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Under-employment: A crisis  
hangover, or something  
more?

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**Under-employment: A crisis hangover, or something more?**

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## *Abstract*

*Since the global financial crisis, under-employment has increased in the majority of OECD countries, and has been slow to decline. On average across the OECD, 5.5% of workers were under-employed in 2017. This represents a 27% increase since 2006. This paper shows that the increase stems from both cyclical and structural factors. The economic crisis has contributed to the movement into under-employment, and so has the gradual shift of employment toward more demand-driven service sectors. This shift has led to more workers having variable hours and fluctuating schedules. The increase in under-employment has disproportionately affected young, female and low-skilled workers. Under-employed workers have lower job quality. They perform tasks that are more monotonous and less complex. They also face lower wage growth, particularly at the bottom of the distribution.*

## Résumé

*Depuis la crise financière mondiale, le sous-emploi a augmenté dans la majorité des pays de l'OCDE et n'a décliné que lentement. En moyenne dans l'ensemble des pays de l'OCDE, 5,5% des travailleurs étaient sous-employés en 2017. Cela représente une augmentation de 27% par rapport à 2006. Ce document de travail montre que cette augmentation provient de facteurs à la fois cycliques et structurels. La crise économique a contribué à la progression du sous-emploi, de même que le transfert progressif de l'emploi vers des secteurs de services davantage régis par la demande. Ce dernier implique des horaires variables pour une plus grande partie des travailleurs. L'augmentation du sous-emploi a touché particulièrement les jeunes travailleurs, les femmes et les travailleurs peu qualifiés. La qualité du travail est moindre pour les travailleurs sous-employés. Ils effectuent des tâches plus monotones et moins complexes. Ils connaissent également de plus faibles augmentations de salaires, particulièrement en bas de l'échelle salariale.*

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## 1. Introduction

1. In many countries, unemployment is at its lowest level since the financial crisis, yet under-employment has been slow to decline. While this is true for all countries, it is especially true for those countries hit hardest by the crisis. While under-employment has increased by about 27% across the OECD between 2006 and 2017, it has increased by an average of 141% in Ireland, Greece, Spain, and Italy.

2. What has been behind the rise in under-employment? This paper shows that cyclical factors have been a key driver, but that structural factors have also played a role. Employment has been shifting from manufacturing to services, and many service sectors have lower rates of unionisation and a greater share of variable-hour contracts and flexible working time arrangements (OECD, 2001<sup>[1]</sup>; OECD, 2017<sup>[2]</sup>). This is born out in an increased risk of under-employment.

3. Under-employed workers are part-time workers who want to work more, but cannot find more hours. This group includes both involuntary part-time workers who work part-time because they could not find full-time employment, and those part-time workers who simply want to work additional hours. While working part-time may be better than being unemployed (Borowczyk-Martins, Lalé and Etienne, 2016<sup>[3]</sup>), and can serve as a stepping stone to full-time work (Borowczyk-Martins and Lalé, 2018<sup>[4]</sup>), an inability to obtain more hours of work can be a source of income instability and poverty for workers.

4. In the past, under-employment has moved in concordance with the unemployment rate. However, this pattern has been less evident since the financial crisis as unemployment rates have slowly returned to pre-crisis levels while under-employment has not (Gee Hee Hong et al., 2018<sup>[5]</sup>; Smith, 2014<sup>[6]</sup>; Altig and Higgins, 2014<sup>[7]</sup>). Where unemployment has declined, under-employment has been slow to follow, suggesting that additional factors beyond the cycle have influenced the incidence of under-employment. This implies that policies aimed at reducing unemployment may not be sufficient for addressing under-employment. Thus, with the aim to inform policies to promote inclusive labour markets, the objective of this paper is to understand the influences of under-employment on different groups of workers.

5. Previous research has documented a rise in under-employment since the global financial crisis (OECD, 2018<sup>[8]</sup>). In the United States, Valletta, Bengali and Van Der List (2015<sup>[9]</sup>), investigated involuntary part-time work and found that both the business cycle and sectoral shifts in employment can explain the recent increases. Beyond the United States, Eurofound (2017<sup>[10]</sup>) provided European estimates of involuntary part-time workers, finding that they were predominantly young female and less skilled workers. Bell and Blanchflower (2018<sup>[11]</sup>) developed an alternative hours-based estimate of under-employment for European countries, and linked the rise in under-employment to lower pay. The same authors investigated aspects of well-being in the United Kingdom,

linking an increase in anxiety and depression to under-employment (Bell and Blanchflower, 2018<sup>[12]</sup>).

6. This paper contributes to this debate by updating the evidence on under-employment for many OECD countries, focusing on its drivers, and implications on wages and other aspects of job quality. Much of the analysis follows Valletta et al. (2015<sup>[9]</sup>) in decomposing cyclical and structural explanations of under-employment for a range of OECD countries. This paper extends the analysis both by including additional countries and by using a broad measure of under-employment similar to that of Bell and Blanchflower (2018<sup>[11]</sup>). This broader measure includes those workers in part-time employment who either could not find a full-time job or would like to work more hours. Using labour force data from 29 OECD countries, supplemented with longitudinal survey data from four other OECD members and Colombia, the report examines the composition and changes in under-employment between 2006 and 2017. Throughout the report, all people currently in education are excluded from the analysis to ensure that an increasing number of students seeking part-time employment do not drive the results.

7. This paper makes three empirical contributions. First, the paper documents that under-employment has increased in most OECD countries over the past 10 years, and has been driven in part by structural changes. Similar results have been presented by Valletta and his co-authors for the United States (2015<sup>[9]</sup>), and this appears to be the first paper to show that this is a common trend internationally. Following the approach of Valletta, this paper disentangles the effects of structural changes from the effects of the business cycle.

8. Second, the paper finds that while under-employment is broadly distributed, some groups are more affected than others. Echoing the findings of Eurofound (2017<sup>[10]</sup>), the evidence presented here suggests that young, female and low-skilled workers are increasingly likely to be under-employed.

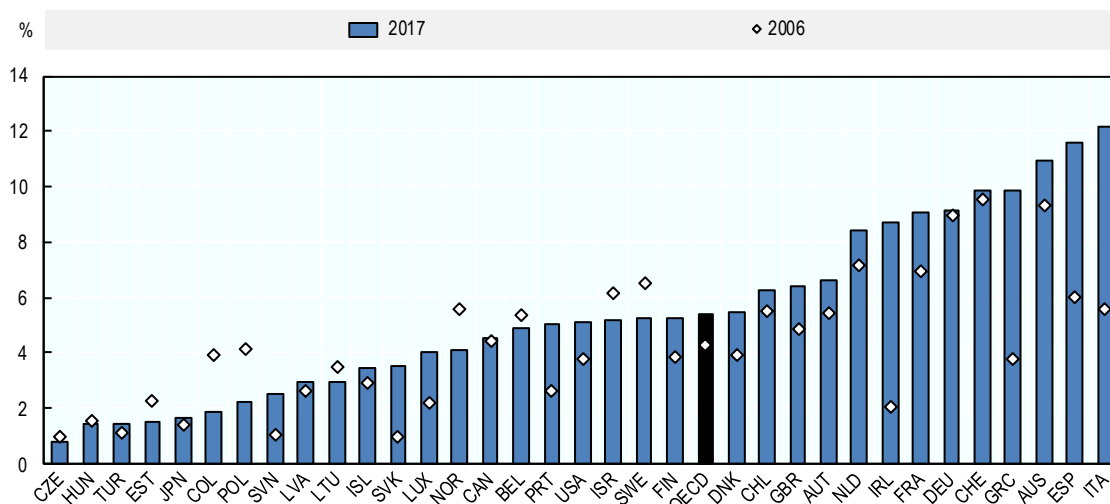
9. Third, it examines the implication of under-employment for job quality and, in particular, wages. Using a select group of countries, the report examines under-employment across the wage distribution to provide novel evidence on both the direct and indirect consequences of under-employment on all workers earnings. That is, the mere existence of under-employed workers in the labour market may indirectly dampen wage growth due to an over-supply of job seekers, over and above the direct effects of being personally under-employed previously highlighted by the OECD (2018<sup>[8]</sup>). Finally, the report offers some thoughts on potential policy options to address under-employment.

## 2. Incidence of under-employment

10. The average share of workers in under-employment across the OECD has increased by a quarter since 2006, reaching 5.5% of dependent employment in 2017. The numbers presented in Figure 2.1 show under-employment as a share of dependent work (that is, employees) including both part-time workers who want more hours (4.3% on average in 2017) and those who would rather work full-time (3.5%).<sup>1</sup> Overall, 24 of the 34 countries examined have higher rates of under-employment in 2017 than in 2006. Across the OECD, this translates to just over a third of all part-time workers being under-employed in 2017 (Figure A A.2).

11. The OECD average belies differences between countries. Italy, Spain, and Australia, have a large share of under-employed workers.<sup>2</sup> On the other side of the spectrum, the Czech Republic, Turkey, Hungary, and Estonia all have relatively low levels of under-employment. However, these countries have a small share of their workers on part-time contracts.<sup>3</sup> In contrast, Portugal also has a small share of part-time workers (7.7% in 2017), but over half of those workers are under-employed (58%). As a result, the share of Portuguese workers who are under-employed is close to the OECD average.<sup>4</sup>

12. Under-employment has increased in many countries hit hard by the financial crisis (Figure 2.1).<sup>5</sup> Since 2006, some of the largest increases in under-employment have been in Italy, Spain, Ireland, and Greece. Under-employment rose in these countries by an average of 6.2 percentage points (141%), much higher than the 1.2 percentage point OECD average (27%).<sup>6</sup> In fact, the increases in these countries drive a large share of the overall increase. Without these six countries, the average increase of the remaining OECD countries is 0.5 percentage points (11.5%).

**Figure 2.1. Under-employment has increased since the crisis**Share of dependent workers indicating some form of time-based under-employment, 2006 and 2017<sup>a</sup>.

*Note:* The OECD average is the unweighted average of the countries depicted, excluding Colombia. Under-employed workers are in part-time employment (working 30 hours or less per week) who report either that they could not find a full-time job or that they would like to work more hours. Workers also in education are excluded from the data.

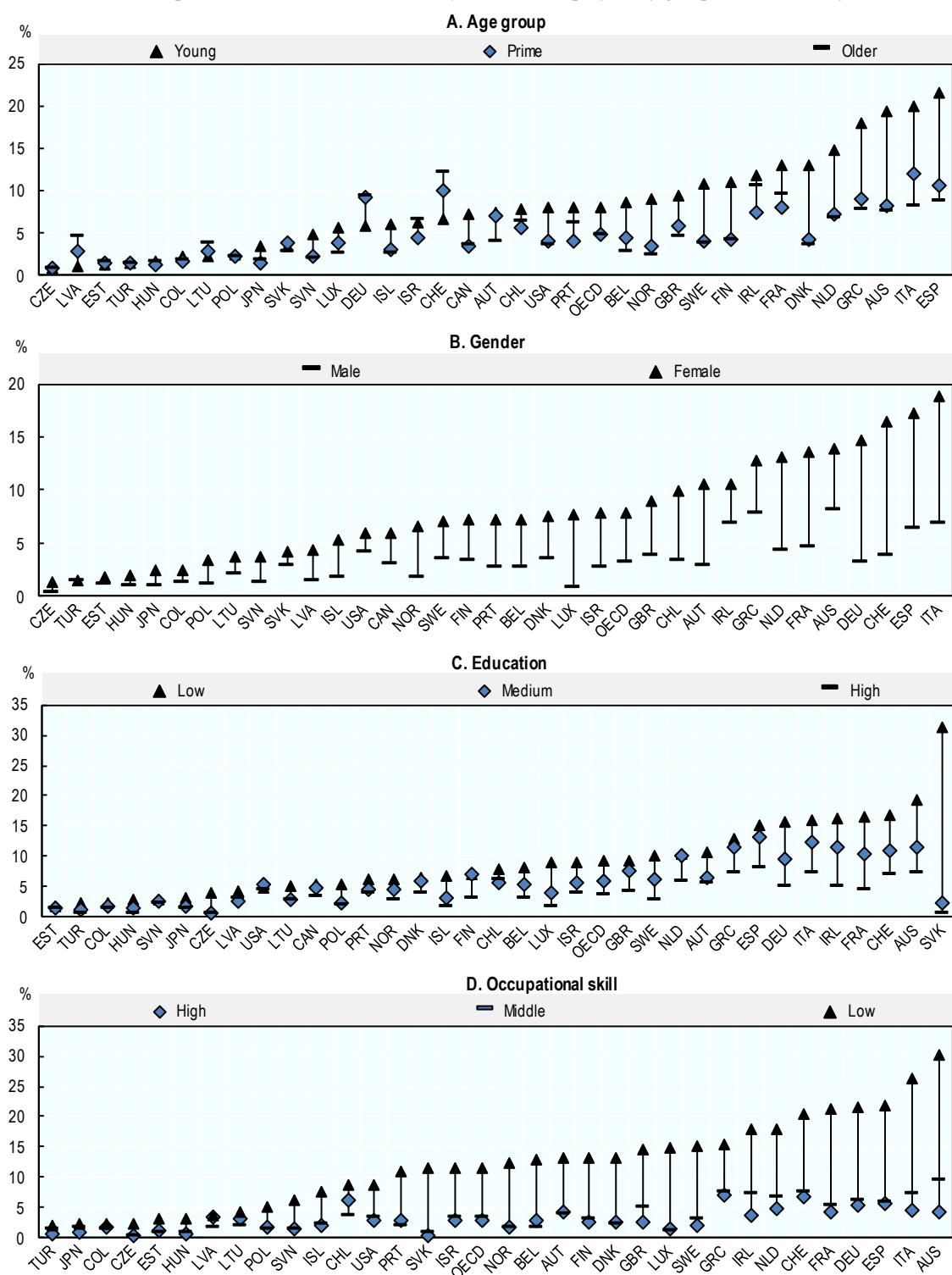
a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

## 2.1. Under-employment among different groups

13. While under-employment has increased in many countries, it is more prevalent for certain groups. For example, it is more common among women and workers in low-skill occupations. As evident in Figure 2.2, many of these trends are consistent across countries. The figure shows under-employment as a share of dependent workers across four dimensions: age, gender, education and occupational skill.<sup>7,8,9</sup>

14. In most countries, the under-employed tend to be young. Switzerland is a notable exception, along with Germany, Lithuania, and Latvia, where older workers (those aged 55 to 69) are more likely to be under-employed. Across the OECD on average in 2017, 8.1% of young workers (aged 15 to 29) were under-employed while only 4.8% of older workers were. Prime-aged workers (those aged 30 to 54) closely resembled older workers with 4.9% being under-employed.

**Figure 2.2. Young, female and low-skilled workers are more likely to be under-employed**Share of dependent workers who indicate they are under-employed, by group, 2017 or latest year<sup>a</sup>.

*Note:* OECD is the unweighted average of the countries depicted, excluding Colombia. Under-employed workers work part-time (30 hours or less per week) who could not find a full-time job or would like to work more hours. **Panel A:** Young workers are those aged 15 to 29; Prime-aged workers are those ages 30 to 54; and Older workers are those aged 55 to 69. **Panel C:** Low education included ISCED 2011 levels 0 to 2 (lower secondary education and below); Medium education contains ISCED 2011 levels 3 and 4 (upper secondary and post-secondary non-tertiary); High education included ISCED 2011 levels 5 to 8 (short-cycle tertiary, bachelor, master, doctoral or equivalent). **Panel D:** High-skill occupations include jobs classified under the ISCO-88 major groups 1, 2, 3. Middle-skill occupations include jobs classified under the ISCO-88 major groups 4, 6, 7, and 8. Low-skill occupations include jobs classified under the ISCO-88 major groups 5 and 9.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

15. Women are much more likely to be under-employed than men. Stemming from the fact that women make up a larger share of part-time workers, around 7.9% of female workers across the OECD were under-employed in 2017, compared with only 3.2% of males. This is a consistent observation, with the exception of Turkey.

16. Low-skill workers are more likely to be under-employed. This is clear whether measuring skills as educational attainment or by worker occupation.<sup>10</sup> As a share of dependent workers, on average, 9.2% of low-educated workers were under-employed in 2017. This is notably higher than 5.9% and 3.7% for workers with medium and high education, respectively. The difference is starker when considering occupations, with 11.6% of workers in low-skill occupations being under-employed on average, compared with 3.4% and 2.9% of workers in middle- and high-skill occupations, respectively. Considering the overlap between these two measures of skill, their agreement is not surprising.<sup>11</sup>

## 2.2. Has the composition of under-employment changed?

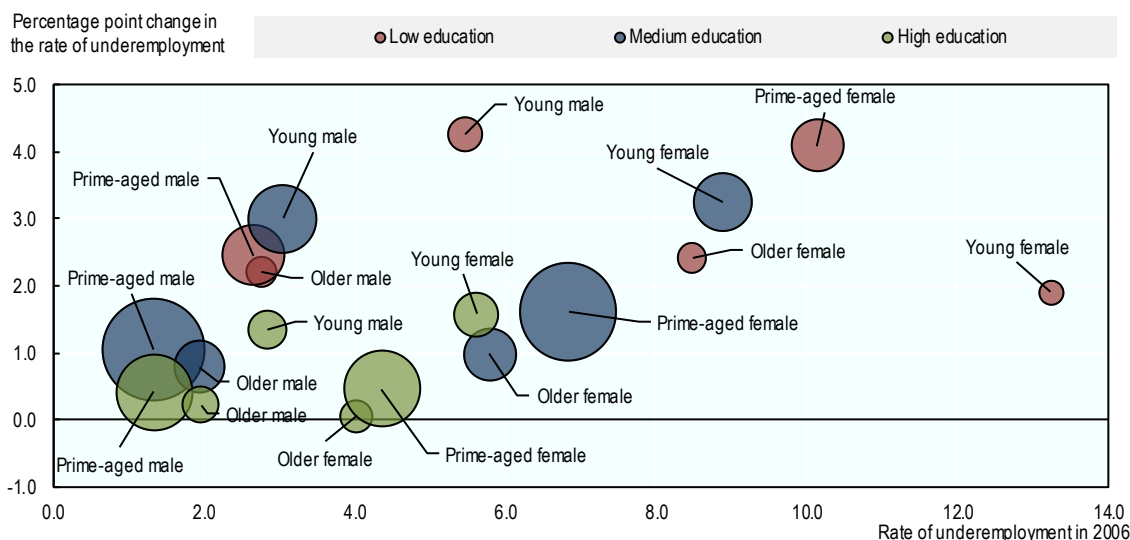
17. The increase in under-employment since the crisis has been broad based and consistent across countries. With this common trend, it is possible to pool countries and descriptively examine trends by group delimited by age, education and gender. The pooled results outline that some groups have seen larger increases in under-employment than others (Figure 2.3)<sup>12,13</sup> In general, similar to the evidence presented in section 2.1, young and lesser-educated workers have seen larger increases than older, well-educated workers.

18. Young women without an upper secondary degree make up the largest share of under-employment, and experienced a notable increase. In 2006, prior to the crisis, just over 13% of these workers were under-employed. That increased to more than 15% in 2017 (an increase of 1.9 percentage points). However, prime-aged women and young males without an upper secondary degree saw even larger increases, 4.1 percentage points and 4.3 percentage points respectively.

19. Older workers have experienced the least growth in under-employment. Among older workers, the largest increase has been among the low educated. In particular, older, low-educated women saw an increase in under-employment by 2.4 percentage points since 2006 (although they are a small portion of overall employment). The next highest increases among older workers were for women with low and medium education, increasing by 1.8 and 1.3 percentage points respectively.

**Figure 2.3. Some groups have seen larger increases in under-employment than others**

Share of dependent workers indicating under-employment, by demographics, unweighted OECD average for 2006 and 2017<sup>a</sup>.



*Note:* The OECD average is an unweighted average. Under-employed workers work part-time (working 30 hours or less per week) and report either that they could not find a full-time job or would like to work more hours. The size of each circle corresponds to the group's share of dependent employment over the period.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

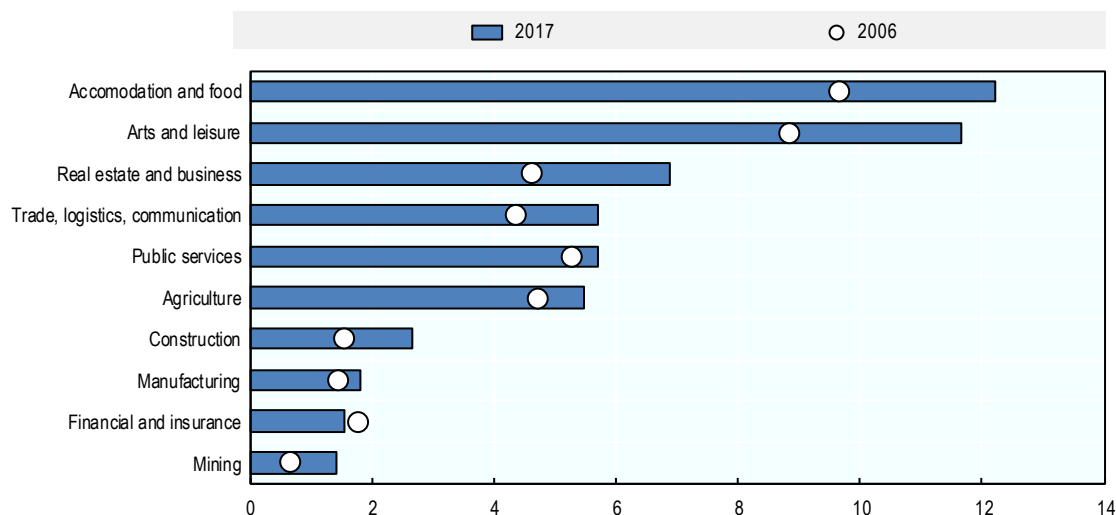
### 2.3. Which sectors have more under-employment?

20. Different sectors of the labour market exhibit different work patterns. For instance, workers in the *Accommodation and food services* and *Arts and leisure* sectors are more likely to be on flexible work schedules as employers try to accommodate more variable customer demand in those sectors (Sasser, 1976<sup>[13]</sup>; Tilly, 1991<sup>[14]</sup>; Carré and Tilly, 2017<sup>[15]</sup>). On the other hand, while the skill requirements for the *Finance and Insurance* sector vary from those of the *Manufacturing* sector, both sectors consist mostly of full-time jobs and work follows a more predictable schedule. As a result, employers in these sectors can offer fixed hours and steady hours of work, whereas those in the aforementioned services sectors face demands to vary work hours in response to the variable demand (Euwals and Hogerbrugge, 2006<sup>[16]</sup>). With lower rates of unionisation, some of these workers may lack the bargaining power to resist these demands (OECD, 2017<sup>[2]</sup>).

21. Service sector workers are more likely to be under-employed (Figure 2.4). Across the OECD, on average, workers in the *Accommodation and food services* and *Arts and leisure* sectors are the most likely to be under-employed.<sup>14,15</sup> In 2017, 12.2% of workers in *Accommodation and food services* workers self-identified as under-employed, while 11.7% of workers in the *Other services* sector did, an increase from 9.7 and 8.8% respectively. The increases for these sectors are the largest percentage point increases of all sectors.

**Figure 2.4. Under-employment is more common in services sectors**

Share of dependent workers indicating under-employment, by broad industry. Unweighted OECD average, 2006 and 2017<sup>a</sup>.



*Note:* The OECD average is an unweighted average. Industries are grouped according to a modified NACE Rev.2 A10 classification structure. The category of "Agriculture" broadly corresponds to NACE Rev.2 section A; "Trade, Logistics, Communications" broadly corresponds to sections G, H, and J; "Public Services" broadly corresponds to sections O, P, and Q; and "Arts and leisure" broadly corresponds to sections R, S, T, and U.

a) Data for Australia, Germany, and Japan are from 2016. Data for Canada and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007.

*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Israel LFS, Australia HILDA.

22. Other service sectors also have high concentrations of under-employed workers, such as *Real estate and business services* and *Trade, logistics and communication*. Meanwhile, the *Manufacturing* sector, which has been declining as a share of total employment (OECD, 2017<sup>[17]</sup>), has one of the lowest rates of under-employment. Only 1.8% of *Manufacturing* sector workers in 2017 declared under-employment. However, this too is an increase over the pre-crisis levels of 1.5%. Only the *Finance and Insurance* sector has experienced a decline in under-employment over the crisis.

23. The redistribution of workers from declining sectors<sup>16</sup> with low under-employment (e.g. *Manufacturing* and *Construction*) to sectors with a relatively higher intensity of under-employment has contributed to the increase in under-employment. A crude decomposition of the change in under-employment over the period indicates that 85% of the change was attributable to an increase of under-employment within sectors and 15% of the change stemmed from employment shifting between sectors. However, the existence of other confounding variables, such as the business cycle and demographics, complicate the interpretation of this decomposition. The regression models presented in the sections below address these issues.

## 2.4. Individual-level factors of under-employment

24. The descriptive analysis presented above highlighted that the likelihood of being under-employed differs across groups. To examine an individual worker's likelihood of



being under-employed in more detail, given a combined suite of characteristics, this section employs a logistic regression analysis at the individual level. The model takes the following form:

$$\mathbb{I}(\text{Under}_{i,c,t}) = \alpha + \mathbf{X}_{i,c,t}\boldsymbol{\lambda} + \beta_1 \text{Cycle}_{c,t} + \beta_2 \text{Cycle}_{c,t}^2 + \varphi_c + \delta_t + \epsilon_i$$

25. where subscripts  $i$ ,  $c$ , and  $t$  refer to individual, country and time, respectively. The dependent variable,  $\mathbb{I}(\text{Under}_{i,c,t})$ , is a binary indicator whether an individual is under-employed.<sup>17</sup> The business cycle is included in the model as  $\text{Cycle}_{c,t}$ , and is allowed to enter the model as a polynomial. Both the unemployment rate and measures of the output gap are used as proxies for the cycle.<sup>18</sup> However, the results from using these separate measures did not greatly affect the conclusions, and only the results using the unemployment rate are reported here.<sup>19</sup> Beyond the business cycle, the likelihood of under-employment is a function of a constant term ( $\alpha$ ), and time and country effects ( $\delta_t$  and  $\varphi_c$ , respectively), while structural factors are included in the matrix  $\mathbf{X}_{i,c,t}$ . The idiosyncratic error term is represented by  $\epsilon_i$ .

26. The choice of the variables included in  $\mathbf{X}_{i,c,t}$  is guided by the descriptive analysis in the previous section and insights provided by earlier literature. As noted previously, over the past few decades, employment has been gradually shifting from middle-skill manufacturing to high- and low-skill services (OECD, 2017<sup>[17]</sup>). In addition, advancements in technology could lead to a reduction in the demand for some types of labour (Gee Hee Hong et al., 2018<sup>[5]</sup>). In particular, while high-skill work is complemented by technology, low-skill workers can find themselves competing for hours with machines. Evidence from the United States, suggests that this sectoral shift can largely explain the sustained elevation in involuntary part-time employment in that country (Valletta, Bengali and Van Der List, 2015<sup>[9]</sup>). As noted by Valletta et al. (2015<sup>[9]</sup>), different sectors have different demand patterns, with some exhibiting a “peak-load” pattern that favours part-time employment over traditional full-time work.<sup>20</sup> These irregular demand patterns encourage firms in these sectors to demand part-time workers, who could possibly become under-employed. To capture this shifting industry mix, the model includes factor variables indicating a workers’ participation in one of six service sectors.

27. To capture worker skill, indicators of job type and worker education are also included. The job type indicator categorises worker occupations into three skill levels broadly following the International Standard Classification of Occupations (ISCO), similar to that used in previous OECD publications (OECD, 2017<sup>[18]</sup>). Using the job type indicator, workers are classed as having low-skill jobs (ISCO-88 1-digit occupations of 5 and 9), middle-skill jobs (ISCO-88 1-digit occupations 4, 6, 7, and 8), or high-skill occupations (ISCO-88 1-digit occupations 1, 2, and 3). The indicator of education also contains three levels. The first level, low education, corresponds to the International Standard Classification of Education (ISCED) 2011 levels 0 to 2. The second level, medium education, contains ISCED levels 3 and 4, while the third level, high education, contains ISCED levels 5 and 6.

28. From the descriptive analysis above, it is clear that under-employment differs by gender (Weststar, 2011<sup>[19]</sup>). Women are still the primary care-giver in most households, and mothers returning to work often take up part-time work as a means to balance their working and domestic lives. However, it can sometimes be difficult to move to full-time work once the need for flexibility has disappeared (Yu, 2002<sup>[20]</sup>; Kjeldstad and Nymoen, 2010<sup>[21]</sup>). The model includes a dummy indicator of worker gender.

29. In addition to gender, the descriptive analysis in the previous section highlighted differences in under-employment by age. In a slack labour market, younger workers have little experience with which to compete for jobs. As a result, they can have difficulty securing the hours that they desire (Prause and Dooley, 2011<sup>[22]</sup>). On the other end of the age distribution, older workers risk some age discrimination, but on the whole should have more established careers than younger workers and thus less under-employment (Virick, 2011<sup>[23]</sup>). Thus, the model includes three factor variables indicating worker age: young (15 to 29), prime-aged (30 to 54), and older (55 to 69).

30. Finally, some additional variables, including a worker's firm size, geographic location, and contract status are included in the model. Temporary work is highly linked with under-employment, with both situations associated with lower job quality (Wilkins and Wooden, 2011<sup>[24]</sup>). Regarding firms, some evidence suggests that different sized firms react differently to negative shocks, implying that workers may have different employment outcomes depending on the size of their employer (Fort et al., 2013<sup>[25]</sup>; Moscarini and Postel-Vinay, 2012<sup>[26]</sup>). Geographically, there may be similar differences, with some indication that rural workers may be more likely to be under-employed (Vera-Toscano, Phimister and Weersink, 2004<sup>[27]</sup>). Thus, the model includes factor variables of contract status (temporary or permanent), firm size, and location (rural, suburban or urban) are included in the model. However, there is a cost to including these data. The indicators of firm size and the rural-urban split require that the country set be limited to European countries.<sup>21</sup> Despite this limitation, in total, there are more than 1.9 million individual observations across 24 countries and spanning 16 years.<sup>22</sup>

31. The regression model confirms the link between the business cycle and under-employment. Table 2.1 displays the estimated marginal effects from a number of model specifications. The model in column 1 only includes indicators of the business cycle, as well as country and year fixed effects. The next model (column 2) adds sectoral indicators, while the third column further includes some demographic indicators. The fourth column includes skill indicators, similar to the education indicators. The fifth model includes some variables, which are only available for European countries, indicating worker's firm size and geographic indicators. The most complete model presented in the sixth column, adds a dummy indicator of contract status.<sup>23</sup>

32. The intermediate models (columns 1 to 5) indicate how the coefficient estimates' magnitude and significance change, as additional variables are included in the model. In particular, the inclusion demographic explanatory variables affect the coefficient estimates of sectoral variables. Relatedly, the inclusion of indicators of occupational skill further alters the sectoral coefficient estimates, as well as those of the educational attainment. Notably, the estimates impact of the unemployment rate is broadly consistent across models, regardless of the other included explanatory variables. Specifically, the most complete model (column 6) estimates that a one-percentage point increase in the unemployment rate is associated with an increase in the likelihood of being under-employed by just over 0.50 percentage points.

33. Once all of the explanatory variables have been included, the individual-based model shows large and significant effects associated with work in services sectors. With reference to the manufacturing sector, workers in all of the services sectors are significantly more likely to experience under-employment. Workers in the *Accommodation and food* and *Arts and Leisure* sectors have an increased probability of under-employment of almost 5.1 and 7.7 percentage points respectively. These estimates are larger in less complex models (columns 2 to 4), but diminish as additional controls for

demographics and skill are introduced. Two additional sectors, *Public services*, and *Real estate and business*, are also associated with higher rates of under-employment, with respective estimates of an increase of around 4.6 and 5.2 percentage points in the preferred model. These results point to the higher prevalence of under-employment in services sectors, even after controlling for compositional differences between industries.

**Table 2.1. Individual factors of under-employment in Europe**

Dependent variable: Indicator of under-employment, estimates presented as average marginal effects.

DV: Under-employment	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate	0.56***	0.54***	0.56***	0.51***	0.51***	0.51***
Unemployment rate <sup>2</sup> /10	-0.07**	-0.07**	-0.07**	-0.06**	-0.06**	-0.06**
Sector : Accommodation and food		12.96***	9.26***	6.06***	5.07***	5.07***
Sector : Arts and Leisure		15.21***	11.85***	9.64***	7.69***	7.69***
Sector : Trade, transportation, communications		4.70***	4.28***	3.44***	3.05***	3.05***
Sector : Financial and insurance		0.02	0.03	0.22	0.00	0.00
Sector : Real estate and business		5.99***	5.80***	5.66***	5.18***	5.18***
Sector : Public services		5.16***	4.85***	4.33***	4.63***	4.63***
Female			5.50***	4.70***	4.41***	4.41***
Age : Young			3.04***	2.43***	2.24***	2.24***
Age : Older			-1.39***	-1.31***	-1.36***	-1.36***
Education : Low			-5.35***	-1.79***	-1.57***	-1.57***
Education : High			-2.84***	-1.36***	-1.28***	-1.28***
Skill : High				-1.57***	-1.56***	-1.56***
Skill : Low				5.07***	4.64***	4.64***
Firm size : 11 to 19 persons					-1.84***	-1.84***
Firm size : 20 to 49 persons					-2.51***	-2.51***
Firm size : 50 or more					-4.07***	-4.07***
Urban : Cities					0.15	0.15
Urban : Rural					0.11	0.11
Temporary contract						0.51***
Country FEs	YES	YES	YES	YES	YES	YES
Year Fes	YES	YES	YES	YES	YES	YES
N/1000	1942	1942	1942	1942	1942	1942
Log-likelihood/1000	-48482	-45762	-43614	-42528	-42086	-42086

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% levels respectively.

*Note:* The model is a logistic regression. The dependent variable is a binary indicator with 1 representing under-employment and 0 representing well-employed. Workers are under-employed if they either want more hours or could not find a full-time job. Analysis computed using data from 2001 to 2017 at the individual level. The analysis is weighted according to annual national employment totals. Standard errors are clustered at the country level. Countries included in the model are: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

34. Further, those workers in larger firms are less likely to be under-employed compared to those in smaller firms. Workers in firms with 11 to 19 workers are 1.8 percentage points less likely to be under-employed. This effect increases with firm size, with those working in firms with 50 or more workers being 4.1 percentage point less likely to be under-employed. Presumably, larger firms have larger flexibility when arranging schedules, and can more easily shift work priorities of under-employed workers. Small firms have less flexibility to adapt to cyclical shocks. Alternatively, as larger firms are likely to pay higher wages (Haltiwanger et al., 2018<sub>[28]</sub>), there may be a

stronger relationship between low wage firms and under-employment. Unfortunately, associated firm characteristics were not available, and this could not be tested.

35. Along geographic lines, compared with suburban workers there is no significant effect associated with being a rural or urban worker.<sup>24</sup> Robustness checks show this lack of significance to be associated with the inclusion of the firm size variables in the model.

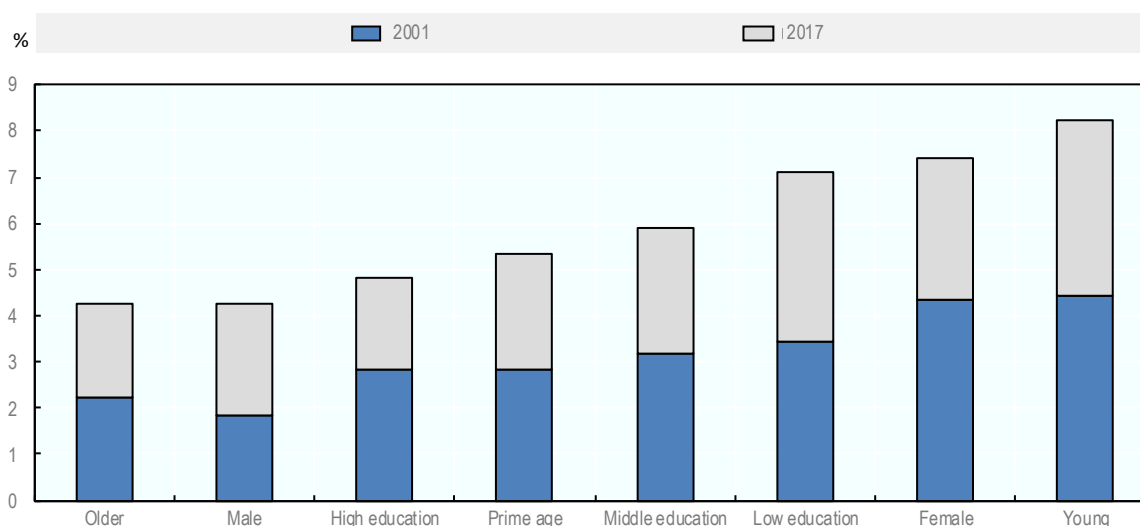
36. Compared with males, being a female worker is linked with an increased chance of under-employment of 4.4 percentage points. Additionally, the descriptive analysis in the previous section shows that women have some of the highest levels of under-employment. They have also had some of the largest increases in under-employment (see Figure 2.4), stemming from the high proportion of part-time workers who are female.

37. A similar result holds for young and prime-aged workers. Being young, as opposed to being prime-aged, is associated with a slightly higher risk of under-employment, 2.2 percentage points. Older workers are linked with a reduced risk of 1.4 percentage points. Examining under-employment on the basis of skills, the preferred model estimates that it is the middle educated and those with low-skill jobs who have the highest incidence of under-employment, after controlling for other factors.

38. The results of the individual-level regression show how the rate of under-employment has been increasing over time for all groups (Figure 2.5).<sup>25,26</sup> After controlling for other factors in the regression model, the marginal effect of being male on under-employment increased from 1.9% in 2001 to 4.3% in 2017. For women, this effect was larger, increasing from 4.3% to 7.4%. This increase was still smaller than the effect of being young, which increased 3.8 percentage points from 4.5% to 8.2% over the period. For prime-aged and older workers the increase was smaller, only increasing by 2.5 and 2.1 percentage points respectively.

**Figure 2.5. Under-employment has increased for all groups**

Estimated average marginal effects over time, percentage.



*Note:* Estimates derived from regression model presented in Table 2.1.

*Source:* OECD calculations.

39. The largest effect (and the largest increase) by education was for the low educated. Being low educated was associated with a 3.4% chance of being under-employed in 2001, which increased to 7.1% in 2017. At an increase of 3.7 percentage points, this is the second largest increase after that of younger workers. The increases for those with a middle education (that is, at least an upper secondary degree but not a completed post-secondary education) was 2.8 percentage points, rising from 3.16% to 5.92%. For highly educated workers, the increase was less, rising 2.0 percentage points.

## 2.5. Cyclical and structural determinants of under-employment

40. While the previous section showed that under-employment has increased for all groups, this has occurred over a period when unemployment rates have fallen to near or below pre-crisis levels in most countries (OECD, 2018<sup>[29]</sup>). This suggests that factors other than the business cycle may have contributed to the widespread growth of under-employment. This section examines the issue. To separate the impact of cyclical factors from more structural factors influencing under-employment at the country level, the analysis estimates the following model using a generalised linear model with a logit link to account for the fact that the dependent variable is a share:

$$Under_{c,t} = \alpha + \beta_1 Cycle_{c,t} + \beta_2 Cycle_{c,t}^2 + \mathbf{X}_{c,t}\boldsymbol{\lambda} + \varphi_c + \delta_t + \epsilon_{c,t}$$

41. Where suffixes  $c$ , and  $t$  refer to country and time (in years), respectively. The dependent variable,  $Under_{c,t}$ , is the share of workers who are under-employed.<sup>27</sup> Like the individual-level model, the business cycle,  $Cycle_{c,t}$ , is included in the model as a polynomial along with a constant term ( $\alpha$ ), and time and country effects ( $\delta_t$  and  $\varphi_c$ , respectively). Structural factors are included in the vector  $\mathbf{X}_{c,t}$  and the idiosyncratic error term is represented by  $\epsilon_{c,t}$ .

42. Taking previous literature and the results of the individual-level regression into consideration, the vector  $\mathbf{X}_{c,t}$  includes the share of women in employment as well as the share of workers in the two service sectors with the highest rates of under-employment (see Section 2.3). That is, the *Accommodation and food* and the *Arts and leisure* sectors (“Industry share: services”).<sup>28</sup> Controls for age, education, and occupational skill group are also presented as shares of dependent employment.<sup>29</sup> In addition, the stock of robots is included as a proxy for labour competing technologies. These technological advancements can lead to a reduction in the demand for some types of labour, particularly the low skilled (Gee Hee Hong et al., 2018<sup>[5]</sup>). The stock of robots is reported as the total stock of industrial robots in thousands.<sup>30</sup> Table 2.2 displays the estimates of the cross-country model as average marginal effects.

43. As expected, under-employment has a cyclical component, as indicated by the positive and highly significant marginal effect of the unemployment rate. In the most elaborated model (fifth column), a one percentage-point increase in the unemployment rate is associated with approximately 0.42 percentage point increase in the share of under-employed workers.<sup>31</sup> These findings are slightly smaller but broadly consistent with the individual regression model (Table 2.1), which estimated an effect of 0.50 percentage points. Beyond cyclical factors, increases in the share of female workers are positively and significantly associated with higher under-employment, in agreement with the individual-level analysis.

44. Notably, neither age group nor skill level was statistically significant in the cross-country model. This is likely the result of the shedding of low-skill jobs and less experienced workers in the aftermath of the crisis (OECD, 2013<sup>[30]</sup>). As these people left work, they decreased as a share of employment. At the same time under-employment increased. As a result, the cross-country model does not link increases in young or low-skill workers with increases in aggregate under-employment.

**Table 2.2. Country-level factors of under-employment**

Dependent variable: share of dependent workers indicating under-employment. Estimates presented as average marginal effects.

DV: Under-employment	(1)	(2)	(3)	(4)	(5)
Unemployment rate	0.37***	0.33***	0.37***	0.40***	0.43***
Unemployment rate <sup>2</sup> /10	-0.04	-0.03**	-0.07***	-0.08***	-0.09***
Industry share: services		0.61***	0.46***	0.42***	0.37***
Share of women			0.35***	0.30***	0.32***
Age share: Younger			-0.05	-0.10	-0.10
Occupation share: Low skill				0.05	0.06
Stock of robots ('000s)					0.01***
Country FEs	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES
Age group	NO	NO	YES	YES	YES
Education	NO	NO	YES	YES	YES
Occupational Skill	NO	NO	YES	YES	YES
N	476	476	476	476	476
Pearson Scaled Deviance	472	443	428	422	416

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% levels respectively.

*Note:* The model is a generalized linear model (GLM) using a logit link. The dependent variable is the share of dependent workers who identify as under-employed, wanting either more hours or a full-time position. Analysis computed using data from 2001 to 2017 at a country level where available. The analysis is weighted according to annual national employment totals. Standard errors are clustered at the country level. “Industry share: services” is the share of total employment located in either Accommodation and food sector or the Arts and leisure sector. Countries included in the analysis are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

## 2.6. Cyclical or structural

45. The cross-country model highlights the importance of the business cycle. However, the models support the notion that structural factors such as female participation and, notably, the share of service sector workers, also play a role. For services, this result is intuitive, as much service sector work consists of variable and demand-driven work schedules (OECD, 2001<sup>[1]</sup>). As services cannot be stored, firms need to maintain the flexibility to produce services when they are demanded, implying the need for more flexible working time arrangements on the part of the worker.

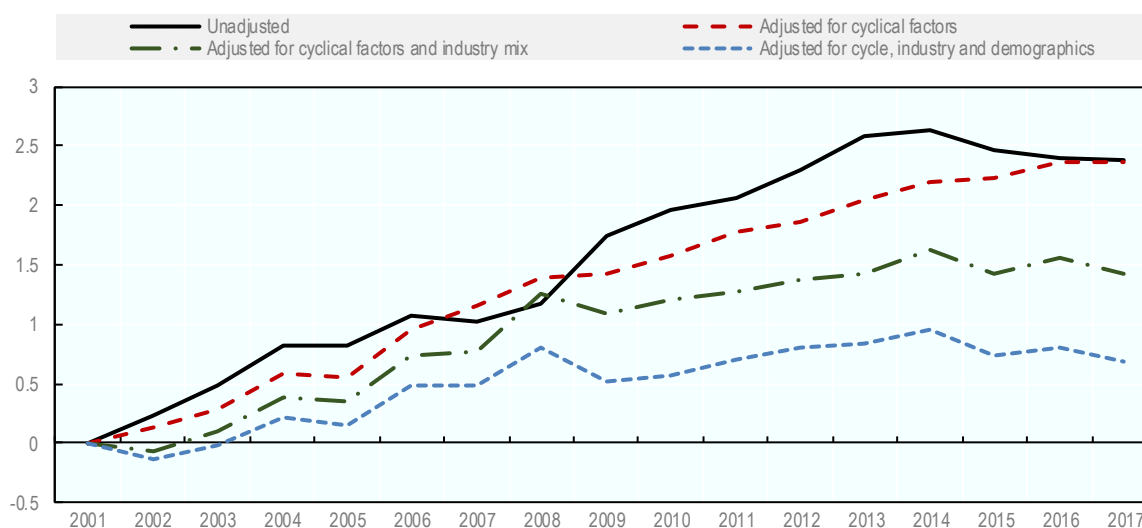
46. The importance of the industry mix is evident in an examination of the time trend of the cross-country model (Figure 2.6). The time trend captures the change in under-employment when holding other variables fixed. Without any holding any

variables fixed, the time trend is positive, and remains positive after adjusting for cyclical factors. Since the onset of the crisis, the inclusion of cyclical factors reduced the time trend on average by 13% since 2008.

47. After adjusting for the industry mix, the time trend flattens noticeably and the time trend is reduced a further 26% on average.<sup>32</sup> Additionally adjusting for shifting demographic distributions, including women's labour force participation and the share of older and younger workers, accounted for an average of 28% of the time trend. In all, the observable covariates included in the model accounted for 75% of the unadjusted time trend since 2008. It is only after adjusting for all of the variables that the time trend loses most of its upward trajectory. This suggests that the variables included in the cross-country model adequately describe the time variation in under-employment at the country level

**Figure 2.6. Both cyclical and structural factors have influenced under-employment**

Contribution of observable characteristics to changes in under-employment, relative to the baseline year, unweighted OECD average.



*Note:* Estimates are derived from a generalized linear model (GLM) using a logit link of the share of workers in under-employment. Table 1.1 presents estimates from these models. The *Unconditional* model contains country and year fixed effects. The model *Adjusted for cyclical factors* controls for changes in the unemployment rate and corresponds with column 1. The model *Adjusted for cyclical factors and industry mix* corresponds with column 2 and controls for the unemployment rate and the share of employment that is in either the “Accommodation and food” or “Art and leisure” sectors. The model *Adjusted cycle, industry and demographics* corresponds with column 3 and additionally controls for shifts in the age and gender distribution of workers.

*Source:* EU-LFS, United States CPS, Canada LFS, Japan JHPS/KHPS, German GSOEP, Australia HILDA.

48. Particularly notable in Figure 2.6, the gap between the unadjusted trend line and the line adjusting for industry mix has widened since the recession. This suggests that the importance of the expanding service sector in driving the increase in under-employment has grown in recent times. These results are in line with those obtained for the United States by Valletta et al. (2015<sup>[9]</sup>).

### 3. Under-employment and job quality

49. With an increasing number of workers finding themselves under-employed, the working conditions of these workers increases in importance. The OECD Jobs Strategy (OECD, 2018<sup>[31]</sup>) emphasised job quality as a part of a broader approach for governments to ensure inclusive growth. Job quality can refer to both non-wage- and wage-related working conditions, including aspects of labour market security and the quality of the working environment. Examining non-wage job quality can provide insight into differences between under-employed and well-employed workers.<sup>33</sup>

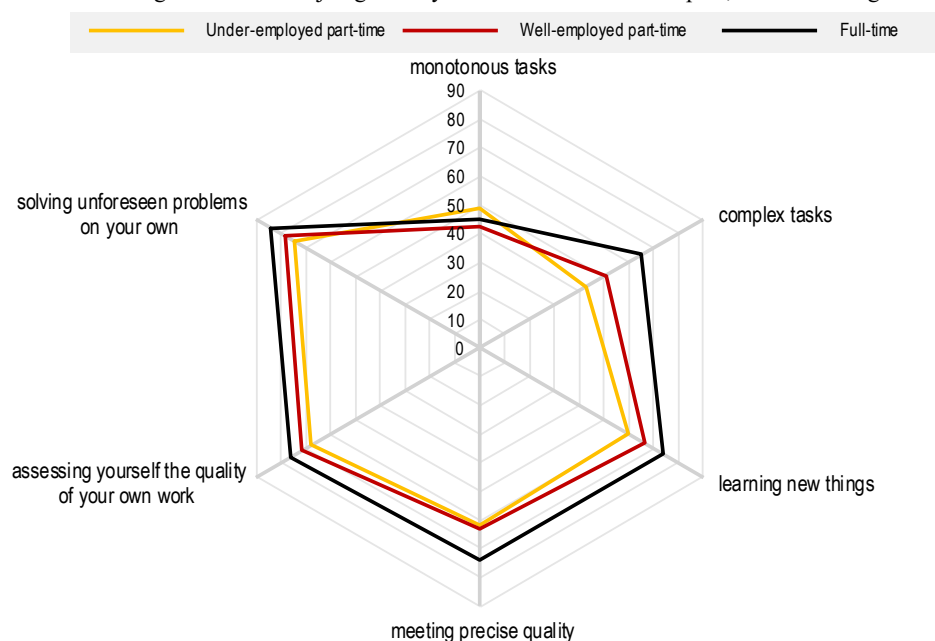
#### 3.1. Non-wage aspects of job quality

50. In general, the under-employed work in less desirable jobs than both full- and other part-time workers (Figure 3.1).<sup>34</sup> On average, across European OECD countries half (49%) of under-employed workers performed monotonous tasks. This is slightly more than both well-employed part-time workers (42.5%) and full-time workers (45%). However, the contrast is most stark when examining complex tasks. Over 65% of full-time workers perform complex tasks, while only 43% of the under-employed do. When coupled with a reduced likelihood of learning new things and other indicators of responsibility, the data suggests that under-employed workers are more likely to have lower quality jobs.<sup>35</sup>



**Figure 3.1. Under-employed workers perform less complex and more monotonous tasks**

Percent of workers indicating that their main job generally involves the indicated aspect, OECD unweighted average, 2015.



*Note:* The OECD unweighted average is the average of European OECD countries that participated in the EWCS. Part-time employment is usually working 30 hours or less per week. Well-employed part-time workers indicate that they do not desire more or less hours than they currently work.

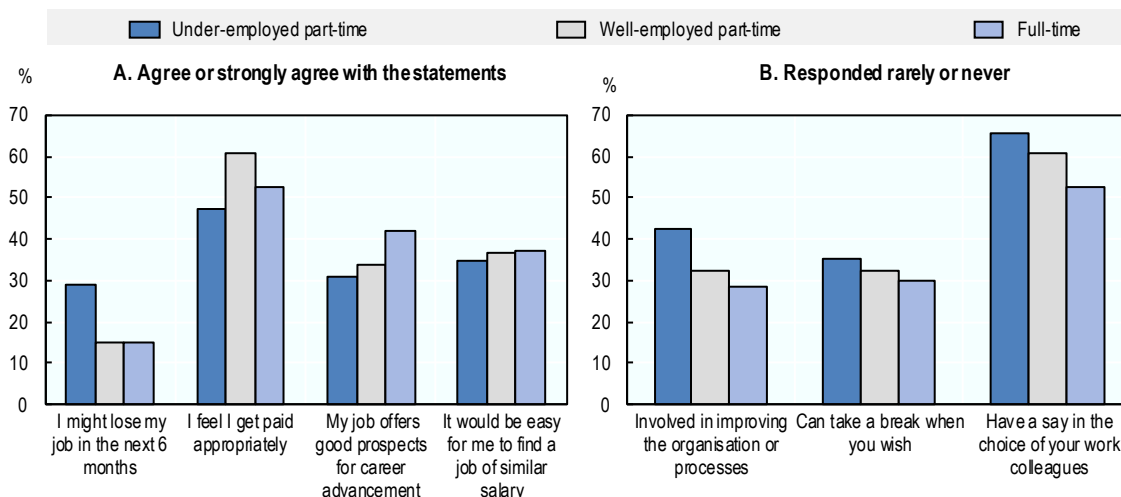
*Source:* European Working Conditions Survey (EWCS) (2015).

51. Beyond tasks, labour market insecurity for under-employed workers erodes job quality. Under-employed workers are almost twice as likely as other workers to fear losing their job in the coming months (Figure 3.2). Just under 29% of the under-employed indicated that they might lose their jobs in the next six months, while only just under 15% of other workers indicated the same. Correspondingly, and in agreement with previous research (Maynard, Joseph and Maynard, 2006<sup>[32]</sup>), the under-employed are less likely to feel appropriately paid (32.4% versus 41.3% for full-time workers), and less likely to feel that their jobs provide good prospects for career advancement (21.5% versus 32.0% respectively).

52. These data suggest that there is some evidence that the under-employed have lower non-wage aspects of job quality compared to their peers. They perform less complex, more monotonous tasks, while facing more uncertain job prospects. This may be one reason why the under-employed feel less attachment to their jobs (Figure A A.9). The under-employed are less likely to stay with their employer if they were offered a higher-paying job elsewhere (on average, 24.8% versus 35.9% of well-employed part-time), and were almost twice as likely as their well-employed part-time counterparts to search for a new job this year (an average of 41.7% versus 21.2%). In essence, if a better paying job were offered to a well-employed part-time worker, they say that they would be less likely to leave than an under-employed worker would. While this willingness to move to jobs that are more profitable is positive, it does imply that under-employed workers are not fully motivated to work for their current employer, possibly hurting their productivity.

**Figure 3.2. Under-employed workers feel less certain in their jobs and are more likely to be in jobs that offer little say**

Distribution of responses to statements about workers jobs, OECD unweighted average, 2015.



*Note:* The OECD unweighted average is the average of European OECD countries. Part-time employment is usually working 30 hours or less per week. Well-employed part-time workers indicate that they do not desire more of less hours than they currently work. **Panel A:** Respondents either “Tend either to agree “or” Strongly agree” to each statement. **Panel B:** Respondents either “Rarely “or” Never” to each statement.  
*Source:* European Working Conditions Survey (EWCS) (2015).

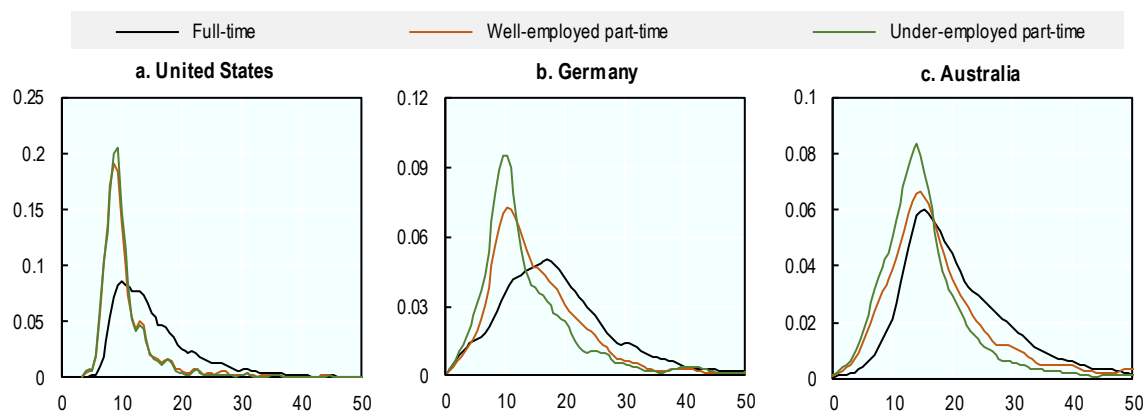
### 3.2. Wage-based aspects of job quality

53. Beyond non-wage differences, under-employed workers, in general, have lower wages than their peers. Figure 3.3 presents wage data for three countries: Australia, Germany, and the United States. Wages have been adjusted for purchasing power parity, but not for other characteristics associated with lower wages. The three countries are selected both for the variety of their labour markets and the accessibility of their wage data. In each country, under-employed workers had the lowest average hourly wages. On average, they had lower wages than well-employed part-time workers, who in turn had lower wages than full-time workers. In Australia and Germany, two countries with higher levels of under-employment, the under-employed had wages 10.6% and 13.8% respectively, lower than other part-time workers. For the United States, the differences are more subtle. In the United States, in 2016, the wage penalty was 6.8% amounting to a lower wage of about 80 cents per hour.<sup>36</sup>

54. Based on the descriptive evidence presented here, the direction of the relationship between under-employment and wages is not clear. While low wages likely causes workers to feel under-employed, it is also possible that under-employed workers lack the bargaining power to demand higher wages. The current analysis is not well equipped to determine the direction of this effect. The following distributional analysis is conducted under the assumption that under-employment leads to decreased bargaining power. However, this does not exclude the former assumption that low wages engender feelings of under-employment.

**Figure 3.3. The under-employed are concentrated at the bottom of the wage distribution**

Density of hourly wages in 2012 USD, 2016 or most recent year available.



*Note:* Data for the United States corresponds to 2017. Wages above 50 USD are not shown. Wages are adjusted for purchasing power parity and the GDP deflator for consumption.

*Source:* United States CPS, German GSOEP, Australia HILDA.

55. Using a regression model, this section examines whether these differences hold after controlling for various factors. In particular, the report uses a set of models that link wage effects and under-employment across the income distribution. These models, named unconditional quantile regressions or re-centred influence function (RIF) regressions, were developed by Firpo, Fortin and Lemieux (2009<sup>[33]</sup>) (see Box 3.1) and they represent an innovation beyond ordinary least squares (OLS) regressions. They allow researchers to investigate the impact of covariates on statistics other than the mean. Their application here is a novel innovation as previous research had focused on the effect of under-employment on average wages (Bell and Blanchflower, 2018<sup>[11]</sup>). In the current case, the statistics of interest are deciles. Each of the three countries included in the analysis were modelled separately. The regressions cover the period from 2001 to the latest year available. For the United States, this is 2017. For Australia and Germany, this is 2016.

56. The regressions estimate that the direct impact of being personally under-employed on wages is significant and negative (Figure 3.4). While the wage penalty is everywhere negative, in general, the workers with the lowest hourly wages suffer the most financially from their under-employment. In Australia and Germany, two countries with high levels of under-employment, under-employment shifts the lowest wage decile down by 10.4% and 18.5% respectively. This downward pressure on wages fades as earnings approach median wages. Above the median, the effect of under-employment is negative but relatively small. At the ninth decile, under-employment shifts the wages down by only 1.8% in Australia and 2.4% in Germany.

57. In contrast, in the United States the negative impact of being under-employed is notable throughout the wage distribution. This effect is primarily concentrated on those workers with wages near the second and third deciles. These workers are on low wages, but are not the lowest earners in the labour market. For example, under-employed workers in the 20th percentile of wages in the United States can expect almost 39% lower wages after controlling for other factors. Notably, the United States exhibited more subtle

differences in wage levels between worker types than either Australia or Germany (see Figure 3.3).

### Box 3.1. Influence functions and RIF Regressions

The influence function of a statistic represents the influence that a single observation has on the value of the statistic. For quantiles, the influence function is:

$$IF(Y; q_\tau, F_Y) = \frac{\tau - \mathbb{I}\{Y \leq q_\tau\}}{f_Y(q_\tau)}$$

where  $Y$  is the income level,  $q_\tau$  is the  $\tau$ th quantile of the distribution, and  $f_Y(q_\tau)$  is the probability density of the income distribution,  $F_Y$ , at  $q_\tau$ . The re-centred influence function is thus:

$$RIF(Y; q_\tau, F_Y) = q_\tau + \frac{\tau - \mathbb{I}\{Y \leq q_\tau\}}{f_Y(q_\tau)}$$

The RIF represents a new dependent variable, indicating the impact that changes to an observation has on a given quantile. By running an OLS regression on the RIF variable it is possible to estimate the effect of the covariates on the wage distribution. Other studies have used this approach to examine the impact of union membership (Firpo, Fortin and Lemieux, 2009<sup>[33]</sup>), performance pay (Lemieux, MacLeod and Parent, 2007<sup>[34]</sup>), imperfect competition (Webber, 2015<sup>[35]</sup>), the white-black wage gap (Heywood and Parent, 2012<sup>[36]</sup>), and the wage penalty associated with motherhood (Killewald and Bearak, 2014<sup>[37]</sup>). Similar to these studies, a series of regression models are estimated, one for each quantile of interest. Explicitly, for a given income distribution, the model of logged wages,  $\ln(Y)$ , can be written as:

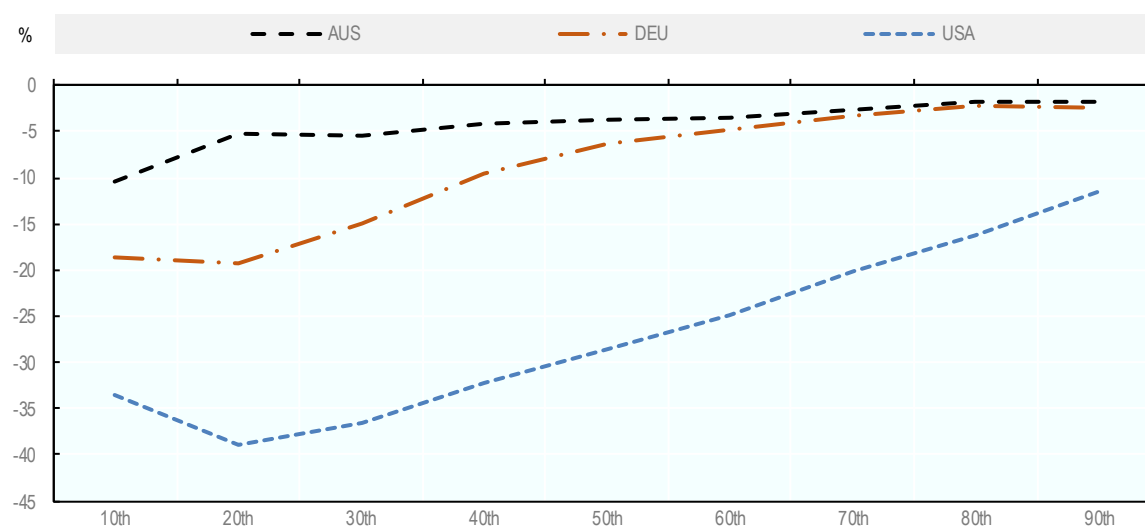
$$RIF(\ln(Y_i); q_\tau) = \alpha + \mathbf{X}_i\boldsymbol{\beta} + \boldsymbol{\delta}_c\boldsymbol{\theta} + T_t\lambda + \epsilon_i$$

In the specification of the current model, the right-hand side of the regression includes a constant and a vector of individual indicators,  $\mathbf{X}_i$ , representing gender, age group, educational status, union status, student status, part-time status, job skill, industry, and under-employment status. A further set of variables,  $\boldsymbol{\delta}_c$ , vary by geographic region and includes the local unemployment rate, a modified measure of the under-employment rate<sup>37</sup>, and a regional indicator. An additional time-varying year indicator,  $T_t$ , and idiosyncratic error term,  $\epsilon_i$ , complete the model.

This model explores how, after controlling for other factors, changes in under-employment affect wages at different points on the income distribution.<sup>38</sup> Using RIF regressions to examine wages expands on a similar approach outlined by Blanchflower and Bell (2018<sup>[11]</sup>) to examine wage evolution and its variations with aggregate unemployment and under-employment.

**Figure 3.4. Under-employment is a drag on wages, particularly low-income workers**

Hourly wage penalty associated with being individually under-employed, at various income percentiles.



*Note:* Estimates obtained from a series of re-centred influence function (RIF) regression models conducted at the sub-national level (as appropriate for each country). The models regressed the natural log of the hourly wage at the indicated percentile on controls for the share of both under-employed and unemployed workers, age, quadratic age, under-employment status. The models contain controls for geographic region, education, union membership, gender, status as a student, part-time status, occupational skill, and industry. Most hourly wages were inferred from, weekly, monthly, or annual wages on the basis of usual hours worked. The regressions cover the period from 2001 to the latest year available. For the United States, this is 2017. For Australia and Germany, this is 2016.

*Source:* OECD calculations based on United States CPS, German GSOEP, Australia HILDA.

58. These estimates suggest that under-employment can be more detrimental for low wage earners, who are often the workers with the least bargaining power and the fewest alternative employment options. These lower income workers are comparatively less skilled, and therefore lack some of the competitiveness of their higher wage peers. As increasingly more workers identify as lacking work hours, this can serve to drag down aggregate wages via a *compositional effect* (OECD, 2018<sup>[38]</sup>). Further, it is in those countries where under-employment is relatively less common (that is, the United States) where there is a more pronounced effect of being under-employed.

59. In Australia and Germany, under-employment is more common and there is a clear difference in the wages of the under-employed. Yet, after controlling for other factors, the effect on wages is less pronounced. This implies that well-employed and under-employed workers in these countries differ in observable ways. Compared to the United States, under-employment in Australia and Germany is more highly concentrated among low-skilled young workers. This possibly explains a greater share of the lower wages for those who are under-employed.

### 3.3. Are there spill-over wage effects for those who are not under-employed?

60. While under-employed workers themselves have lower wages on average, search theory suggests that there could be an indirect effect on all workers' wages. Under-employed workers are unsatisfied with their jobs, and likely continue to search for another job. These additional job searchers increase the number of applications for any

vacancy, and send a signal to firms about labour supply. A larger number of potential candidates allow firms to offer lower wages to fill vacant positions. With this reasoning, more under-employed workers could help keep wages low. This section explores the potential of such a *search effect*. The evidence presented below shows that, while there is some evidence of a negative *search effect* on wages, the estimates are small and generally not statistically significant, with the exception of the United States.

61. A key issue in conducting the analysis is that it is difficult to disentangle an unemployment *search effect* from one stemming from under-employment. As both unemployed workers and under-employed workers are searching for jobs, increases in either should dampen wages. As these measures generally move in tandem, it can be difficult to disentangle the effect of additional under-employed workers from the effect of unemployed workers who are searching for a job. Other researchers have attempted to examine the effect of these two factors on wages. Blanchflower and Bell (2018<sup>[11]</sup>) found evidence that under-employment has dominated unemployment as a factor in wage growth in the United Kingdom and the United States since the onset of the crisis. However, the multicollinearity between unemployment and under-employment makes it difficult to provide unbiased estimates (see Figure A A.10). To account for multicollinearity, the wage analysis presented here makes use of a sequential regression procedure popular in ecological studies (Dormann et al., 2013<sup>[39]</sup>). As the multicollinearity is generally restricted to a pair of variables, (under-employment and unemployment) it is possible to assume that the more important variable has priority when determining the information shared by the collinear variables (Graham, 1997<sup>[40]</sup>; Graham, 2003<sup>[41]</sup>). In the current case, unemployment is given priority, and thus under-employment is regressed against the unemployment rate and the residuals from that regression are used as an adjusted measure in the regression coefficient estimates presented in Figure 3.5. This way, the *adjusted* under-employment rate variable that only includes information not contained in the unemployment rate.

62. After addressing multicollinearity, the model obtains a familiar result that the local unemployment rate has a small but persistently negative effect on wage growth across all incomes (Figure 3.5). This effect is slightly more pronounced at lower wage levels, although it is a subtle distinction. Notably, the United States and Germany both have stable effects that are statistically significant throughout the income distribution. Although consistently negative, the estimates for Australia are only significant for six of the percentiles examined.<sup>39</sup>

63. The consideration of the aggregate level of under-employment provides little additional information on wages. While the estimated coefficients in Panel B of Figure 3.5 are generally negative or close to zero, only a few are statistically significant. The coefficients are negative and significant for all but the ninth decile for the United States; estimates are significant for Australia only up to the median. For Germany, the estimates for the lowest two deciles are significant, but positive. Focusing on the United States, an increase in the under-employment rate over-and-above the unemployment rate is associated with 1.2% lower wages for those workers in the second and third decile of earners, regardless of their own individual under-employment status. While significant, the effect is smaller than the individual effect of under-employment.

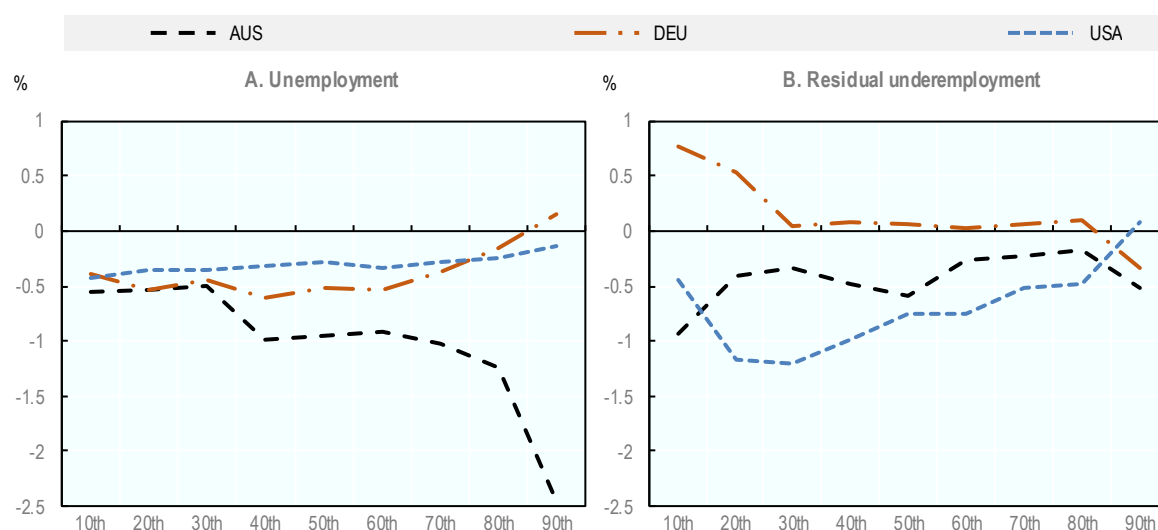
64. The 2018 OECD Employment Outlook (2018<sup>[8]</sup>) outlined two mechanisms by which under-employment could affect wages. The first, the *heterogeneity effect*, concerned differential wage growth between the under-employed and the well-employed. The second, the standard *compositional effect*, would occur if the specific wages of the

under-employed were lower than other workers, and a higher share of under-employed workers would lower wages. These two effects are separate from the *search effect* of an increasing number of job searchers putting pressure on wages.<sup>40</sup>

65. The models presented above for three countries find support for the *heterogeneity* and *compositional* effects, while only finding limited support for a *search effect*. In particular support for the *heterogeneity effect*, the models find a strong downward pressure on wages for the under-employed, an effect that is stronger for lower income workers. This points to the risk of lower income workers becoming trapped, where their desire for more hours sees them lack the bargaining power to demand higher wages (Altonji and Paxson, 1988<sup>[42]</sup>; Chetty et al., 2011<sup>[43]</sup>; Hahn, Hyatt and Janicki, 2018<sup>[44]</sup>). Policy makers should act to ensure that under-employment, and by extension low pay, does not become a lengthy sentence.

**Figure 3.5. Beyond unemployment, under-employment may dampen aggregate wages**

Hourly wage penalty associated with local unemployment and under-employment, by income percentiles.



*Note:* Estimates obtained from a series of re-centred influence function (RIF) regression models conducted at the sub-national level (as appropriate for each country). The models regressed the natural log of the hourly wage at the indicated percentile on controls for the share of both under-employed and unemployed workers, age, quadratic age, under-employment status. The models contain controls for geographic region, education, union membership, gender, status as a student, part-time status, occupational skill, and industry. Hourly wages were inferred from, weekly, monthly, or annual wages on the basis of usual hours worked. The regressions cover the period from 2001 to the latest year available. For the United States, this is 2017. For Australia and Germany, this is 2016. **Panel A:** Presents the impact of the sub-national unemployment rate. **Panel B:** Presents the residual impact of the sub-national under-employment rate.

*Source:* OECD calculations based on United States CPS, German GSOEP, Australia HILDA.



## 4. Conclusion and policy implications

66. In many countries, unemployment is at its lowest level since the financial crisis, but under-employment has been slow to decline. This is especially true in the countries hit hardest by the crisis, such as Italy, Spain, Ireland, Greece, Denmark and Portugal. The models presented in this paper suggest that, along with cyclical effects, structural changes have had a part to play. Demographic shifts in the labour force in the form of ageing and a shifting gender composition have also had a notable effect. However, these structural and demographic effects are in general slow moving, and can take decades to vary to the point of having a meaningful impact.

67. The shift of employment to service sectors has an increased workers' probability of being under-employed. The particular nature of the service sector lends itself more easily to variable hours and flexible working time arrangements, and this is borne out in increased under-employment risk. As work increasingly shifts away from goods producing sectors and into services sectors, the issue of under-employment may increasingly become a challenge.

68. Alleviating under-employment is important both because of the lower quality of those jobs, but also because being under-employed is associated with lower wage growth. This effect is more directly associated with those individuals actually seeking more hours, but there is some limited evidence that a higher number of under-employed job searchers may dampen wage growth for all workers. Of the three countries examined, this is most evident in the United States, though admittedly small in magnitude. The direct effect (that is, the effect of personally being under-employed) of under-employment on wages is much larger, and falls predominantly on low-income earners. This means that the burden of under-employment falls mostly on those least productive workers who are the least prepared to remedy the situation.

69. The fact that these predominantly lower-skilled workers cannot find more hours suggests that their cost may be greater than the value that they provide to a firm. All else equal, firms that face high labour costs are likely to demand less labour (Lichter, Peichl and Siegloch, 2014<sup>[45]</sup>). High non-wage labour costs encourage firms to invest in labour-substituting capital, which risks pricing low-skill workers out of the market, especially for those who lack the skills to complement the new technology (Autor, 2015<sup>[46]</sup>). Understanding these challenges faced by low-skilled workers suggests some policy actions that could alleviate under-employment.<sup>41</sup>

70. Policy makers can reduce non-wage labour costs, making labour less expensive, especially for low earners. Non-wage labour costs include social security contributions and labour taxes. As labour taxes are progressive and generally make up a large portion of an economy's tax base, governments can reduce obligatory social security contributions to reduce labour costs. There is a catch, however, that these contributions are usually linked to a benefit. To compensate any reduction in benefits, policy makers can increase the progressivity of income taxes, particularly when there is a weak link between an individual's contributions and their benefit entitlements (for example, with



risk-based benefits, such as health care and family allowances). This would draw labour costs away from low earners who already suffer due to a lack of competitiveness.

71. In addition, governments should continue to invest in education and skills training. While changing the labour costs faced by firms can have a direct effect on under-employment, investments in skills and education can help to prevent the problem in the first place. By encouraging training systems and instilling workers with a commitment to lifelong learning, policy makers can help ensure that workers have strong basic skills and the required socio-emotional skills to succeed. Stronger ties between industry and educational systems can help to accomplish this. Vocational apprenticeships and other forms of work-based learning can reinforce link between skills learned and skills required. With a close link between firms and education, workers in a given region receive training according to the needs of those firms in the same region. This can help to reduce skills mismatches in local labour markets.

72. Finally, collective bargaining and social dialogue can help to improve the quality of jobs by improving the bargaining power of workers. These collective processes contribute to both wage and non-wage working conditions and can especially help those workers who have weak bargaining positions. Governments can promote the inclusiveness of collective bargaining by extending the coverage of collective bargaining agreements to cover all workers in a sector, including the under-employed.

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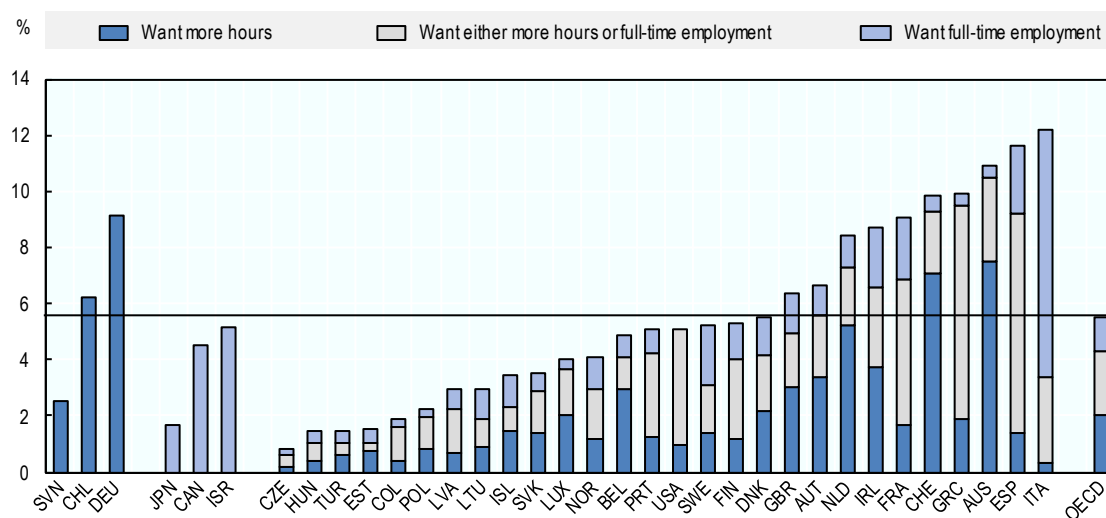
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## Annex A. Additional content: Incidence of under-employment

**Figure A A.1. Finding more work hours is difficult for many workers.**

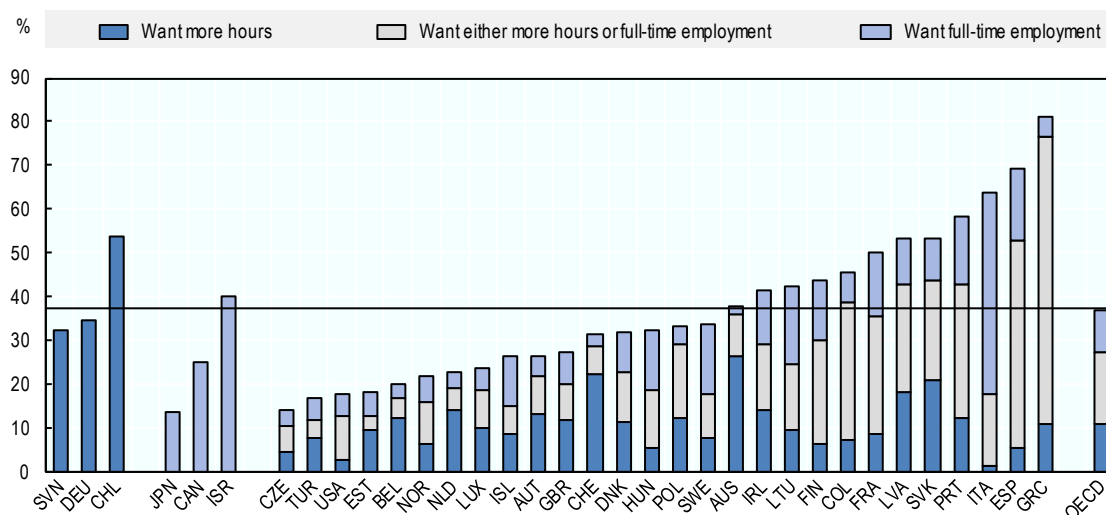
Share of dependent employment indicating some form of time-based under-employment, 2017 or latest year<sup>a</sup>.



*Note:* OECD is the unweighted average of the countries depicted, excluding Colombia. Under-employed workers work part-time (30 hours or less per week) and could not find a full-time job or would like to work more hours.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

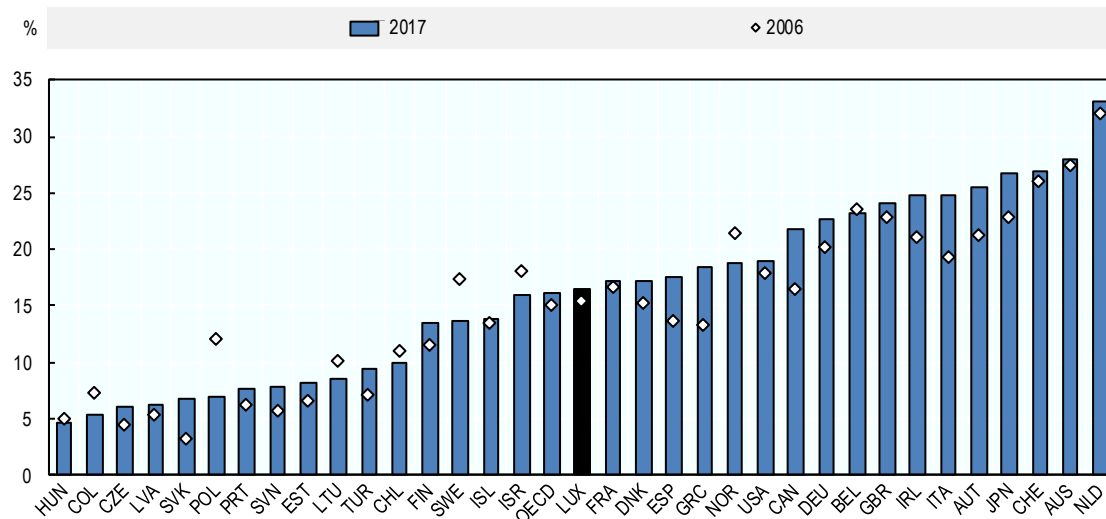
*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

**Figure A A.2. On average, more than a third of part-time workers are under-employed**Share of part-time workers indicating some form of time-based under-employment, 2017 or latest year<sup>a</sup>.

Note: OECD is the unweighted average of the countries depicted. Under-employed workers work part-time (30 hours or less per week) and could not find a full-time job or would like to work more hours.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

Source: EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

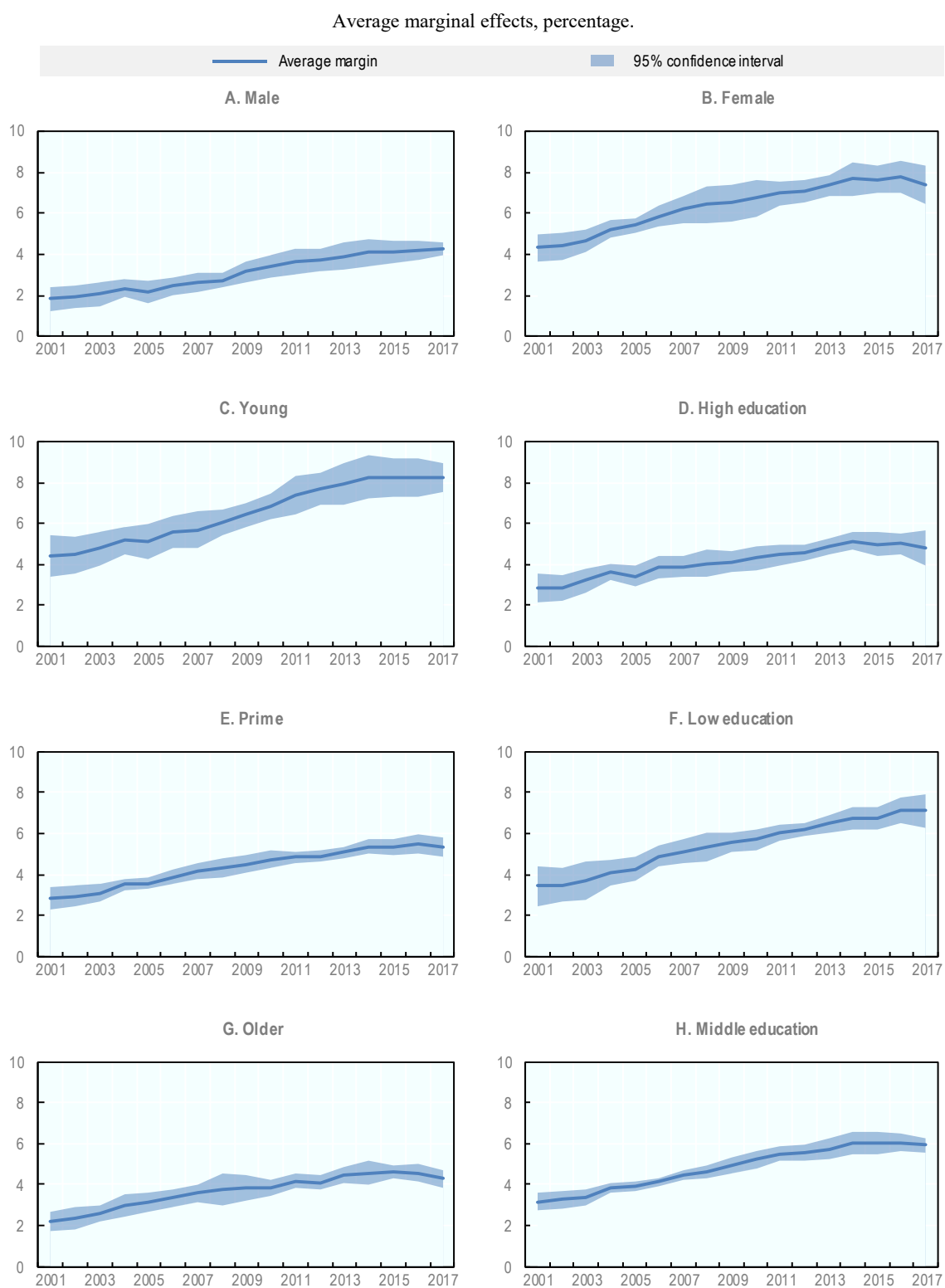
**Figure A A.3. On average, the share of part-time employment has increased**Share of dependent workers who hold part-time positions, 2006 and 2017 or latest available<sup>a</sup>.

Note: OECD is the unweighted average of the countries depicted. Under-employed workers work part-time (30 hours or less per week) and could not find a full-time job or would like more hours.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

Source: EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.



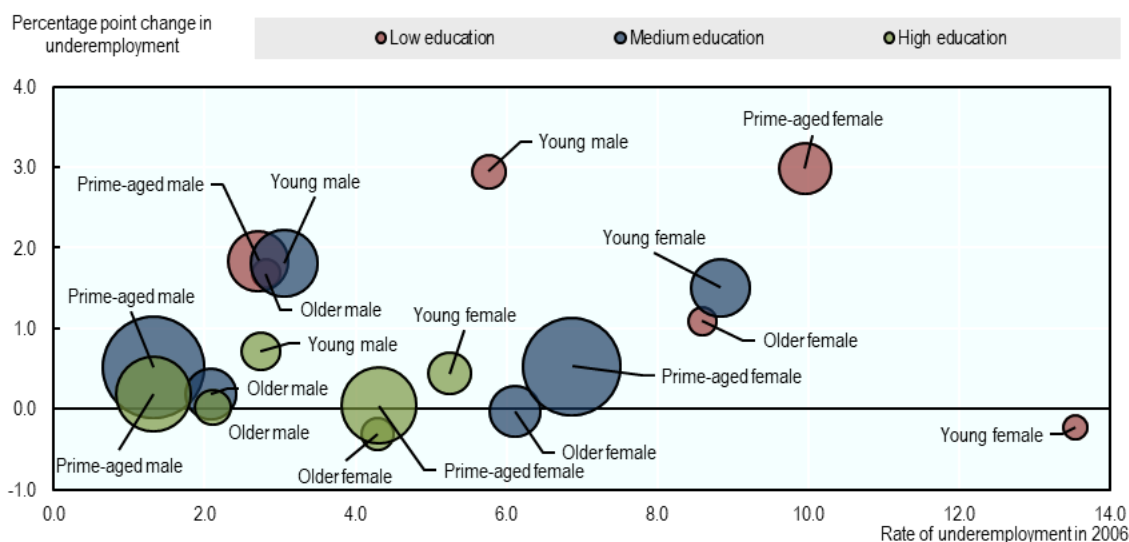
**Figure A A.4. Evolution of under-employment for different groups**

*Note:* Shaded area represents 95% confidence bounds.

*Source:* OECD calculations.

**Figure A A.5. Countries that have recovered from the crisis still have increased under-employment among certain groups**

Share of dependent workers indicating under-employment, by demographics, unweighted OECD average excluding crisis hit countries for 2006 and 2017<sup>a</sup>.



*Note:* Add the note here. If you do not need a note, please delete this line.

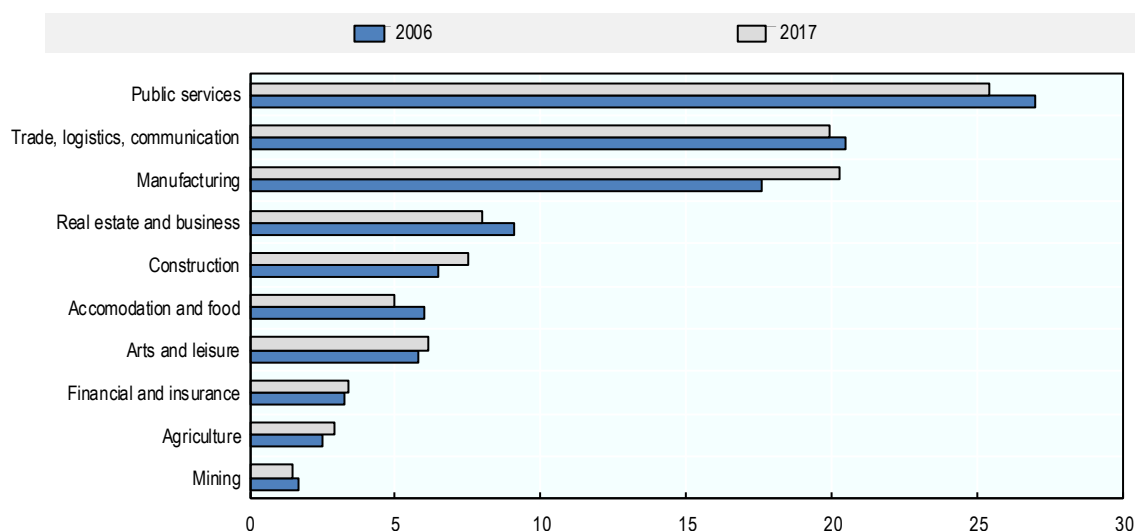
*Source:* Add the source here. If you do not need a source, please delete this line.

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.

*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

**Figure A A.6. Manufacturing has declined since the crisis in favour of services**

Percentage share of dependent workers by sector, OECD average, 2006 and 2017 or latest year<sup>a</sup>.

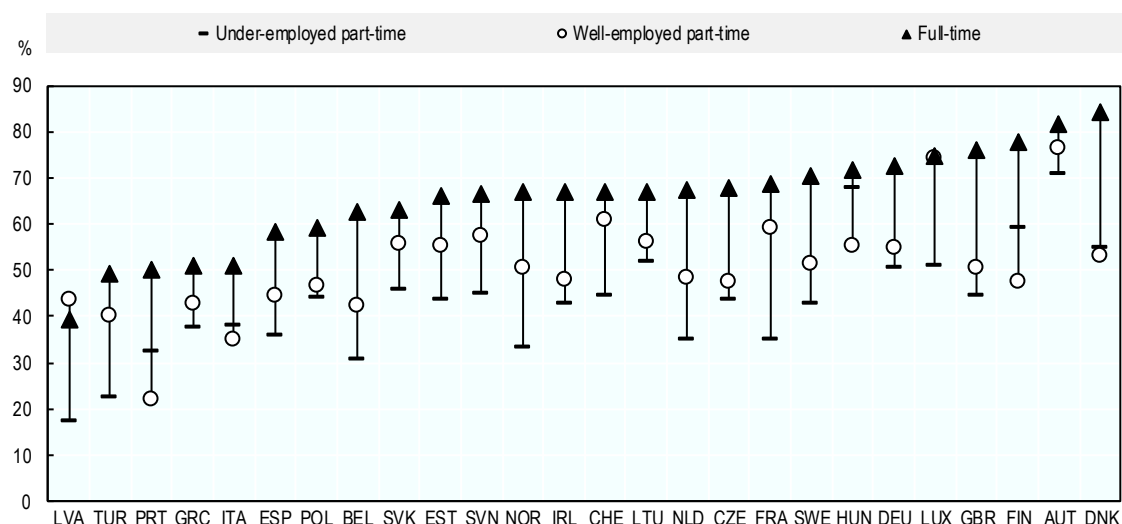


*Note:* The OECD average is an unweighted average. Industries are grouped according to a modified NACE Rev.2 A10 classification structure. Industries are grouped according to a modified NACE Rev.2 A10 classification structure. The correspondence is as follows: *Agriculture* (A); *Trade, Logistics, Communications* (G, H, and J); *Public Services* (O, P, and Q); and *Arts and leisure* (R, S, T, and U).

a) Data for Australia, Germany, and Japan are from 2016. Data for Chile and Turkey are from 2015, while Israel data is from 2011. Colombia data for 2006 is from 2007, while Chile uses data from 2009.  
*Source:* EU-LFS, United States CPS, Canada LFS, Turkey LFS, Japan JHPS/KHPS, German GSOEP, Colombia GEIH, Chile CASEN, Israel LFS, Australia HILDA.

**Figure A A.7. Across Europe, the under-employed engage in fewer complex tasks**

Share of workers indicating that their main job generally involves complex tasks, 2015.

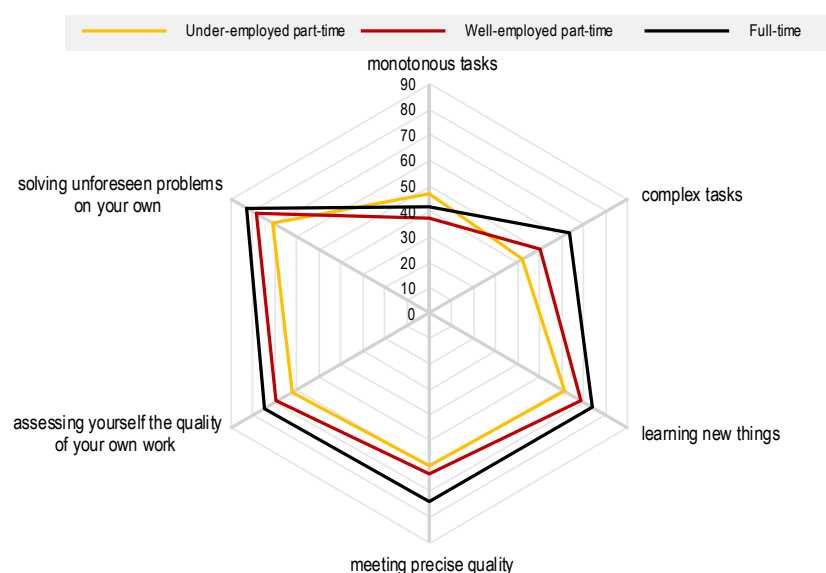


*Note:* Part-time employment is usually working 30 hours or less per week. Well-employed workers indicate that they do not desire more or less hours than they currently work.

*Source:* European Working Conditions Survey (2015).

**Figure A A.8. Under-employed workers in Europe performed less complex tasks in 2005**

Share indicating that their main job involves the indicated aspect, OECD unweighted average, 2005.

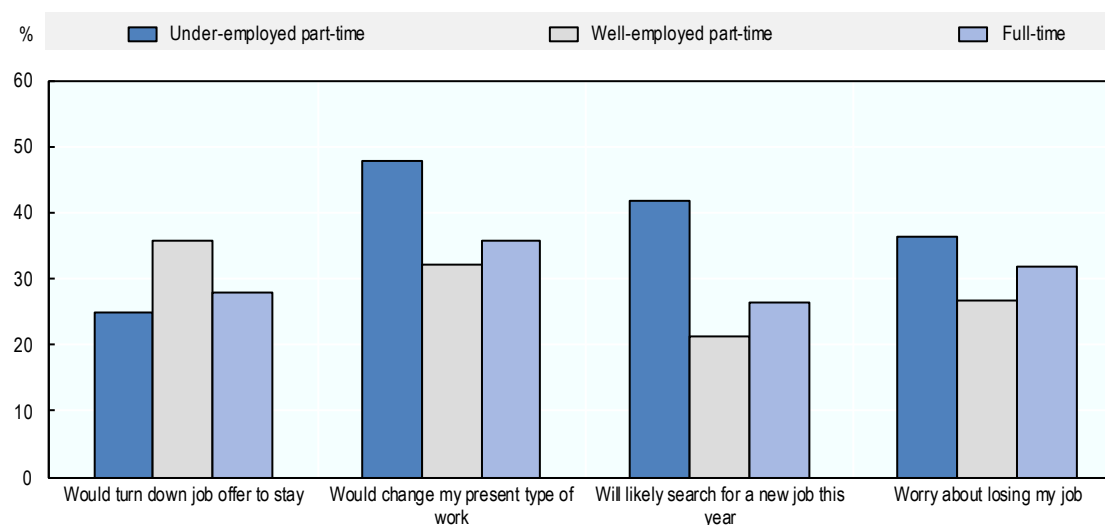


*Note:* The OECD unweighted average is the average of European OECD countries. Part-time employment is usually working 30 hours or less per week. Well-employed workers indicate that they do not desire more or less hours than they currently work.

*Source:* European Working Conditions Survey (2005).

**Figure A A.9. Under-employed workers have relatively less attachment to their current jobs**

Share of respondents who agree or strongly agree with the statements, OECD unweighted average, 2015.

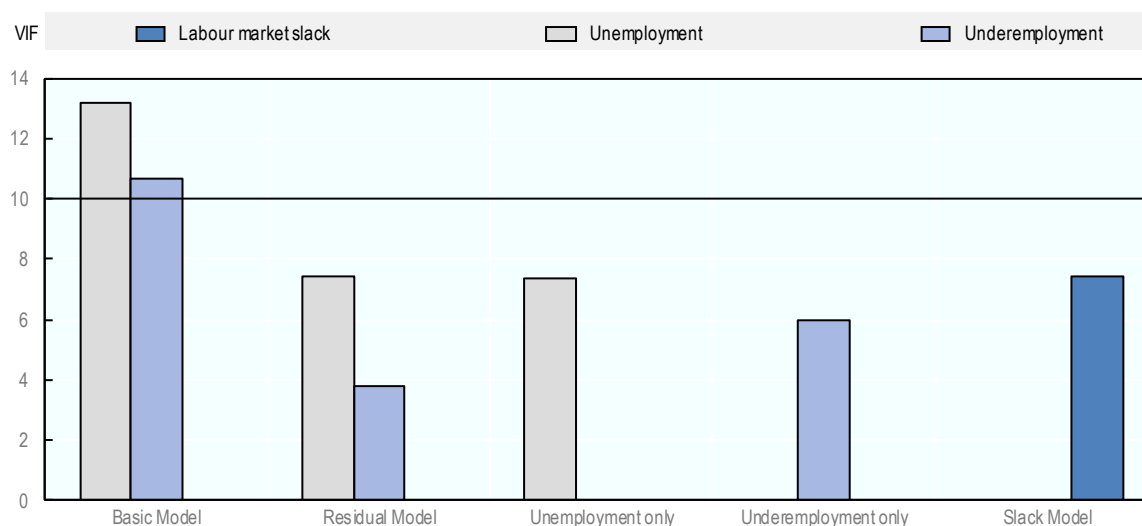


*Note:* The OECD unweighted average is the average of select OECD countries. Part-time employment is usually working 30 hours or less per week. Well-employed part-time workers are part-time workers who indicate that they do not desire more hours than they currently work. Respondents provided levels of agreement to the following four statements: 1) "I would turn down another job that offered quite a bit more pay in order to stay with this organisation.", 2) "Given the chance, I would change my present type of work for something different.", 3) "All in all, how likely is it that you will try to find a job with another firm or organisation within the next 12 months", 4) "To what extent, if at all, do you worry about the possibility of losing your job". The figure depicts the share of respondents who responded Agree / Strongly Agree, Likely / Very Likely, or Worry a great deal / Worry to some extent, as appropriate.

*Source:* International Social Survey Program (ISSP) Work Orientations Survey (2005).

**Figure A A.10. Multicollinearity hampers the decomposition of labour market slack**

Variance inflation factors for various models of under- and unemployment, United States.



*Note:* The variance inflation factor (VIF) provides an indication of the multicollinearity of each variable in conjunction with the other variables within a model. Generally, values above 10 are considered excessive. Each set of bars represents a regression model at the individual level including various variables to represent labour market slack. Each model include controls for age, gender, education, industry, occupational skill, state, union membership, previous wages, part-time status, student status, the effective state-wide minimum wage and an indicator of individual under-employment. The Basic Model also includes variables for the state-wide unemployment and under-employment rates. The Residual Model includes the state-wide unemployment rate the residual measure of under-employment. The Unemployment only model only includes state-wide unemployment, while the Under-employment only model only includes the state-wide under-employment rate. The Slack Model includes an hours-based indicator of slack derived by combining the deficit hours of under-employed workers with an hours-based measure of unemployment. While the Slack Model also addresses the multicollinearity, it does not allow for a de-coupling of un- and under-employment.

*Source:* OECD calculations.

## Notes

<sup>1</sup> Figure A A.1 presents a decomposition of under-employment by type. While similar, there is not a complete overlap between the two main concepts of under-employment. This lends weight to the argument that these groups deserve to be considered separately. This report leaves that in-depth consideration for future work. For the rest of the analysis treats these groups as one undifferentiated group of under-employed workers. The results of the each set of analysis are broadly robust to this decision, agreeing in both direction and level of magnitude with analysis conducted on either component of under-employment in isolation.

<sup>2</sup> These three countries also have some of the highest rates of part-time workers (Figure A A.3).

<sup>3</sup> These four countries had on average 7.1 percent of their dependent workers on part-time contracts in 2017.

<sup>4</sup> The operational definition of under-employment used in this report restricts the incidence to part-time workers.

<sup>5</sup> In all, under-employment increased in 24 of the 34 countries examined. The ten countries where under-employment did not increase were Belgium, Colombia, the Czech Republic, Estonia, Hungary, Israel, Lithuania, Norway, Poland, and Sweden.

<sup>6</sup> For context, over the same period the incidence of part-time employment has increased 1.4 percentage points on average across the OECD and 4.1 percentage points in the six crisis hit countries (see Figure A A.3). Of the remaining countries, part-time work increased on average 0.8 percentage points. While not a direct one-to-one relationship, clearly increases in part-time work are associated with more workers being under-employed.

<sup>7</sup> Worker age is divided into three broad categories. Young workers are those aged 15 to 29. Prime-aged workers are those ages 30 to 54. Older workers are those aged 55 to 69. This distinction is consistent throughout the report.

<sup>8</sup> Educational groups are categorised according to the International Standard Classification of Education (ISCED) 2011 classification. Low education includes ISCED 2011 levels 0 to 2 (lower secondary education and below). Medium education contains ISCED 2011 levels 3 and 4 (upper secondary and post-secondary non-tertiary). High education includes ISCED 2011 levels 5 to 8 (short-cycle tertiary, bachelor, master, doctoral or equivalent).

<sup>9</sup> Occupational skill levels are categorised according to the International Standard Classification of Occupations (ISCO) 1-digit groups. High-skill occupations include jobs classified under the ISCO-88 major groups 1, 2, 3. Middle-skill occupations include jobs classified under the ISCO-88 major groups 4, 6, 7, and 8. Low-skill occupations include jobs classified under the ISCO-88 major groups 5 and 9. For those countries that do not follow the ISCO classification system, a broad mapping between the national classification system and ISCO was applied.

<sup>10</sup> Researchers often determine worker skills either based on the education that they have obtained, or based on the skill requirements of the jobs that they work. These two measures do not always agree, which forms the basis of research into skills mismatch (see, for example, Pellizzari and Fichen (2013<sup>[48]</sup>), and Montt (2015<sup>[49]</sup>)). However, when examining under-employment, there is a broad agreement between these two measures.

<sup>11</sup> One notable outlier from this conclusion is Slovakia. Figure 1.2, Panel C, shows that over 30 percent of workers with less than an upper secondary education are under-employed, while the distribution of under-employment by occupational skills broadly aligns with the OECD average. This disagreement is a consequence of the small number of workers in Slovakia with a low education. After the Czech Republic and Lithuania, Slovakia has the smallest share of working age individuals without an upper secondary education (OECD, 2018<sup>[13]</sup>). As a result, most low-skill

jobs are filled by those with medium levels of education. While almost all low-skill and low-education workers in Slovakia are under-employed, many low-skill workers with a medium education are not.

<sup>12</sup> The results are consistent when querying the data using occupational skill groups as an alternative measure of skill.

<sup>13</sup> Excluding the four crisis hit countries does not drastically affect the conclusions (see Figure A A.5).

<sup>14</sup> The distribution of under-employment is broadly common across countries. Turkey and Luxembourg are notable exceptions. A higher than average share of Turkish *Agriculture, forestry and fishing* sector workers are under-employed, while Luxembourg has a large share of its under-employment in the *Financial and insurance activities* sector.

<sup>15</sup> The *Arts and leisure* sector includes such sectors as the creative arts and entertainment, and sports, as well as other personal services

<sup>16</sup> Changing levels of employment by sector can be observed in Figure A A.6.

<sup>17</sup> In order to provide a perspective that includes all workers, this model includes the self-employed. Thus, the estimated likelihood of under-employment is presented as a share of total employment.

<sup>18</sup> The dependent variable in Table 1.1 is the share of workers exhibiting either involuntary part-time or hours-based under-employment. Regression results examining involuntary part-time and hours-based under-employment separately produce similar results.

<sup>19</sup> Using the unemployment rate as a measure of the business cycle results in an estimate that is the lower bound of its effect on under-employment. This is due to attenuation bias, resulting from the imperfect correlation between the business cycle and the unemployment rate.

<sup>20</sup> A prime example is that of a restaurant, which has separate lunch and dinner rushes. Part-time work is an effective means of managing this irregular demand, but can lead to under-employment for some workers.

<sup>21</sup> Models that exclude firm size and the rural-urban indicator (thus contain additional non-European countries) produce similar estimates.

<sup>22</sup> Under this specification, countries with larger populations carry more weight in the analysis. Using a weighting that provides equal weight across countries does not change the direction, or the magnitude of the estimates.

<sup>23</sup> Table 2.1 presents results for overall under-employment. Models that examine involuntary part-time and hours-based under-employment separately obtain similar results.

1. <sup>24</sup> This lack of a rural result potentially speaks to the relativity of under-employment, whereby workers may not feel under-employed if they believe that there are no better options available in their area (Stofferahn, 2000<sup>[47]</sup>).

<sup>25</sup> The results presented in the figure apply an individual weighting. The conclusions also hold when applying an equal weighting to every country.

<sup>26</sup> The evolution of the average marginal effects over the period can be found in Figure A A.4.

<sup>27</sup> Like the individual level analysis, the cross-country regression model includes self-employed workers. Thus, under-employment is presented as a share of total employment.

<sup>28</sup> The results are not meaningfully different when including a larger set of service sectors.

<sup>29</sup> The shares of young workers (“Age share: Younger”) and low-skill occupations (“Occupation share: Low skill”) are controls which are explicitly reported in the table.

<sup>30</sup> Data for industrial robots comes from the International Federation of Robotics (IFR) at: <https://ifr.org/>

<sup>31</sup> The inclusion of a squared term on unemployment (and its statistical significance) implies a non-linear relationship between unemployment and under-employment.

<sup>32</sup> The years considered include 2009 to 2017.

<sup>33</sup> Two surveys of working conditions, the European Working Conditions Survey (EWCS) and the International Social Survey Program (ISSP) Work Orientations Survey, provide some insight. Both surveys ask workers about their working conditions, and both were conducted in 2015. Within this period, the EWCS was conducted in 2010. Both surveys were also conducted in 2005.

Twenty-six OECD countries participated in the 2015 edition of the EWCS: Austria, Belgium, Switzerland, the Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Sweden, Turkey, and the United Kingdom.

Twenty-six OECD countries also participated in the 2015 edition of the ISSP Work Orientations Survey. Eighteen European countries also participated in the EWCS survey: Austria, Belgium, Switzerland, Czech Republic, Germany, Spain, Estonia, Finland, France, Hungary, Lithuania, Latvia, Norway, Poland, Slovak Republic, Slovenia, Sweden, and the United Kingdom. The ISSP sampled eight non-European countries: Australia, Chile, Iceland, Israel, Japan, Mexico, New Zealand, and the United States.

<sup>34</sup> While the figure shows a country average, this comparison is possible as the relationships are similar across almost all of the countries examined. Figure A A.7 presents an example of this homogeneity as it related to the completion of complex tasks. This job component had the starkest difference between the three work situations. Across countries, only in Latvia do under-employed workers regularly perform more complex tasks than other workers do. In this case, than the well-employed part-time.

<sup>35</sup> These differences may have been more apparent before the crisis. Figure A A.8 presents the same response set from the 2005 edition of the survey. It shows slightly more contrast between the under-employed and other types of workers. This suggests that, since the crisis, workers with higher quality jobs have been increasingly held non-ideal working time arrangements.

<sup>36</sup> Using data from 2017.

<sup>37</sup> The under-employment rate is modified to account for the multicollinearity between the unemployment rate and the rate of under-employment. As these measures co-move, it can be difficult to disentangle the effect of additional under-employed workers from the effect of unemployed workers who are searching for a job.

Addressing the multicollinearity required a modelling decision. One variable would be the primary variable, and the second variable was modified to only include the information not already contained within the primary. As unemployment is the traditional measure of labour market slack, it was chosen as a primary variable. An adjusted measure of under-employment was generated by taking the residuals of a model regressing unemployment on under-employment. These residuals no longer represent under-employment, but rather under-employment that unemployment does not explain. It can be interpreted as the information held in under-employment that is missing from the unemployment rate. While this approach did not fix the problem of multicollinearity, it did aid in the interpretation of the coefficient estimates of the two variables.



<sup>38</sup> Using a RIF regression model specification allows for a computationally cheap method of inferring the conditional probability distribution.

<sup>39</sup> This is possibly due to sample size. While the United States has around 50 to 60 thousand observations per year, and Germany has around 13 to 19 thousand, Australia has between 8 and 11 thousand.

<sup>40</sup> When examining these two effects, the Employment Outlook chapter noted that there was a bigger role for the *heterogeneity effect* than for the *standard compositional effect*. That is, different wage growth between full-time and part-time workers was more important than an increase in the under-employed as share of workers.

<sup>41</sup> Many of these options are outlined in further detail in the OECD Jobs Strategy (OECD, 2018<sup>[31]</sup>).