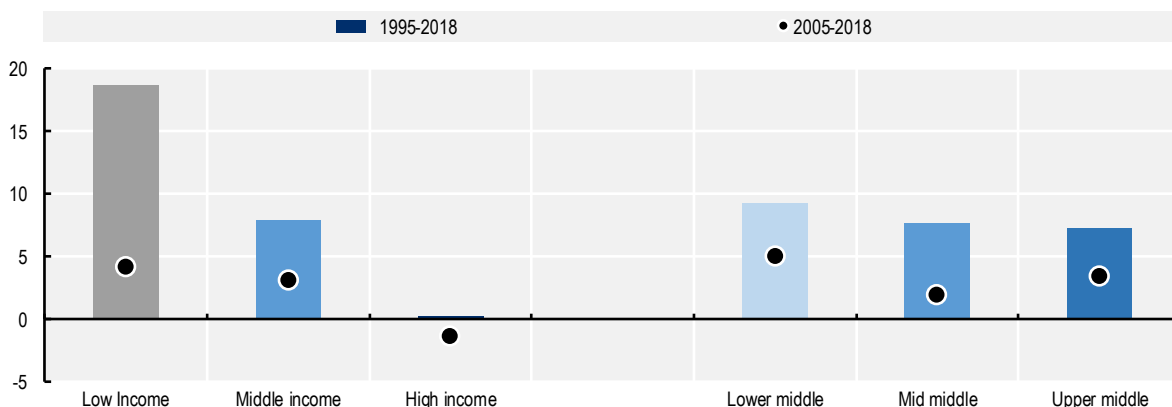
These results suggest that there is considerable scope for Germany to raise household earnings and incomes by increasing female labour force participation, including in middle-income households. Chapter 2 illustrates that one-earner-couples still make up the majority of working couples in the middle-income group, even as the share of one-and-a-half earner couples has slightly risen (Figure 2.12). This implies that policies that enable, and incentivise, women to pick up work or remain in employment can make a valuable contribution in helping households secure a middle-income status. Couples with two full earners increasingly make it into the high-income group in Germany. This underlines the potential for policies that help second earners, and notably women, raise the number of hours they work. Chapter 5, Section 5.4 discusses such policies.

Figure 3.7. Many working women across all income groups work part-time in Germany, but part-time work has expanded most strongly among low-income workers

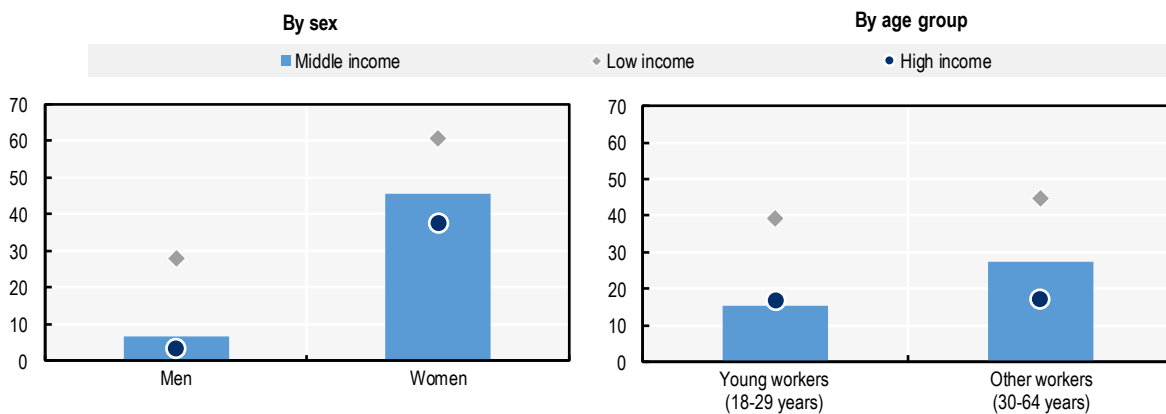
Panel A. Percentage of part-time workers, by income group, selected OECD countries, 2018 or latest



Panel B. Percentage-point change in the share of part-time workers, by income group, Germany, 1995-2018



Panel C. Percentage of part-time workers, by income group and sex / age group, Germany, 2018



Note: In Panel A, OECD gives the unweighted average of the 19 countries represented in the figure.
 Source: OECD calculations based on data from LIS Cross-National Data Center.

3.3.3. Few middle-income workers in Germany are self-employed

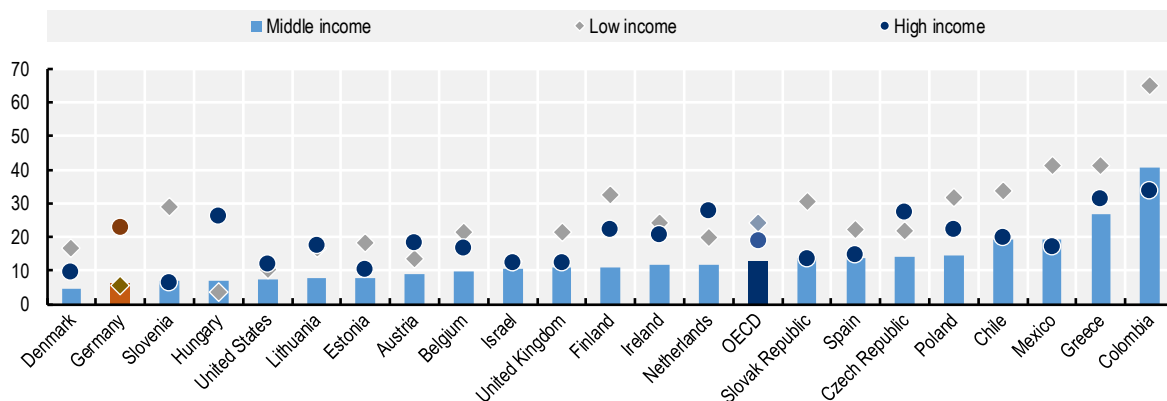
The self-employed account for a relatively small share of workers in Germany, except among high-income workers. In 2018, 8% of all workers in Germany reported being self-employed as their main activity status, one of the lowest rates of self-employment across OECD countries with available data by income level (Figure 3.8, Panel A).⁶ The share was even lower among middle-income workers (6%) and low-income workers (5%), while being much higher among high-income workers (23%). This concentration of self-employment in the high-income group sets Germany somewhat apart from most other OECD countries. Besides business owners, this group includes self-employed professionals such as lawyers, psychologists, dentists, accountants, and designers. But also in other countries, rates of self-employment are generally low among middle-income workers – in a few, such as in Denmark, Finland, Poland, and the United Kingdom, self-employment is rather associated with low incomes.

The share of self-employment in Germany has slightly declined since the mid-1990s, by around 1.6 percentage points across all workers. This reflects a decline in both the low- and middle-income group, while the share of self-employed among high-income workers has risen (Figure 3.8, Panel B).

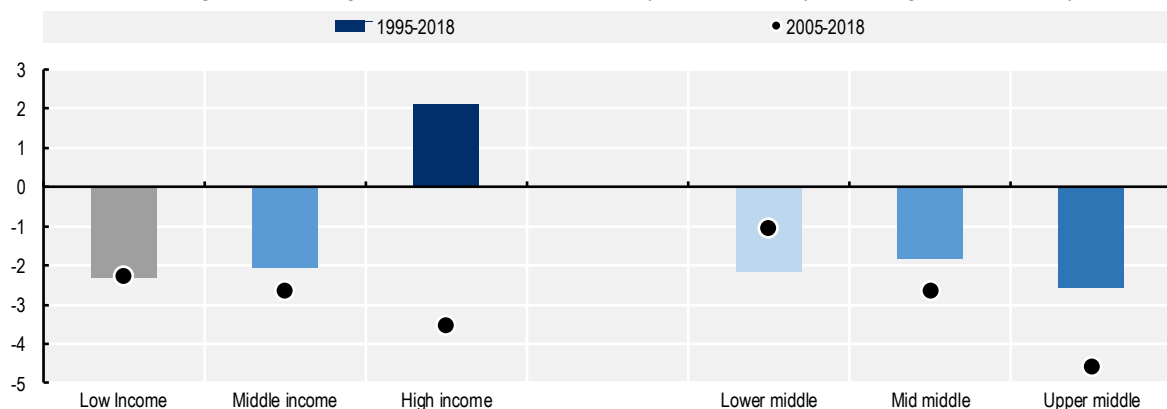
Gender differences in the rate of self-employment are small; young workers are much less likely to be self-employed than other working-age adults (Figure 3.8, Panel C).

Figure 3.8. Self-employment is widespread in Germany only among high-income workers

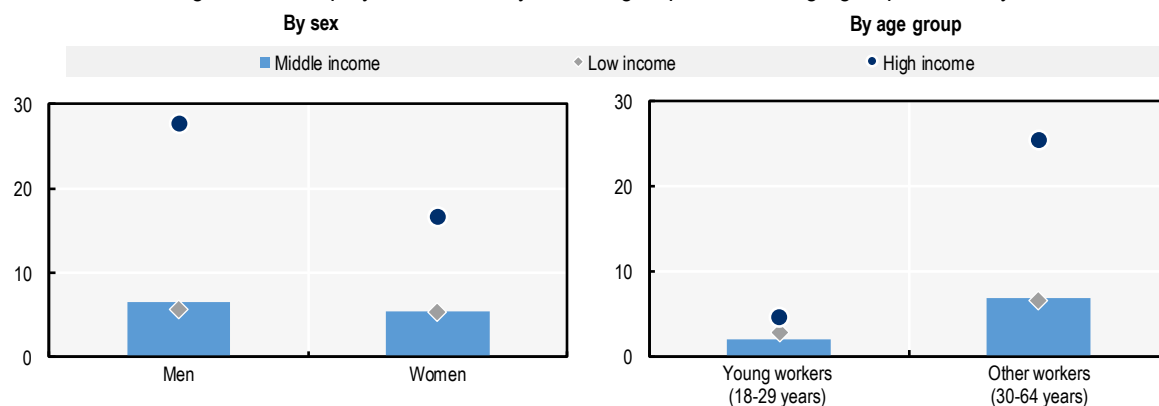
Panel A. Percentage of self-employed workers among all workers, by income group, selected OECD countries, 2018 or latest



Panel B. Percentage-point change in the share of self-employed workers, by income group, Germany, 1995-2018



Panel C. Percentage of self-employed workers, by income group and sex / age group, Germany, 2018



Note: In Panel A, OECD gives the unweighted average of the 22 countries represented in the figure.
 Source: OECD calculations based on data from LIS Cross-National Data Center.

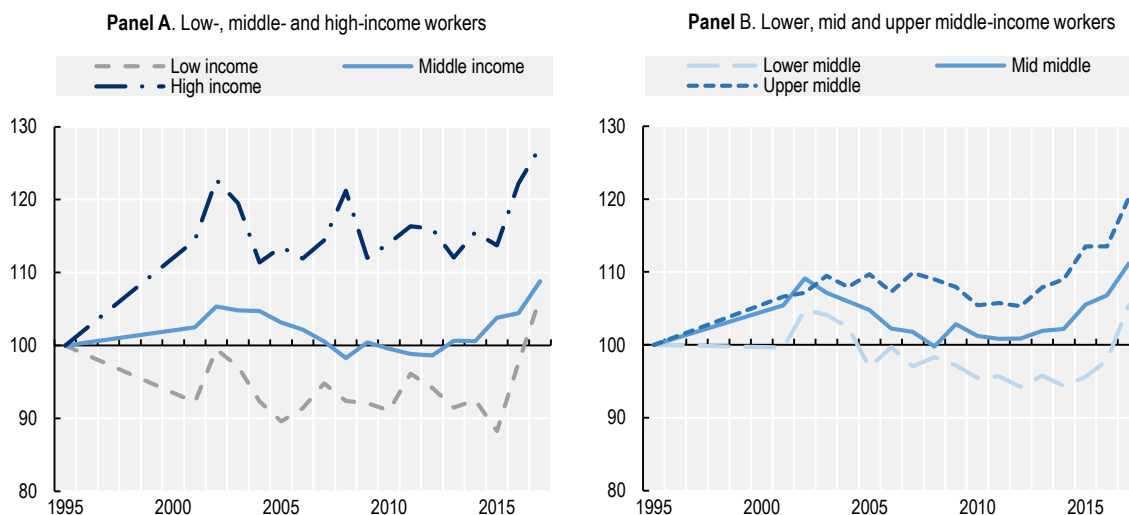
3.3.4. A sizeable minority of full-time middle-income workers are in low-paid jobs, but low-paid employment has risen only for low-income workers

With labour income being the most important income source for the large majority of households (see Chapter 2, Figure 2.9), there is good reason to believe that workers' earnings level should closely align with their income group status. But while indeed most middle-income workers have earnings that put them towards the middle of the earnings distribution, the association is by no means perfect. This is true, because incomes are assessed at the *household level*. In households with several earners, secondary earners with low earnings may still make it into the middle-income group because their partners earn well. Meanwhile, workers with comparatively high earnings may find themselves further down in the income distribution if they are the only earner in a large household. A look at the earnings levels of middle-income workers, and particularly at the incidence of very low earnings, can therefore provide useful evidence on the quality of middle-income jobs, and the share of middle-income workers in potentially precarious employment.

Middle-income workers in Germany experienced little to no earnings growth for nearly two decades since the mid-1990s, up until an uptick in earnings growth around 2015. This reflects a long period of real earnings stagnation since 2000s for workers across all income groups (Figure 3.9, Panel A). After the recent rise in real earnings, the median full-time worker in the middle-income group earned only about 9% more in 2018 than in 1995 after adjusting for inflation. Within the middle-income group, workers in the upper middle experienced somewhat larger gains (+20% relative to 1995) than those in the mid middle (+11%) and lower middle (+5%, Figure 3.9, Panel B). In spite of the compositional issues raised in the previous paragraph, these earnings developments largely mirror the trends in disposable household incomes for the different income groups in Germany discussed in Chapter 2, Figure 2.4.

Figure 3.9. Earnings disparities in Germany have remained largely stable since the early 2000s

Trends in median real earnings of full-time workers by income group, Germany, 1995-2018 (1995=100)



Note: No data are available for the years 1996-2000. The earnings data have been adjusted for inflation using a consumer price index.
Source: OECD calculations based on data from LIS Cross-National Data Center.

A sizeable minority of middle-income workers are in jobs that are low paid. Among full-time workers in the middle-income group, about one-in-six (18%) earn less than two-thirds of median earnings. However, the low-pay rate is much higher for workers in the low-income group (75%; Figure 3.10, Panel A). The focus

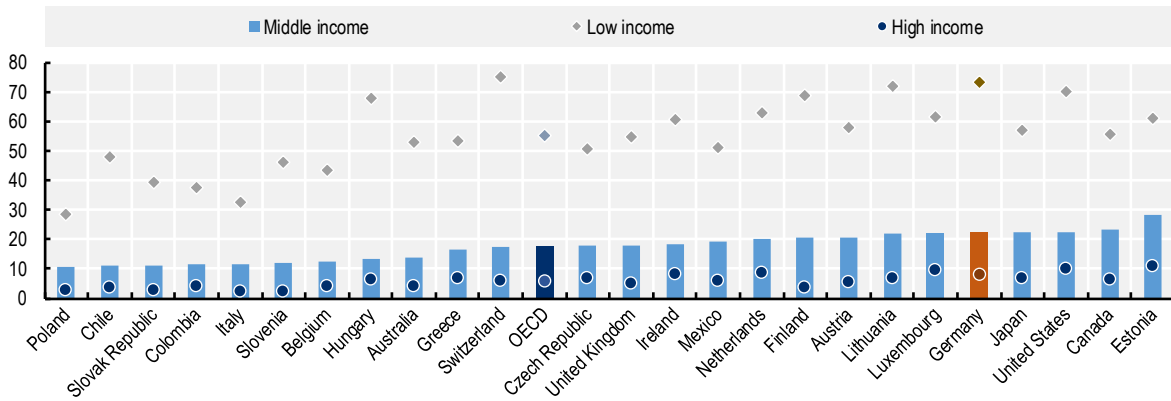
is here on full-time workers and annual earnings for comparability reasons, as good-quality data on hourly wages and usually not available across countries.⁷ A clear limitation of this approach is that workers in low-paid part-time employment and marginal employment (*Minijobs*, see below) are not included. According to a recent study using SOEP data, the share of workers employed on low wages in Germany increased by 60% between the mid-1990s and 2018, with one-in-five employees having earned less than EUR 11.40 per hour gross in 2018 (Grabka and Göbler, 2020^[11]).

Also when looking only at workers in full-time employment, the share of those working in low-paid jobs has increased since the mid-1990s, by around 9 percentage points. However, as for the measures of non-standard work, most of these changes occurred in the first ten years of the observation period, i.e. up to 2005. The incidence of low pay also increased only among low-income workers, while remaining stable for middle- and high-income workers (Figure 3.10, Panel B).

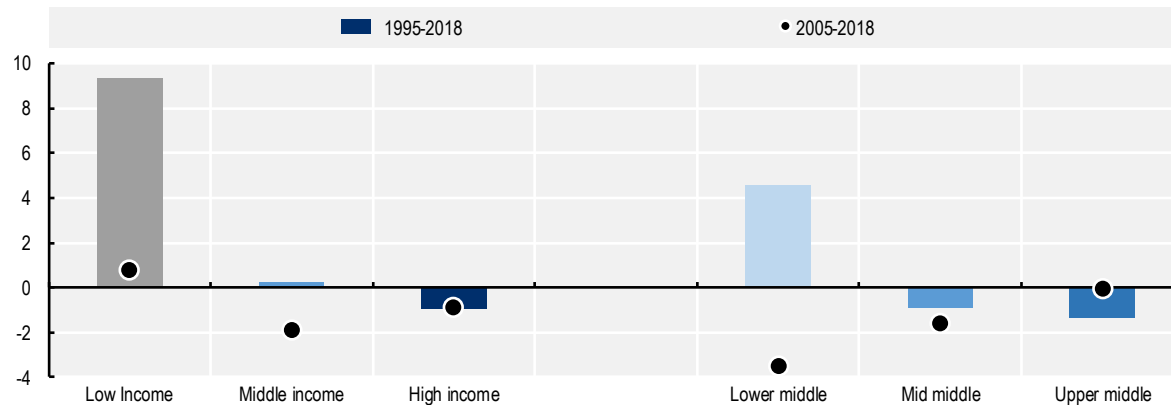
Women in the middle-income group are somewhat more likely than men to have low earnings, at low-pay rates of 22 vs. 16% (Figure 3.10, Panel C). This reflects the fact that a larger share of middle-income women work in low-skilled elementary occupations and sales and services jobs (see Figure 3.4, Panel B), for which they are often overqualified (Bönke, Harnack and Wetter, 2019^[9]). Also young workers are overrepresented among those on low earnings.

Figure 3.10. About one-in-six middle-income workers have low earnings, but the low-pay rate among low-income workers is much higher

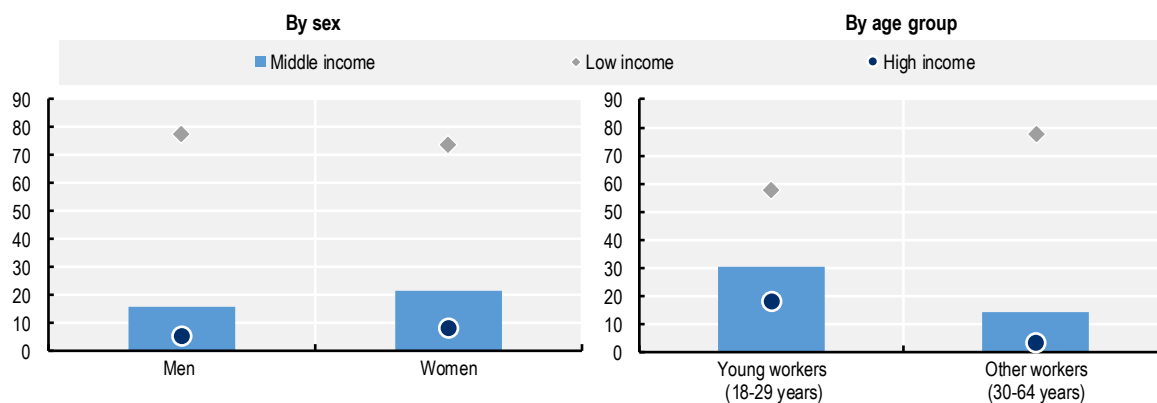
Panel A. Percentage of full-time workers who are low-paid, by income group, 2018 or latest



Panel B. Percentage-point change in the share of full-time workers who are low-paid, by income group, Germany, 1995-2018



Panel C. Percentage of full-time workers who are low-paid, by income group and sex / age group, Germany, 2018



Note: The incidence of low pay gives the share of full-time workers earning less than two-thirds of median annual earnings of full-time workers. In Panel A, OECD gives the unweighted average of the 25 countries represented in the figure. Source: OECD calculations based on data from LIS Cross-National Data Center.

3.4. Employment prospects of middle-class workers – the risk of automation and changes in skill demand

The implications for jobs and skills of the developments in artificial intelligence and machine learning have dominated recent debates on the Future of Work and the changes brought about by digital technologies. In their landmark study, Frey and Osborne (2013^[12]; 2017^[13]) predicted that as many as 47% of jobs in the United States are at high risk of being automated drawing on expert assessments of the ease, or difficulty, of automating specific tasks across occupations. More recent studies, which exploit the OECD Survey of Adult Skills (PIAAC) to account for variation in the tasks involved in jobs with the same occupational title, have significantly brought down these estimates (Arntz, Gregory and Zierahn, 2016^[14]; Nedelkoska and Quintini, 2018^[1]; OECD, 2019^[2]). According to OECD estimates, 14% of jobs OECD-wide are highly automatable, i.e. they face a probability of automation of at least 70%. Another 32% have an automation risk of between 50 and 70%, i.e. there is a possibility of significant change in the way these jobs are carried out as a result of automation (Nedelkoska and Quintini, 2018^[1]).⁸

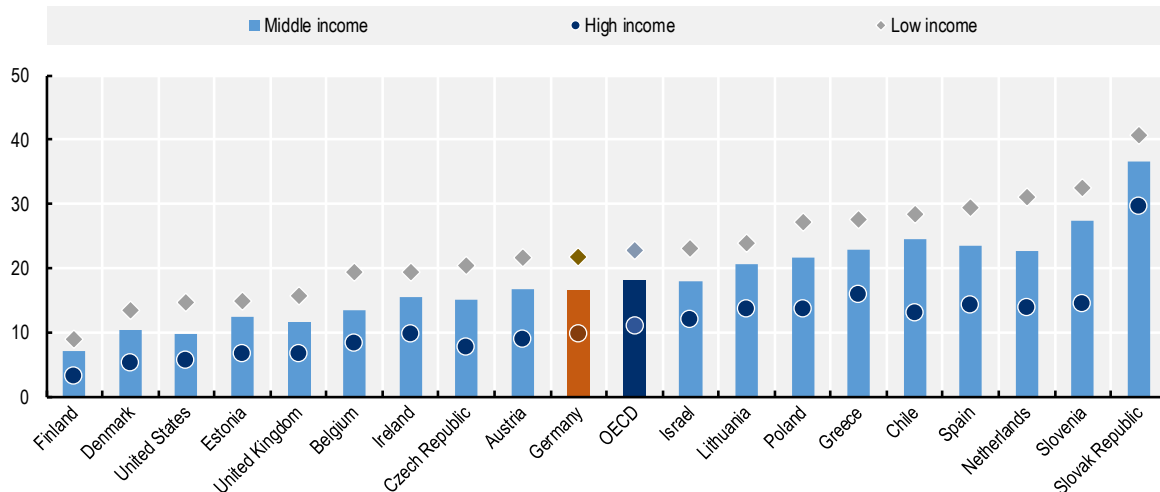
Cross-country variability in automatability is large: the share of jobs that are either highly automatable or at risk of significant change ranges from around one-in-three in some Nordic countries (Finland, Norway, Sweden) and New Zealand to nearly two-in-three in the Slovak Republic and Lithuania. In Germany, more than half (54%) of jobs are likely to be significantly affected by automation (18% of jobs are highly automatable, and a further 36% likely face significant change), well above the OECD average of 46%. Large cross-country variation in job automatability reflects a combination of differences in i) the structure of economic sectors, ii) occupational mixes within those sectors, and iii) the task content of jobs within occupations. Routine jobs with low skill requirements are most prone to automation. A recent study for Germany using administrative data indeed finds that robot exposure is associated with displacement effects in manufacturing, but that those are fully offset by new, often better-quality jobs in services (Dauth et al., 2021^[15]).

3.4.1. A substantial share of middle-income workers are in occupations that are highly automatable

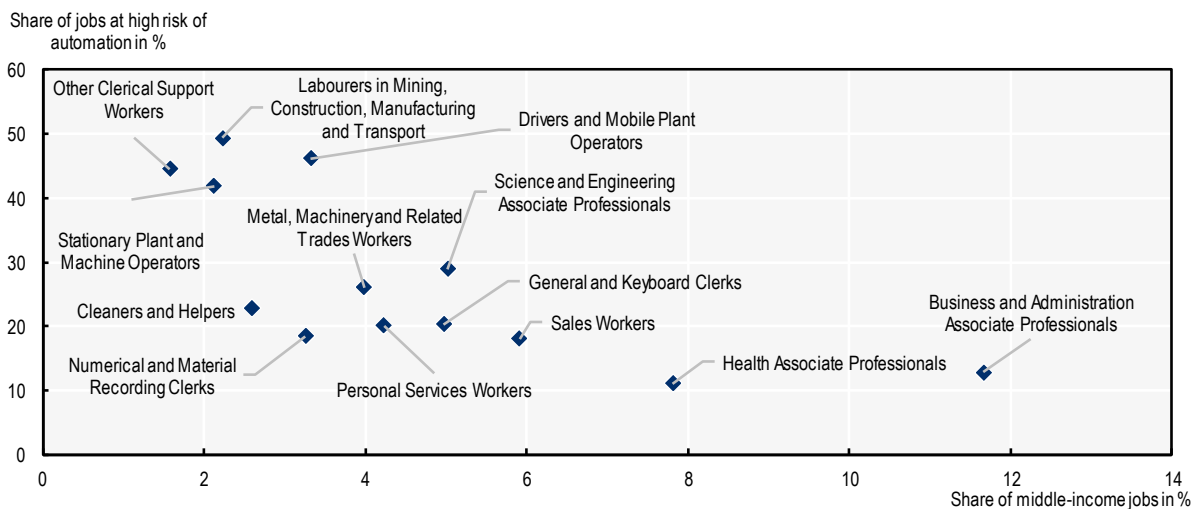
Middle-income workers in Germany face a slightly lower – but still substantial – automation risk compared to workers in Germany overall. About one-in-six (17%) middle-income workers in Germany are in jobs that are highly automatable, slightly below the average across OECD countries with available data (Figure 3.11, Panel A). As in other OECD countries, middle-income jobs are much less likely to be automated than low-income jobs (22% of jobs at high risk of automation in Germany), but substantially easier to automate than high-income jobs (10%). Those estimates were obtained by matching the occupation-specific risk produced by Nedelkoska and Quintini (2018^[1]) with data on the occupational distribution of workers across income groups, as summarised in Figure 3.2.

Figure 3.11. One-in-six middle-income workers in Germany work in occupations at high risk of automation

Panel A. Share of workers in occupations at high (over 70%) risk of automation, by income group, selected OECD countries, 2018 or latest



Panel B. Occupational titles with the largest contribution to the risk of automation among middle-income workers in Germany, 2018



Note: The risk of automation is calculated by occupation and then aggregated to income groups using the income-group-specific occupation shares. Panel A is an update of Figure 3.11 in *Under Pressure* (OECD, 2019_[16]). It combines the occupation-specific automation risks predicted by Nedelkoska and Quintini (2018_[11]) matched with the latest data on the occupational distributions within income groups. In Panel A, OECD gives the unweighted average of the 19 countries represented in the figure.

Source: OECD calculations based on data from LIS Cross-National Data Center and PIAAC.

Occupational groups who require little or no skills at work face the highest risk of automation. Some of those occupations are represented also among middle-income workers (compare Figure 3.2), implying that these workers face a concrete risk of job and income loss. In the German middle-income group, drivers and mobile plant operators, labourers in mining, construction, manufacturing and transport, and clerical support workers face the highest automation risk (Figure 3.11, Panel B, vertical axis). Some other occupational groups with a lower share of at-risk jobs nonetheless significantly contribute to the overall automation risk for middle-income workers because they account for relatively large shares of middle-income employment. This includes different groups of associate professionals (in business and

administration, health, and science and engineering) as well as sales workers (Figure 3.11, Panel B, horizontal axis). Male middle-income workers in Germany are somewhat more likely than female workers to be employed in occupations with high automatability. This reflects gender differences in the occupational distribution documented earlier in Figure 3.4. This may imply a greater income risk for households as a result of automation, because men are in most cases the primary (or even: single) earner.

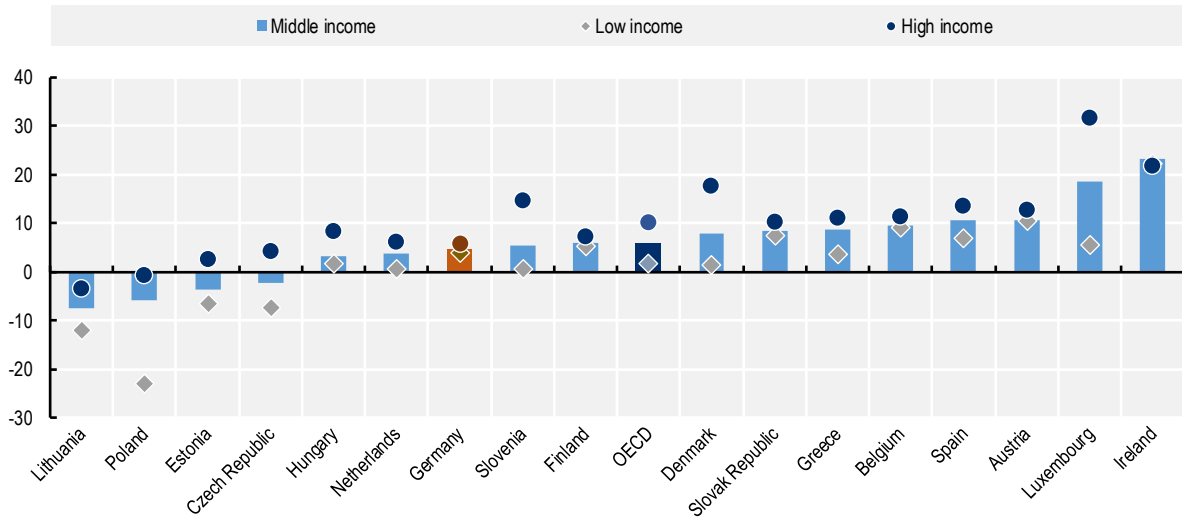
3.4.2. Growth forecasts for middle-income jobs are positive but point towards further occupational polarisation

An alternative way of assessing the employment prospects for middle-income workers is to look directly at employment growth forecasts. Such projections are available by occupational group for EU countries through the European Centre for the Development of Vocational Training for the period up to 2030 (Cedefop, 2021^[17]). One limitation of these forecasts is that they currently take account only of global economic developments up to May 2019, i.e. that they do not yet consider the potential impact of the COVID-19 crisis. Still, they can give an indication of longer-term trends in skills demand and employment growth.

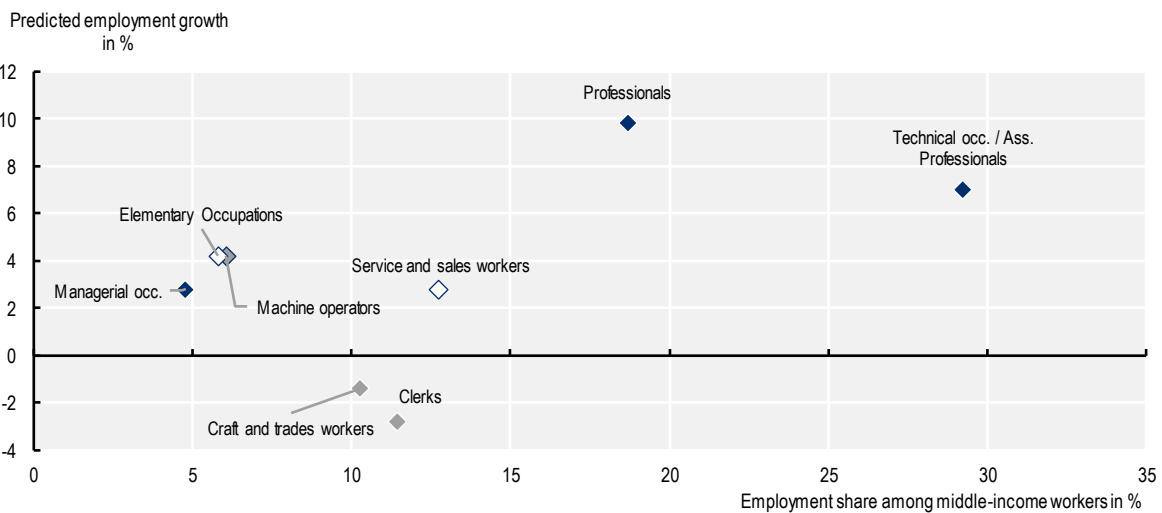
Employment growth in Germany will be positive over the next decade, with only small differences across workers in different income groups. According to Cedefop forecasts, total employment will grow by approximately 4.5% (+1.5 million workers) between 2018 and 2030, or an annual 0.3% (EU average: +0.4%). This number is identical to the employment growth forecast for middle-income workers in Germany, which can be obtained by weighing Cedefop's occupation-specific employment forecasts by the respective employment shares of occupation groups in the middle-income group (Figure 3.12, Panel A). The employment growth rate for the occupation mix in the middle-income group is higher than that for the low-income group (+3.8%), but lower than for the high-income group (+5.8%). These calculations rely on the *current* occupational mix of workers within income groups (as illustrated in Figure 3.2), i.e. they do not account for changes in the occupational distribution within income groups over the next decade.

Figure 3.12. Predicted employment growth for middle-income workers is positive but points towards further occupational polarisation

Panel A. Total predicted employment growth by income group, selected EU-OECD countries, 2018-30



Panel B. Predicted employment growth (2018-30) and employment share in the middle-income group, by occupation, Germany



Note: In Panel A, employment growth by income group was calculated by matching Cedefop's occupation-specific employment growth forecasts with LIS data on the occupational distribution of workers within income groups. OECD gives the unweighted average of the 17 countries represented in the figure. In Panel B, high-skilled, middle-skilled and low-skilled occupations are colour-coded in blue, grey and white. Source: OECD calculations based on data from LIS Cross-National Data Center and Cedefop Employment Forecasts (<http://www.cedefop.europa.eu/en/publications-and-resources/data-visualisations/skills-forecast>).

However, occupation-specific growth forecasts point towards potential further polarisation of the occupational distribution in Germany. Predicted employment growth is forecast to be strong in high-skilled occupations, such as professionals (+10%), technical occupations and associate professionals (+7%), and managerial occupations (+3%). It is lower but positive also in low-skilled elementary occupations (+4%) and service and sales workers (+3%). Meanwhile, employment growth forecasts for middle-skilled occupations are more pessimistic, at +4% for machine and plant operators but -1% for craft and trades workers and -3% for clerks.

3.5. Employment outcomes and incomes of middle-class workers during the COVID-19 crisis

The COVID-19 pandemic caused a shock to OECD economies that is unparalleled in post-war history and whose societal and economic impact is still unfolding. Compared to other OECD countries, Germany has weathered the COVID-19 crisis relatively well so far (OECD, 2020_[18]). OECD GDP figures released in the recent *Interim Economic Outlook* in September 2021 document a less severe economic contraction for 2020 than in other big European economies, with -4.9% drop year-on-year (OECD, 2021_[18]). Also the unemployment response has been relatively mild, with Germany having reached a peak unemployment rate of 4.1% in August 2020, 0.6 percentage points above its pre-crisis level (OECD, 2021_[19]). This reflects also the swift and decisive fiscal response by the German Government to support companies, workers and their families, notably through the rapid expansion of its short-time work scheme (*Kurzarbeit*). Nonetheless, the COVID-19 crisis had a massive effect on the economic situation and well-being of workers in Germany, including those in the middle-income group. The precise implications of this shock on household economic well-being are still difficult to assess, however, because standard micro data on household incomes during the crisis – such as those from the SOEP and LIS data used in this report – will not be available before late 2022.

This subsection provides first evidence on impact of the COVID-19 crisis on labour market outcomes and incomes for middle-income workers on the basis of survey data collected through the SOEP-CoV survey (Kühne et al., 2020_[20]).⁹ The SOEP-CoV draws on a sample of households from the regular SOEP, who have been interviewed twice so far during the first year the COVID-19 crisis, once during the first wave between April and June 2020 and a second time in January / February 2021. The results presented draw on a policy brief produced in collaboration with the Bertelsmann Stiftung and the German Institute for Economic Research, DIW (Braband et al., forthcoming_[21]).

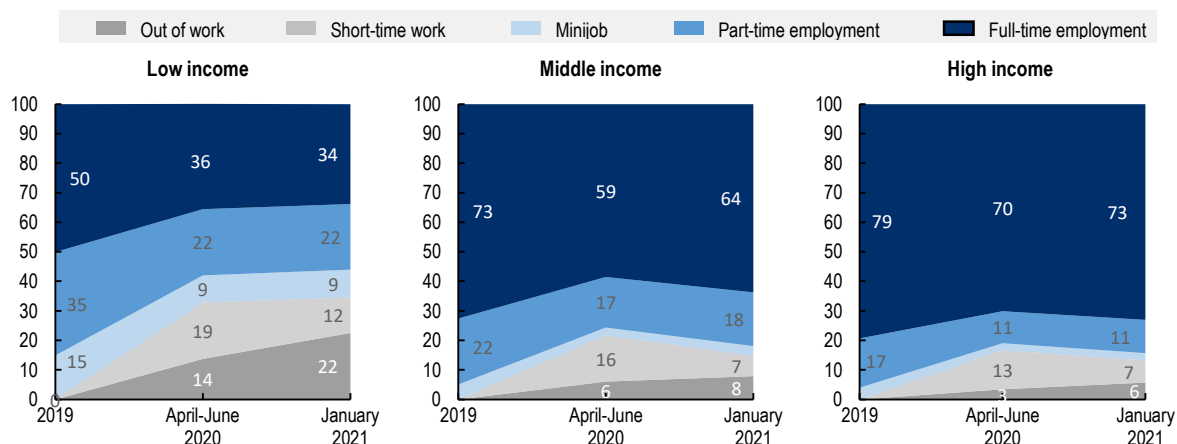
3.5.1. Short-time work prevented larger employment losses among middle-income workers during the initial phase of the COVID-19 crisis

One key pillar in OECD governments' responses to the COVID-19 crisis has been the rapid expansion – or introduction – of job retention schemes (OECD, 2020_[23]; 2021_[20]). Indeed, nearly all OECD governments operated such schemes during the initial phase of the crisis, in form of short-time work or wage subsidy schemes. At the peak of the first wave, in April/May 2020, about one-in-five workers in dependent employment were on job retention schemes across these countries on average, with shares in a number of countries reaching or exceeding one-in-three workers. In Germany, 15.5% of dependent workers were on *Kurzarbeit* in April/May 2020. This massive use of short-time work can be considered one of the lessons learned from the 2008-9 global financial crisis, where such schemes proved very effective at protecting jobs and incomes in Germany and a few other countries (Hijzen and Venn, 2011_[22]).

SOEP-CoV data for the initial phase of the COVID-19 crisis show that *Kurzarbeit* was widely used among workers of all income groups, and that it seems to have prevented larger job losses particularly among middle- and high-income workers (Figure 3.13). According to these data, 13 to 19% of workers who had been employed in 2019 reported being on *Kurzarbeit* in April to June 2020 depending on workers' income group. By January 2021, the share of workers on *Kurzarbeit* had about halved for workers in middle- and high-income households, to 7%, while it remained high for low-income workers, at 12%. This disparity likely reflects differences in sectoral composition, with low-income workers being more likely to have been working in sectors such as hospitality, where activity took longer to pick up again after the initial phase of the crisis.¹⁰

Figure 3.13. Short-time work was widely used by workers across all income groups, and employment losses among middle-income workers have been comparatively modest

Labour force status of workers employed before the crisis, by income group, Germany, 2019-21, as percentages



Note: Results for 18-64 year-olds who were employed full-time, part-time or in *Minijobs* in 2019. Income groups are defined based on disposable equivalised household income for the year 2018.

Source: DIW calculations based on the SOEP v36 and SOEP-CoV 1 and 2.

In spite of the massive use of *Kurzarbeit*, a significant share of workers lost their jobs, particularly among low-income workers (Figure 3.13). By January 2021, 8% of middle-income workers and 6% of high-income workers who had been employed in 2019 were out of work; among low-income workers, the share was three times as high, at 22%. Many of these workers were likely working in jobs that did not qualify for *Kurzarbeit*, including workers in marginal employment (the so-called *Minijobs*, see also the discussion in Chapter 5) and the self-employed. These numbers include workers who left the labour market for retirement. A recent study exploiting state-level variation in the exposure to the pandemic shock and the take-up of *Kurzarbeit* suggests that in absence of the extension of short-time work, the unemployment rate could have increased by an additional 3 percentage points on average (Aiyar and Dao, 2021^[23]).

Those numbers are mirrored by a decline in employment (outside of short-time work) across the different employment types. Also among middle-income workers, the share of workers employed outside of short-time work dropped significantly, but much less so than for low-income workers. Out of all middle-income people in work before the crisis in 2019 (Figure 3.13, middle panel), the share of those in

- *full-time employment* outside of short-time work had dropped by 9 percentage points by January 2021. This reflects a notable drop in employment in the initial months of the crisis (i.e. until April-June 2020), and a recovery thereafter up to January 2021;
- *part-time employment* outside of short-time work dropped by 4 percentage points, again mostly in the initial months of the crisis;
- *Minijobs* outside of short-time work declined by 2 percentage points, which corresponds to a drop by over 30% in the total number of middle-income people on *Minijobs*.

While these losses for middle-income workers up to early 2021 were broadly comparable in magnitude to those for high-income workers, low-income workers suffered a much greater drop in employment. Part of the reason is that low-income workers appear not to have benefited from an improvement in labour market outcomes during autumn and winter 2020, and that the share of workers on short-time work was higher among low-income workers. By January 2021, the shares of low-income workers in full-time employment,

part-time employment, and *Minijobs* outside short-time work had declined by 16, 13, and 6 percentage points.

3.5.2. Income losses during the COVID-19 crisis have so far been largest for workers high-income households

One of the most striking findings evolving from analysis of the economic impact of COVID-19 crisis is that disposable household incomes seem to have been affected only very little during the initial phase of the crisis, and that income inequality may indeed have *shrunk*. While standard survey data on annual disposable household incomes for the crisis years are not available yet, earlier analysis of SOEP-CoV data show that in the initial months of the crisis, income losses were largely restricted to high-income households. Meanwhile low- and middle-income households even experienced (nominal) income *gains*, possibly as a result of general pay increases (Grabka, 2021^[26]). This is consistent with the results from an ad-hoc panel survey carried out among respondents in five European countries at the University of Luxembourg (Clark, D'Ambrosio and Lepinteur, 2021^[25]). They show, for Germany, a decline in relative income inequality between January 2020 and 2021, driven by a slight *rise* in disposable household incomes for employees, the unemployed and the retired, and substantial income losses for the (higher-income) self-employed. Also OECD National Accounts point to a rise in gross disposable per-capita income in Germany in Q3 2020 and Q4 relative to Q4 2019, after a temporary drop in Q2 2020 (OECD, 2021^[19]).

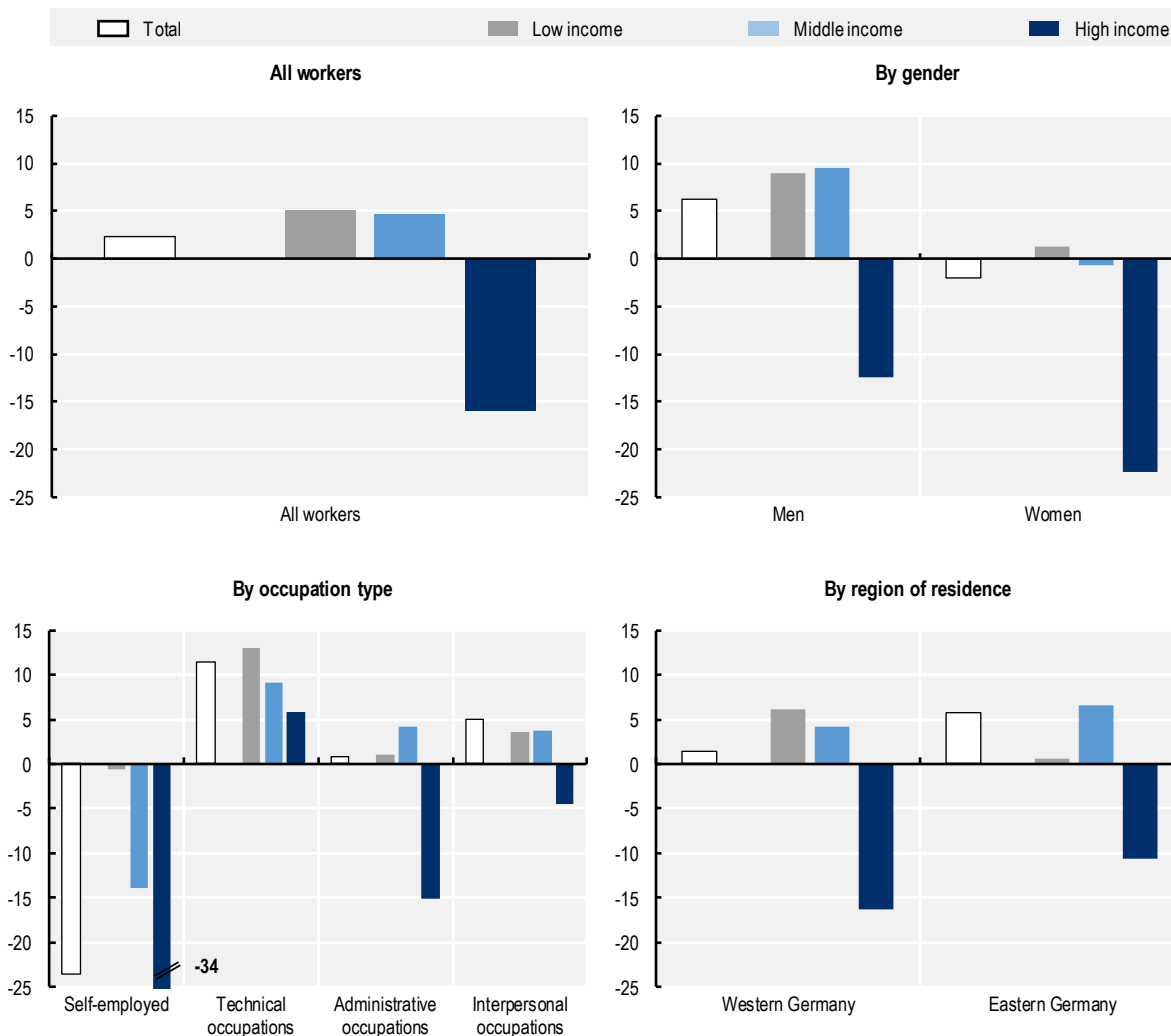
New analysis of workers' disposable incomes during the COVID-19 crisis carried out using the most recent SOEP-CoV data corroborate those results. Among workers employed in 2019, i.e. prior to the crisis, those living in middle- and low-income households experienced, on average, small gains in net monthly incomes, about +5% up to January 2021 (Figure 3.14, top-left panel). Meanwhile, workers in high-income households suffered large income losses of -16% on average. This implies that relative inequality in workers' incomes declined in Germany up to January 2021.

Income gains and losses have varied across groups of workers:

- *Women have fared, on average, much less well than men:* female workers in middle- and low-income households experienced no income growth, while those in high-income households suffered much greater income losses than high-income working men (Figure 3.14, top-right panel). This likely reflects that women were more likely to work in jobs or sectors heavily exposed to the crisis.
- *The impact of the crisis has varied across occupations:* self-employed workers have suffered the greatest income losses by far, particularly those in high-, but also in middle-income households (Figure 3.14, bottom-left panel). This likely reflects greater exposure to the economic shock (e.g. a more volatile income stream and an overrepresentation in highly affected sectors) and lesser access to government income support in the form of unemployment benefits and short-time work. High-income workers in administrative occupations also suffered strong income losses. Meanwhile, workers in technical occupations in all income groups experienced income gains over the crisis.
- *Income inequality declined much less in the east than in the west:* in eastern Germany, low-income workers experienced smaller income gains than in the west, and incomes losses for high-income workers were lower (Figure 3.14, bottom-right panel). However, middle-income workers experienced slightly stronger income growth in the east than in the west.

Figure 3.14. Income losses during the COVID-19 crisis have mostly concerned high-income workers

Percentage nominal change in monthly net household income between 2019 and January 2021 for workers employed before the crisis, by household income, Germany



Note: Results for 18-64 year-olds who were employed full-time, part-time or in *Minijobs* in 2019. Income groups are defined based on disposable equivalised household income for the year 2018. Monthly net household incomes are measured in January 2021 (SOEP CoV 2) and compared to pre-crisis values for 2019 taken from the SOEP.

Source: DIW calculations based on the SOEP v36 and SOEP-CoV 2.

3.6. Conclusions

Middle-class employment in Germany has proven quite robust, so far, to the substantial changes affecting the German labour market since the mid-1990s. The shrinking of the middle-income group in Germany also led to a decline in the share of workers living in middle-income households. However, the absolute number of middle-income workers rose as many women entered the labour market. As many OECD countries, the labour market in Germany has polarised, as middle-skilled occupations lost employment shares relative to low- and high-skilled occupations. However, high-skilled occupations have experienced the strongest employment growth – both among middle-income workers and workers

more generally – and they now account for over half of all middle-income jobs in Germany. This also reflects the growing number of women working in these occupations. Temporary and part-time employment have risen among middle-income workers, but mostly in the late 1990s and early 2000s, and they remain much less widespread than for workers in other income groups. The German labour market will continue to undergo substantial transformation over the next decades, which will also strongly affect middle-class workers. About one-in-six middle-income workers are employed in occupations that are highly automatable, and hence face the risk of job and income losses. First evidence on employment and income trends during the initial phase of the COVID-19 crisis shows that middle-income workers have suffered much smaller employment losses than workers in low-income households, and that their disposable incomes have remained stable on average, thanks to comprehensive government support.

Annex 3.A. Further details on occupational categories and sectors

Annex Table 3.A.1. Overview of ISCO occupational categories

Occupational category label used in this chapter	International Standard Classification of Occupations (ISCO-88)	Tasks	Three largest occupational titles among workers in Germany, 2018	
			Men	Women
Managers	Legislators, senior officials and managers	Determining and formulating policies, planning, directing and co-ordinating	Managing Directors and Chief Executives Sales and Marketing Managers Supply, Distribution and Related Managers	Education Managers Restaurant Managers Sales and Marketing Managers
Professionals	Professionals	Increasing knowledge, applying concepts and theories to solve problems, and teaching	Mechanical Engineers Software Developers Secondary Education Teachers	Secondary Education Teachers Social Work and Counselling Professionals Vocational Education Teachers
Technical occupations and associate professionals	Technicians and associate professionals	Application of concepts and operational methods, and in teaching at certain educational levels	Manufacturing Supervisors Nursing Associate Professionals Commercial Sales Representatives	Nursing Associate Professionals Social Work Associate Professionals Accounting Associate Professionals
Craft and trades workers	Craft and related trades workers	Understand materials and tools, all stages of production and intended use of final product	Agricultural and Industrial Machinery Mechanics and Repairers Motor Vehicle Mechanics and Repairers Metal Working Machine Tool Setters and Operators	Product Graders and Testers Craft and Related Workers Not Elsewhere Classified Motor Vehicle Mechanics and Repairers
Plant and machine operators	Plant and machine operators and assemblers	Operate and monitor large scale, highly automated, industrial machinery and equipment	Heavy Truck and Lorry Drivers Car, Taxi and Van Drivers Lifting Truck Operators	Food and Related Products Machine Operators Car, Taxi and Van Drivers Electrical and Electronic Equipment Assemblers
Clerks	Clerks	Secretarial duties, operating word processors and other office machines, computing data	Stock Clerks General Office Clerks	General Office Clerks Secretaries (general)

Occupational category label used in this chapter	International Standard Classification of Occupations (ISCO-88)	Tasks	Three largest occupational titles among workers in Germany, 2018	
			Men	Women
Sales and service workers	Service workers and shop and market sales workers	Provide personal and protective services, and to sell goods in shops or at markets	Bank Tellers and Related Clerks Shop Sales Assistants Building Caretakers Cooks	Bank Tellers and Related Clerks Shop Sales Assistants Waiters Health Care Assistants
Elementary occupations	Elementary occupations	Routine tasks, involving the use of hand-held tools and limited personal initiative or judgement	Manufacturing Labourers Not Elsewhere Classified Freight Handlers Cleaners and Helpers in Offices, Hotels and Other Establishments	Cleaners and Helpers in Offices, Hotels and Other Establishments Kitchen Helpers Domestic Cleaners and Helpers

Note: Occupations sorted in descending order of workers' average earnings in Germany in 2018.
Source: ILO (2004^[26]) and OECD calculations based on data from LIS Cross-National Data Center.

Annex Table 3.A.2. Overview of ISIC sectors

Sector classification used in this chapter	International Standard Industrial Classification (ISIC)	Three largest industries among workers in Germany, 2018	
		Men	Women
Agriculture	Agriculture, hunting and forestry Fishing	Crop and animal production, hunting and related services Forestry and logging Fishing and aquaculture	Crop and animal production, hunting and related services Forestry and logging Fishing and aquaculture
Manufacturing	Mining and quarrying Manufacturing Electricity, gas and water supply	Manufacture of motor vehicles, trailers and semi-trailers Manufacture of machinery and equipment n.e.c. Manufacture of fabricated metal products, except machinery	Manufacture of food products Manufacture of motor vehicles, trailers and semi-trailers Manufacture of electrical equipment
Construction	Construction	Specialised construction activities Construction of buildings Civil engineering	Specialised construction activities Construction of buildings Civil engineering
Retail and hospitality	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods Hotels and restaurants	Retail trade, except of motor vehicles and motorcycles Food and beverage service activities Wholesale trade, except of motor vehicles and motorcycles	Retail trade, except of motor vehicles and motorcycles Food and beverage service activities Wholesale trade, except of motor vehicles and motorcycles
Transport and communication	Transport, storage and communications	Computer programming, consultancy and related activities Land transport and transport via pipelines	Computer programming, consultancy and related activities Postal and courier activities

Sector classification used in this chapter	International Standard Industrial Classification (ISIC)	Three largest industries among workers in Germany, 2018	
		Men	Women
		Warehousing and support activities for transportation	Warehousing and support activities for transportation
Finance	Financial intermediation	Financial service activities, except insurance and pension Insurance, reinsurance and pension funding, except social security Activities auxiliary to financial service and insurance activities	Financial service activities, except insurance and pension Insurance, reinsurance and pension funding, except social security Activities auxiliary to financial service and insurance activities
Real estate	Real estate, renting and business activities	Services to buildings and landscape activities Architectural and engineering activities; technical testing/analysis Legal and accounting activities	Services to buildings and landscape activities Legal and accounting activities Real estate activities
Public services	Public administration and defence; compulsory social security Education Health and social work	Public administration and defence; compulsory social security Human health activities Education	Human health activities Education Public administration and defence; compulsory social security
Other	Other community, social and personal service activities Activities of private households as employers and undifferentiated production activities of private households Extraterritorial organisations and bodies	Creative, arts and entertainment activities Activities of membership organisations Sports activities and amusement and recreation activities	Activities of membership organisations Other personal service activities Activities of households as employers of domestic personnel

Source: United Nations (2002_[27]) and OECD calculations based on data from LIS Cross-National Data Center.

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Notes

¹ This chapter makes no assumption on these workers’ *wages* or *earnings*: also people on low wages or working few hours qualify as “middle-income workers” if they live in a middle-household. This may be the case if there are other earners, or sources of income, in the household. The definition employed in this chapter includes workers who are also enrolled in education, including apprentices.

² The statistical analysis is again largely based on data from the Luxembourg Income Study Database (LIS; <https://www.lisdatacenter.org/>), which for Germany uses microdata from the German Socio-Economic Panel (SOEP), with income information up to 2018. The results presented are regularly cross-checked against data from labour force surveys, which provide more robust information on labour market outcomes but generally do not include information on workers’ incomes.

³ Not all of these jobs in public services are necessarily also public-sector jobs. This group also includes people working in private hospitals and non-governmental childcare institutions.

⁴ These LIS-based figures are largely consistent with those for total employment from the OECD *Labour Force Statistics* (OECD, 2021^[32]), which draw on more precise labour force survey data that, however, cannot be broken down by household income. According to the most recent 2019 data, 12.0% of dependent workers in Germany were in temporary employment, compared to 12.1% across OECD countries on average. The incidence of temporary employment in Germany has risen between 1995 and 2008, from 10.4 to 14.7%, but declined again thereafter.

⁵ The LIS-based rates of part-time work shown in Figure 3.7 are a bit higher than those from the OECD *Labour Force Statistics* (OECD, 2021_[10]) cited further up in the same subsection. This may reflect differences in the age groups considered (18-65 in the LIS analysis vs. all ages in the official OECD data), but also differences in data quality.

⁶ LIS data only provide information on people's main activity status. Dependent workers, who additionally engage in some activities as self-employed, are therefore not considered as self-employed in this analysis. This may include for instance craft and trades workers, who are employed by a company and work a few hours as self-employed on the side, or workers who offer any sort of services via online platforms in addition to their main job as dependent employees.

⁷ The analysis applies the definition of low pay from the OECD *Earnings Distribution Database*, which however uses data on monthly rather than annual earnings for most countries (<https://www.oecd.org/employment/emp/employmentdatabase-earningsandwages.htm>). For further results, see also Table O in the Statistical Annex of the latest *Employment Outlook* (OECD, 2021_[31]).

⁸ Frey and Osborne (2017_[13]) use an occupation-based approach assuming that whole occupations rather than single job tasks are automated by technology, and found that 47% of jobs in the United States are at high risk of being automated in the next ten to 20 years. Other studies that have applied the same methodology to German data have estimated similarly high values (Bonin, Gregory and Zierahn, 2015_[30]; Brzeski and Burk, 2015_[28]). Later studies, such as the OECD work cited in this paragraph, have used task-based approaches, i.e. taken into account the heterogeneity of workers' tasks within occupation, and estimated much lower values. Those results are in line also with a study by Dengler and Matthes (2018_[29]), who – using a task-based approach – estimate that 15% of jobs in Germany are at high risk of being automated.

⁹ For further information, see https://www.soep-cov.de/Home/Home_en/index.php/.

¹⁰ These numbers are broadly in line with the shares reported in official statistics. Based on administrative data from the German Federal Employment Agency, the OECD estimates that about 15.5% of dependent employees in Germany were on *Kurzarbeit* in April/May 2020. By February/March 2021, the rate had dropped to 8.4% (OECD, 2021_[31]).



From:

Is the German Middle Class Crumbling? Risks and Opportunities

Access the complete publication at:

<https://doi.org/10.1787/845208d7-en>

Please cite this chapter as:

OECD (2021), "The German middle class in a changing world of work", in *Is the German Middle Class Crumbling? Risks and Opportunities*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/951b8209-en>

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