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DIRECTORATE FOR EMPLOYMENT, LABOUR AND SOCIAL AFFAIRS
EMPLOYMENT, LABOUR AND SOCIAL AFFAIRS COMMITTEE

ANTICIPATING CHANGE: WORK, SKILLS AND JOB QUALITY

(Note by the Secretary General)

Meeting of the Council at Ministerial Level 1-2 June 2016

Background Document

Item 3: Enhancing Productivity for Inclusive Growth
Breakout Group 1 - Anticipating Trends - Education, Skills and Quality Jobs

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EXECUTIVE SUMMARY[1]

1. The digital revolution is profoundly changing the types of jobs available and the way we work. Alongside other major structural changes such as globalisation and rapid population ageing, it raises significant challenges for people and governments to adapt to these changes. However, going forward, there is substantial uncertainty about the scale and scope of the impact of these megatrends on the future of work. On the one hand, they may lead to substantial gains as long as the right policies are put in place to manage the required adaptation. On the other hand, there are concerns about the negative impact that these major structural changes might have on aggregate employment and job quality.

2. Digitalisation, globalisation and population ageing may affect the aggregate level of employment. Digitalisation, has already led, for example, to the automation of many routine tasks. However, concerns about mass "technological unemployment" are probably exaggerated. Indeed, it is unlikely that entire occupations will disappear because their tasks are automated given the great variability in these tasks and their evolution over time within each occupation. While digitalisation and globalisation are likely to lead to job losses in some traditional occupations, many new jobs will be created elsewhere, including in new and emerging occupations, even if with some lag. The overall impact on employment is therefore less clear.

3. One thing is more certain, digitalisation, globalisation and population ageing are affecting the characteristics of jobs and occupational structure. Already in the past two decades, job types have undergone a process of skill or routine-biased technical change. This brought a polarisation of labour demand between high-skilled non-routine jobs, such as those involving interpersonal skills or creativity, and low-skilled non-routine jobs, such as food services and security. Routine jobs (many of which are middle-skilled) are sought less as they are the ones most easily automated. At the same time, over the past decades, most countries have seen the rise of various forms of atypical employment – part-time, temporary, independent, on-call work, etc. – often characterised by greater instability and weaker access to social protection with respect to traditional open-ended jobs. These trends have implications for the quality of jobs, which the OECD is closely monitoring.

4. Digitalisation will continue to change how existing jobs are carried out. In most OECD countries, workers in over 95% of large businesses and those in over 85% of medium-sized businesses have access to and use the internet as part of their jobs, and workers in at least 65% of small businesses connect to the internet for work. The digital revolution will continue to alter how work is performed. The Internet has enabled more businesses to hire in competitive suppliers throughout the global supply chain. This has led to the development of the still small but rapidly growing "platform" or "gig" economy. The platform economy is largely based on non-standard work arrangements. It can provide greater opportunities for more flexibility in work arrangements and workers can enjoy the flexibility and benefits of teleworking and freelancing, not least to top up their incomes, but it has also raised concerns about lower wages, weakened labour rights and poorer access to social protection.

[1] The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

5. To maximise the positive impact of these structural changes on productivity while ensuring a more inclusive approach to growth, countries will need to provide an environment where all workers and companies have a fair chance to succeed. Technological change can bring substantial productivity gains - which in turn can lead to higher wages and better quality jobs – but, if the skills of the workforce do not keep up with the change, it can also contribute to growing income inequality by shifting the production process towards skilled labour. To maximise the positive impact of digitalisation on productivity and growth, countries will need to invest in the right skills, promote job quality, and adapt labour market institutions and social protection to the new world of work. This will entail policies that:

- Promote access to quality education and training for all, especially for more disadvantaged children and youth at risk of being left behind, provide more effective career guidance and improve recognition of skills;

- Remove barriers to youth employment which will allow young people to capitalise on their digital skills;

- Promote lifelong skills development so that individuals can adapt to changing skill requirements and thrive in an uncertain future;

- Lower barriers to competition to ensure that productivity growth translates into lower prices, higher demand and more employment; and ensure that labour market regulations facilitate labour mobility and reduce skill mismatch while also providing adequate support to workers;

- Strengthen active labour market programmes to reduce the effects of displacement, limit skills loss among jobseekers, and facilitate transitions to new jobs and careers;

- Provide adequate work-related benefits and social protection for workers engaged in new forms of work while not reducing the potential benefits that these workers gain from additional flexibility and income;

- Foster a business environment that encourages the development of new activities that create both the new and complementary jobs associated with the digital economy.

6. In addition, maximising the positive impact of digitalisation on productivity and inclusive growth will depend on policies that facilitate the adoption and diffusion of new technologies in the first place.

ANTICIPATING CHANGE: WORK, SKILLS AND JOB QUALITY

Introduction

7. Globalisation and technological progress are affecting the pace of job creation and job destruction as well as the quality of jobs. Most people spend a substantial amount of time at work and work for a significant part of their lives, so assessing the quality of existing jobs and how it evolves in light of the digitalisation, globalisation and population ageing is essential to design policies that foster productivity and inclusive and fairer labour markets. Job quality is an elusive concept but the OECD has developed a framework organised around three objective and measurable dimensions (see Box 1): earnings quality, labour market security and the quality of the working environment (OECD, 2014; Cazes, Hijzen and Saint-Martin, 2015). As shown in Figure 1, job quality outcomes vary substantially across OECD countries along each of these three dimensions.

Box 1. The OECD job quality framework

The OECD framework for measuring and assessing job quality considers three objective and measurable dimensions of job quality that are both important for worker well-being and relevant for policy. Together, they provide a comprehensive assessment of job quality:

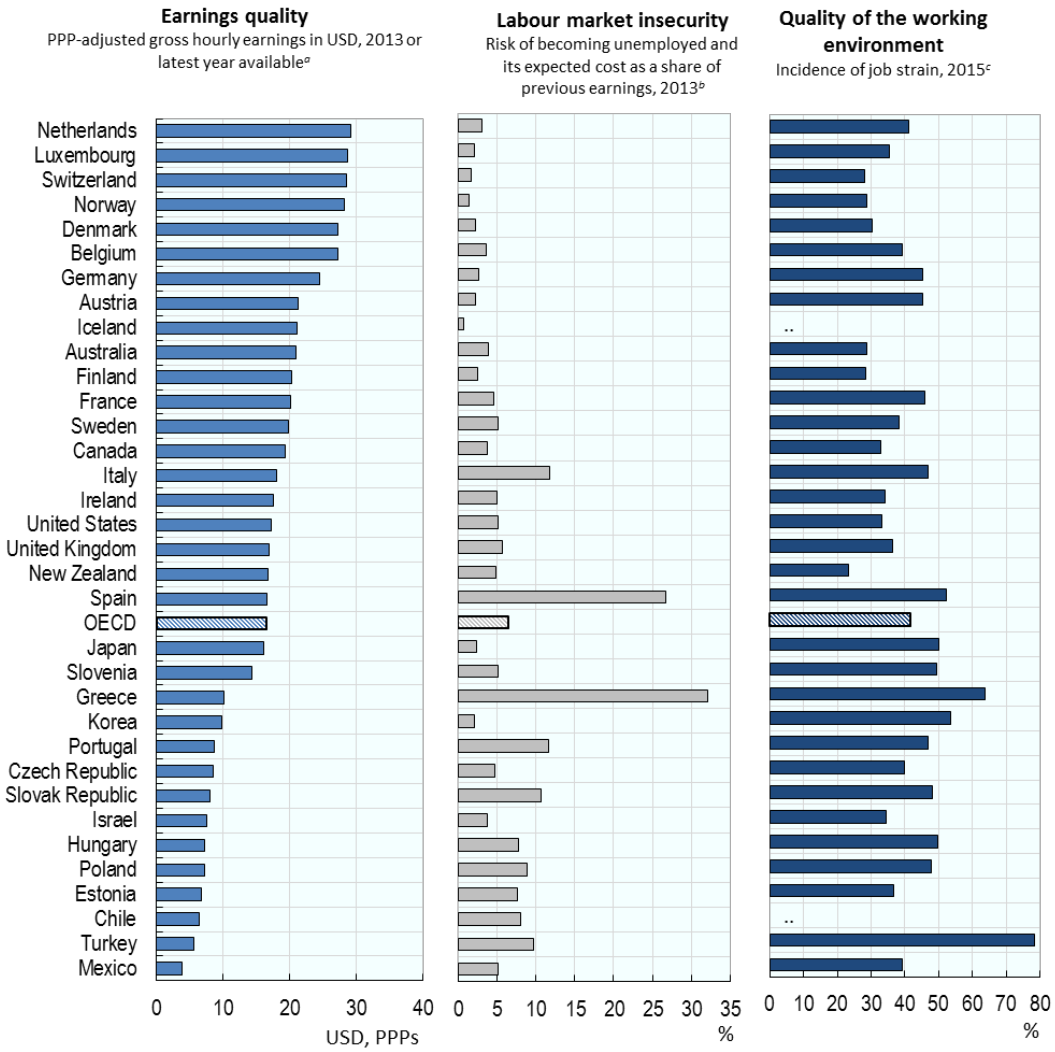
- **Earnings quality** *refers to the extent to which the earnings received by workers in their jobs contribute to their well-being. While the level of earnings provides a key benchmark for assessing their contribution to material living standards, the way earnings are distributed across the workforce also matters for well-being. Therefore, the OECD measures earnings quality by an index that accounts for both the level of earnings and their distribution across the workforce.*

- **Labour market security** *captures those aspects of economic security that are related to the probability of job loss and its economic cost for workers. This is measured by the risk of unemployment which encompasses both the risk of becoming unemployed and the expected duration of unemployment, and by the degree of public unemployment insurance, which takes into account both the coverage of the benefits and their generosity.*

- **Quality of the working environment** *captures non-economic aspects of job quality and includes factors that relate to the nature and content of work performed, working-time arrangements and workplace relationships. Jobs that are characterised by a high level of job demands such as time pressure or physical health risk factors, combined with insufficient job resources to accomplish the required job duties, such as work autonomy and social support at work, constitute a major health risk factor for workers. Therefore, the quality of the working environment is measured by the incidence of job strain, which is a combination of high job demands and limited job resources.*

Source : OECD, 2014

Figure 1. Job quality in OECD countries



Note: OECD is the unweighted average of countries shown.
a) The data refer to: 2012 for France, Italy, Poland, Spain and Switzerland; and 2010 for Estonia, Luxembourg, Netherlands, Slovenia and Turkey. Generalized means approach is used as an aggregation tool to compute earnings quality measures, assuming a high inequality aversion.
b) Data on Chile refers to 2011 instead of 2013.
c) 2015 for the European countries (6th European Working Conditions Survey), 2010 for Turkey and 2005 for the other countries (International Social Survey Program Work Orientations Module III).
Source: OECD Job Quality database (2016).

8. Over the past decade the economic crisis deeply affected the quality of existing jobs. Earnings quality was affected by the fact that the jobs lost during the crisis were predominantly low-paid. This led to an apparent increase in earnings quality on average. However, if one keeps the employment structure constant, two thirds of the countries experienced a deterioration of earnings quality. Labour market security instead worsened in most OECD countries, reflecting the combination of a substantially higher risk of unemployment with lower unemployment insurance. The quality of the working environment changed differently across OECD countries: in some countries workers experienced a worsening in working conditions while in other countries those who managed to keep their job saw their working conditions improve. All three dimensions need to be considered jointly to have a comprehensive assessment of changes in job quality. Germany, for instance, experienced at the same time an increase in

the employment rates and an improvement in all aspects of job quality. On the contrary, Greece experienced both a sharp rise in unemployment and a fall in earnings quality and labour market security (while the incidence of job strain remained stable). In the United Kingdom, where employment after the initial dip in the early years of the crisis is now almost back to pre-crisis levels, earnings quality decreased over the period but labour market security fell only slightly, while the quality of the working environment was unaffected. In other OECD countries, the effects of the crisis were much more mixed. In Portugal, for example, earnings quality stagnated and labour market security fell considerably because of the upsurge in unemployment that is still far from being reabsorbed, while quality of the working environment improved for those people still employed. Conversely, in Sweden earnings quality improved but labour market security decreased and the quality of the working environment worsened (albeit from a relatively high level).

9. But many are concerned that the future will bring even deeper changes to the quality and even the number of jobs in our economies. Many advanced countries have seen the rise of various forms of atypical employment – part-time, temporary, independent, on-call work, etc. – often characterised by greater flexibility in work arrangements but also greater job instability and weaker access to social protection with respect to traditional open-ended jobs.

10. In particular, digitalisation is changing the types of jobs available and the way we work. Ever more computer power, Big Data, the penetration of the Internet, Artificial Intelligence, the Internet-of-Things and online platforms, among other developments, are radically changing prospects for the type of jobs that will be needed in the future and how they will be carried out (OECD 2015a).

1. The impact of digitalisation on the world of work

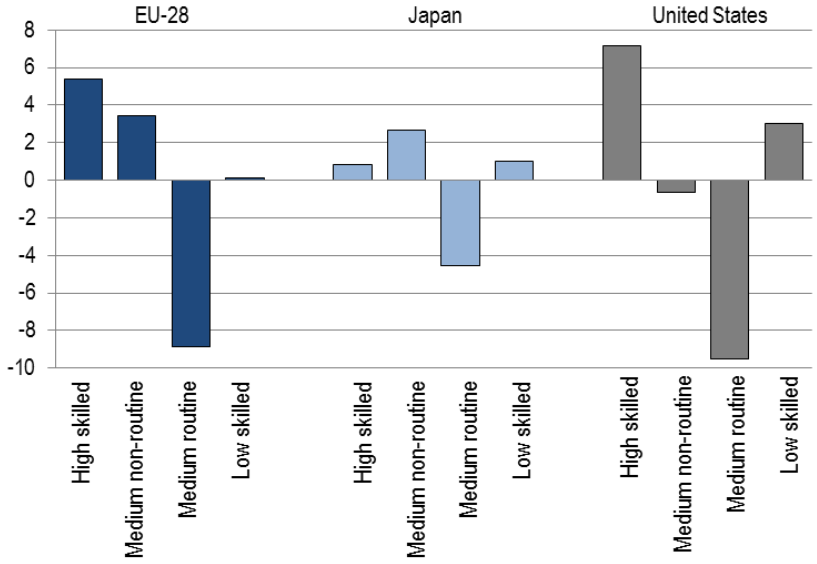
How many jobs are at risk of being replaced?

11. Economic history suggests that major innovations such as the steam engine, electricity and the assembly line, can be disruptive. They can result in substantial job losses in the short-term, even if this is more than offset in the long-term by the creation of more productive and rewarding jobs with substantial improvements in living standards (e.g. Mokyr, Vickers and Ziebarth, 2015, OECD, 2015b). But the lessons of the past may not always apply to the future.

12. While technological innovation is positively associated with employment in all groups of occupations (OECD, 2015c), artificial intelligence (AI) and digitalisation challenge high-routine jobs (Marcolin et al. 2016). The rapid progress in AI is also raising the prospect that a much broader range of work tasks than previously could be carried out by machines. There has already been a hollowing out of jobs involving mid-level skills (Figure 2). Automation has led to the substitution of machines for a substantial part of routine jobs, irrespective of the skill level, (OECD, 2013). At the same time, the demand for workers in high-skilled, non-routine jobs has increased considerably. These jobs often involve tasks such as working with new information, interpersonal skills and solving unstructured problems. Some increase has also occurred in the demand for workers in low-skilled non-routine jobs in activities such as caring and personal services that are hard to automate. The end result has been a pattern of job polarisation by skill level in many but not all OECD countries (Autor, 2015; Berger and Frey, 2016). It is not clear how these trends will play out in the future, particularly because other changes are simultaneously taking place (e.g. globalisation, demographic change, etc.) but there will continue to be a high premium placed on having the skills to solve non-standard problems.

Figure 2. Job polarisation in the European Union, Japan and the United States

Percentage point change in employment shares by occupation category, 2002-2014



Source: OECD calculations based on EU-LFS, Japanese Labour Force Survey and BLS Current Population Survey.

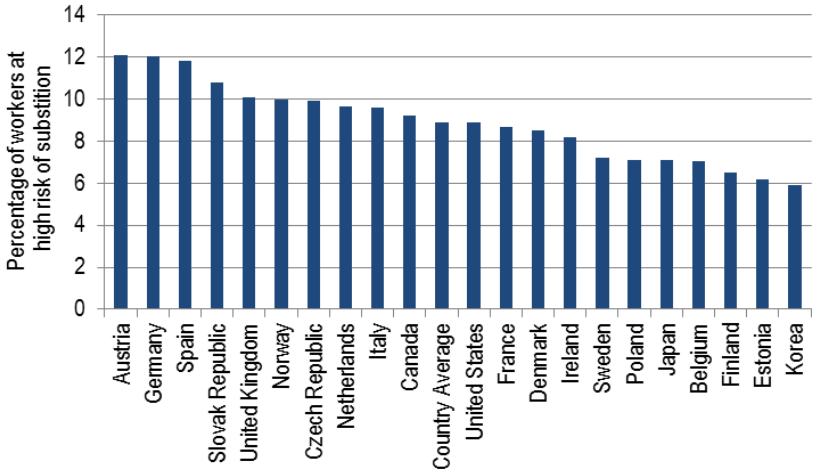
13. The idea of 'technological unemployment' was already highlighted by Keynes in his essay on "*The Economic Possibilities for Our Grandchildren*" (Keynes, 1931). Some experts (e.g. McAfee and Brynjolfsson, 2014), suggest that the technological change we are experiencing in this 'second machine age' not only risks displacing some specific types of jobs, but could lead to a decline in overall employment. Not only will routine tasks continue to be automated but cognitive tasks that until recently were considered non-automatable are now at risk, for example, writing standard reports on stock-market changes (OECD, 2015c). Some estimates based on the characteristic tasks of each occupation suggest that almost half of all jobs in the United States and other advanced countries are at risk of being substituted by computers or algorithms within the next 10 to 20 years (e.g. Frey and Osborne, 2013).

14. Critics of these alarming estimates argue that occupations as a whole are unlikely to be automated as there is great variability in the tasks involved within each occupation and tasks evolve over time within occupations (Autor and Handel, 2013). Two workers holding jobs in the same occupation may not perform the same tasks because their work may be organised differently, requiring more face-to-face interaction or autonomy, for example. At the same time, within most if not all occupations, tasks have been evolving already for a long time.

15. A better approach to analysing the number of jobs at risk of automation is to analyse the task content of individual *jobs* instead of the average task content of all jobs in each *occupation*. This results in much lower figures for the share of jobs potentially at risk of automation. Using workers' reports of the tasks involved in their job from the OECD's Survey of Adult Skills (PIAAC), Arntz, Gregory and Zierahn (2016) estimate that just 9% of jobs are at a high risk of being automated on average, ranging from around 12% of workers in Austria, Germany and Spain to around 6% or less in Finland and Estonia (Figure 3). These are jobs for which at least 70% of the tasks are automatable.

Figure 3. The risk job loss because of automation is less substantial than sometimes claimed

Percentage of workers in jobs at high risk of automation



Notes: Data for the United Kingdom correspond to England and Northern Ireland. Data for Belgium correspond to the Flemish Community

Source: Arntz, M. T. Gregory and U. Zierahn (2016), "The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis", OECD Social, Employment and Migration Working Papers, forthcoming.

16. Cross-country differences in the share of workers at high risk of substitution reflect to some extent differences in how work is organised. Countries where jobs rely less on face-to-face interactions are at higher risks of automation. Country differences also reflect the extent to which technology already plays a big role in the economy. Denmark, Japan and Sweden spend a comparatively large percentage of their GDP on ICT investment, signalling that they may well have already automated several tasks or jobs (Arntz, Gregory and Zierahn, 2016).

17. Across all countries, workers with a lower level of education are at the highest risk of displacement. Thus, automation could reinforce existing disadvantages faced by some workers (Berger and Frey, 2016; Arntz, Gregory and Zierahn, 2016).

Are we facing a risk of "technological unemployment"?

18. The risk of extensive technological unemployment can be discounted for several reasons. First, while the number of new jobs directly created by the ICT sector may not fully compensate for jobs displaced elsewhere (Berger and Frey, 2016; OECD, 2015b), new jobs are likely to appear as technological applications develop and other sectors expand as costs fall and income and wealth increase, even if these latter may take some time to materialise. Indeed, some estimates suggest that for each job created by the high-tech industry, around five additional, complementary jobs are created (Moretti, 2010; Goos, Konings and Vandeweyer, 2015).

19. Second, estimates of job automation typically rely on the theoretical possibility of technology displacing existing jobs, but ignore whether these technologies are actually adopted, which may lead to overestimating the overall impact of technology on the number of jobs in the economy.

20. Finally, even if there is less need for labour in a particular country, this may translate into a reduction in the number of hours worked and not necessarily a reduction in the number of jobs. This has been the experience of many European countries over past decades (Spiezia and Vivarelli, 2000).

21. Even if the risk of technological unemployment can be discounted, job displacement and changes to the occupational structure will take place. The magnitude of these changes will vary from country to country, reflecting differences in industry structure and skill mix of the workforce. These changes can have an adverse impact on those workers who are not able to make the transition to new jobs. If the labour market polarises even further, more workers are likely to end up stuck in low-skill, low-paying jobs with little possibility of crossing the growing divide into jobs that provide sufficient income and well-being.

Will there be greater work-life flexibility or greater job insecurity?

22. The Internet facilitates a more efficient matching between the demand and supply of labour, products and tasks. This creates greater opportunities for workers to enjoy the flexibility and benefits of freelancing, and to top-up their income with additional work in other jobs. Service providers can divide otherwise complex tasks into a set of cheap, routine mini-tasks to workers around the world. This trend has led to the flourishing of the 'gig-', 'on-demand-', 'sharing-' or, more generally, the 'platform economy' (e.g. AirBnB, Uber, Lyft, Blabla Car, Nubelo, Amazon Mechanical Turk, Task Rabbit, YoupiJob, Frizbiz, etc.) (Spiezia and Gierten, 2016).

23. Though still relatively small in scale, the 'platform economy' is largely based on non-standard work arrangements and independent work in particular. Relative to standard wage and salary employment, workers in non-standard jobs tend to have fewer rights to social protection, receive less training, often have weaker career progression, lack access to mortgage and other forms of credit, and face greater insecurity.

24. It is too early to tell whether this reflects the inherent insecurity of jobs in the platform economy or whether workers who in general are likely to wind up in more precarious jobs tend to be over-represented in these new forms of work. Unfortunately, the available employment data are not suitable for examining in detail the growth in new forms of work and the extent to which they are associated with greater insecurity.

25. Available data suggest that between 2012 and 2013 in the EU-28 area, the share of the self-employed among those in employment aged 18 to 64 fell by 0.6% (Figure 4). However, this partly reflects the declining importance of the agriculture sector where the self-employed account for a high share of employment. By occupation, self-employment accounted for a growing share of all jobs among technicians and associate professionals and elementary occupations. There are also some differences across countries, with a long-term rise in self-employment as a share of total employment in Germany, the Netherlands and the United Kingdom (France Stratégie, 2015).

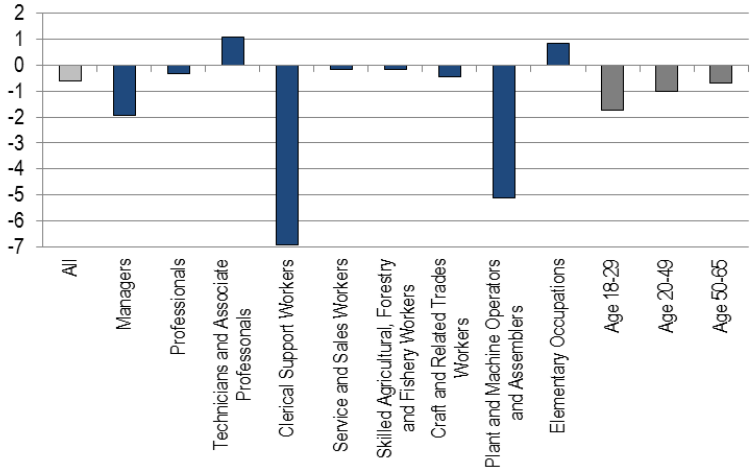
26. The most common sources of data on self-employment do not differentiate between independent workers who do independent work as their primary or only activity (freelance business owners, independent contractors), from those who consider themselves freelancers although they are also employees (diversified workers) or from those who have an employer and did some freelance work on the side of a regular or temporary job (moonlighters or temporary workers). Between 2014 and 2015, the share of diversified workers in total employment increased from 6% to 9% in the United States. The other forms of independent work declined during this period in the United States (Mishel, 2015).

27. As workers in the 'platform economy' are more likely to have multiple jobs and income sources, the role and meaning of traditional labour market institutions and policies are being challenged. Statutory working hours, minimum wages, unemployment insurance, taxes and benefits are still modelled on the notion of a traditional and unique employer-employee relationship. In addition, as independent work becomes more common, an increasing number of workers may not be covered by collective agreements. They may also not be eligible for unemployment benefits and pension and health schemes available to employees and face difficulties in obtaining credit. Currently, in 19 out of 34 OECD countries, self-

employed workers are not eligible for unemployment benefits and in 10 they are not eligible for work injury benefits. Even if eligible, the self-employed in many countries receive less generous benefits or enrolment is optional, as is commonly the case for insurance benefits, sickness/maternity, unemployment and old-age/disability/survivor benefits (OECD, 2015e).

Figure 4. **Change in the share of self-employment by age and occupation in the European Union**

Percentage change between 2012 and 2013 in the EU-28 area



Source: OECD calculations based on the EU-LFS.

Is there a risk of growing inequality?

28. The polarisation of the occupational structure into high-skilled and low-skilled non-routine jobs and between open-ended and various atypical forms of employment may entail further polarisation of the wage structure into high-paying and low-paying jobs. In some countries, the reduction in the demand for workers with middle-level routine skills has increased competition for lower-paid jobs which has held down wages in the bottom half of the earnings distribution. At the same time, wages at the top of the distribution have risen because of the high demand for workers with high-level skills. These developments could increase the risk of experiencing in-work poverty and the persistence of low income from work (OECD, 2015a; OECD 2015e).

29. The shift to capital-intensive modes of production could also spur further declines in the labour share of GDP and further increases in inequality. The changes in the occupational structure may create regional inequalities, as new, highly-productive jobs are created in cities with a high concentration of highly-skilled workers, which are usually different cities and areas than those experiencing displacement or job losses (Berger and Frey, 2016).

30. In the face of these developments, tax and benefit schemes will need to be adapted to ensure that work, even low-paying work, provides a sufficient income to escape poverty.

2. Skills are crucial for adapting to a digital and globalised world

31. Ensuring that everyone has the relevant skills in a digital and globalised world is key to promote greater labour market inclusiveness but also to spur innovation, productivity and growth in the first place. A digital economy requires a range of skills, including: ICT specialist skills for workers driving digital innovation and supporting digital infrastructures; ICT foundation skills for workers to be able to use digital

technologies; and complementary skills to ICT use (e.g. literacy, numeracy, and socio-emotional skills) to translate ICT tools into higher levels of productivity and well-being (OECD, 2015f; Rimini and Spiezia, 2016). Economies lacking this range of skills risk not being able to capitalise on the benefits of a digital economy; workers lacking foundation and complementary skills risk poor career prospects and labour market exclusion.

32. The use of ICT tools – specific to only a handful of occupations a few decades ago – is now required in all but two occupations in the United States: dishwashers and food cooking machine operators and tenders (Berger and Frey, 2016). Similarly, in most OECD countries, over 95% of workers in large businesses and 85% in medium-sized businesses have access to and use the Internet as part of their jobs. In small businesses the share is at least 65% (OECD, 2013).

33. Thus, as digital technology becomes more pervasive in the workplace, workers will need a skill set that allows them to take on complex tasks that are difficult to automate and the skills to effectively use the new technologies. This means having solid literacy, numeracy and problem-solving skills, but also complementary ICT skills (e.g. basic information-processing skills and socio-emotional skills) (OECD, 2015f) and continuous skill adaptation as new technologies are adopted (Spitz-Oener, 2006; Bessen, 2015).

34. Globalisation is also driving changes to the workplace and spurring the pace of digitalisation as a way for firms to increase their competitiveness. For example, German workers today, compared to those in the 1970s, are required to possess a more varied skill set because they are expected to perform multiple tasks rather than one specific task. The offshoring of certain tasks is one of the reasons behind the trend towards multi-tasking that is less easy to outsource (Becker and Muendler, 2015).

35. These changes go beyond the workplace. Interaction between public and social services and business and citizens increasingly relies on digital, mobile or social-media tools (OECD, 2009; OECD, 2011). For example, and recognising the matching potential of digital applications, the Flemish public employment service (VADB) has launched mobile apps for providing services to jobseekers. Recognising the efficiency gains of "going digital", the Dutch public employment service (UWV) has digitised most of its functions (OECD, 2015a). In India, Bajajob.com connects jobseekers to jobs in the informal sector via its website, voice services and SMS-texting.

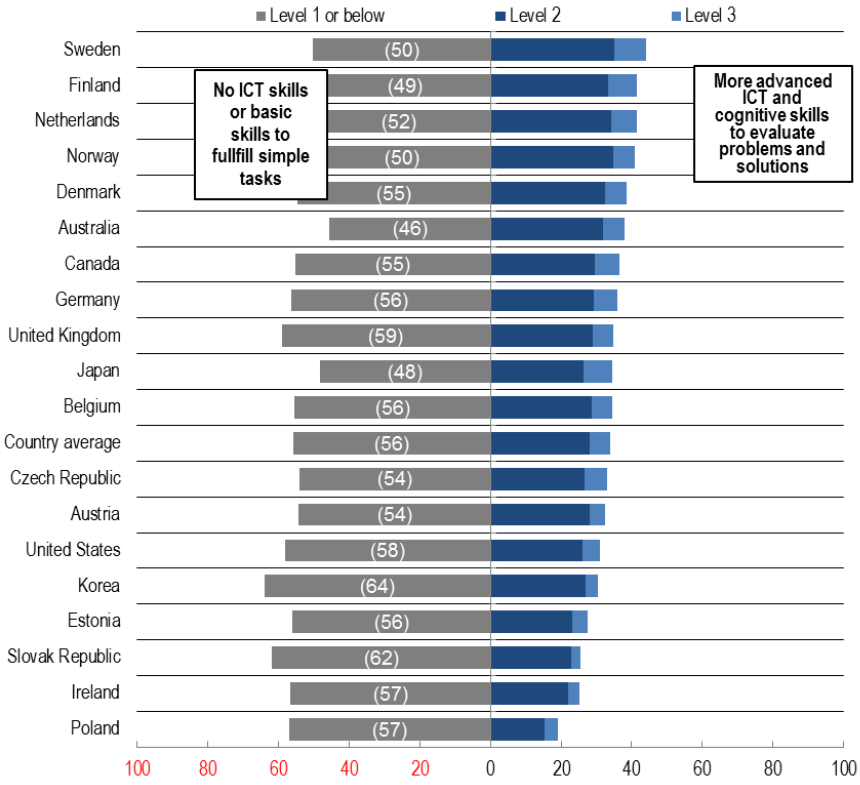
Are workers ready for a digital world?

36. In a world where the skill needs of businesses employers are continuously evolving, a key policy challenge is to reduce the large disparities across individuals in the acquisition and upgrading of their skills. Recent technological change has shifted skill demands toward high-level skills. Workers are increasingly likely to change jobs over their working life, and must have the skills to successfully shift between jobs while avoiding unemployment or the risk of ending up in a lower paying job. ICT foundation skills are increasingly a requirement for workers to benefit from technological innovation in terms of better employment chances and wages.

37. However, the evidence for whether countries are well-prepared for the digital economy is rather disturbing. The results of the OECD's Survey of Adult Skills (PIAAC) suggest that more than half the adult population on average in 20 OECD countries have only the skills necessary to fulfil the simplest set of computer tasks or no ICT skills at all (see Figure 5). Only around a third of workers have the more advanced ICT and cognitive skills that enable them to evaluate problems and solutions (OECD, 2013).

Figure 5. The majority of adults have low proficiency in problem solving in technology-rich environments

Percentage of 15-65 year-olds performing in each proficiency level



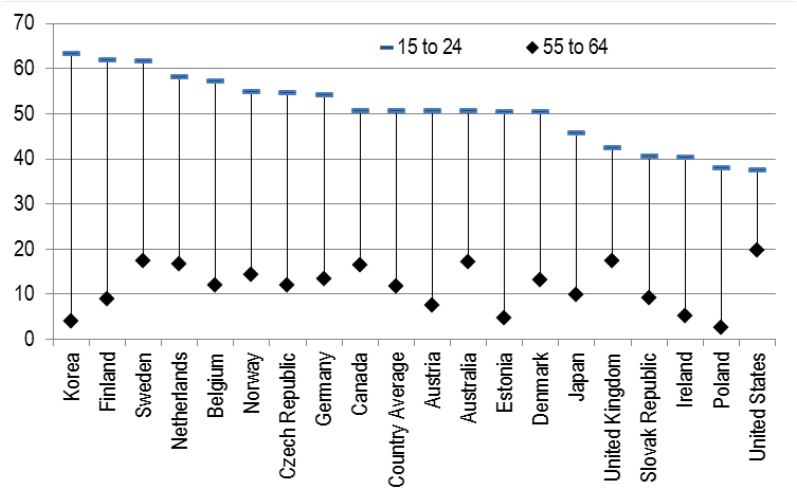
Notes: Individuals in Level 2 or Level 3 have more advanced ICT and cognitive skills to evaluate problems and solutions than those in Level 1 or below. Data for the United Kingdom correspond to England and Northern Ireland. Data for Belgium correspond to the Flemish Community.

Source: OECD (2015c), Adults, Computers and Problem Solving: Where's the Problem?, OECD Publishing.

38. Low levels of proficiency in ICT-related skills partly reflect an age divide with younger people, as expected, performing better than older people (Figure 6). Half of the population aged 15 to 24 can complete tasks involving multiple steps and overcome unexpected outcomes in technology-rich environments (Level 2 or 3), but this share falls to only around one in ten for adults aged 55 to 64. Youth appear to be prepared the best for a digitalised environment in Finland, Korea and Sweden, where around six in ten young adults reach proficiency Level 2 or 3. Less than 40% of youth in the United States and Poland reach this level of proficiency in problem solving in technology-rich environments. The United States is, however, the country with the highest share of older adults with high levels of proficiency in this domain.

Figure 6. Younger people are better prepared for the new digital working environment than older people

Share of 15-24 and 55-64 year-olds performing at Level 2 or 3 in Problem Solving in Technology-Rich Environments



Notes: Data for the United Kingdom correspond to England and Northern Ireland. Data for Belgium correspond to the Flemish Community
Source: OECD (2015c), Adults, Computers and Problem Solving: Where's the Problem?, OECD Publishing.

39. Although most young people seem ready to interact with technology, there is still an important proportion of youth that do not reach high levels of proficiency and may face a disadvantage in the digital economy. Moreover, the possibilities to adopt technologies and disseminate innovation may prove difficult for countries with a high overall percentage of adults with low ICT skill levels. The unequal distribution of ICT skills across gender, socio-economic and migrant status may also amplify existing inequalities even further as these skills become increasingly important.

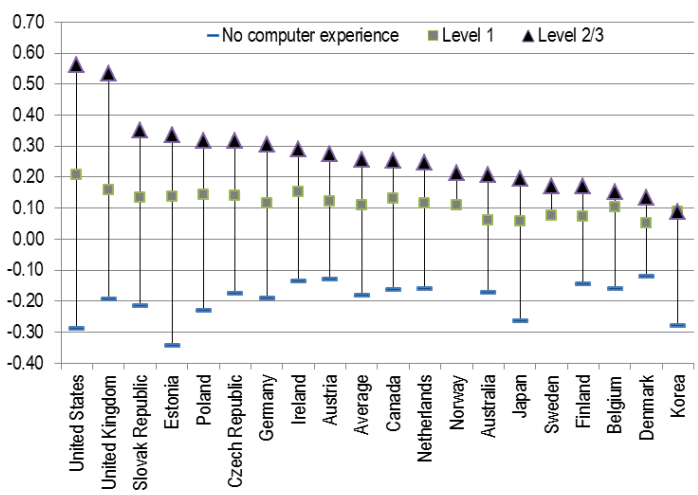
40. The importance of digital skills can be assessed by looking at the wage returns to these skills (Figure 7). Compared to workers who can only perform the most basic computer functions like typing or operating a mouse (workers at or below Level 1), workers performing at Level 2 or 3 wages are paid 26% more on average. These returns are greater than 50% in the United States and United Kingdom (England / N. Ireland). Workers with no computer experience earn around 20% lower wages than those with the most basic computer skills.

41. As the digital technology enters the workplace and tasks and skill requirements change, skills that are complementary to ICT use are important as well. Jobs requiring more intensive ICT use also require a solid level of information-processing skills (e.g. literacy and numeracy), as well as the skills involved in collaboration, information-sharing, giving presentations, providing advice, self-direction, management, influencing and problem-solving (OECD, 2015f). As technology automates certain tasks, the value of skills involved in non-automatable tasks, such as social skills, also increases (Autor, 2015; Deming 2015). Moreover, in response to further innovation, workers will need to develop their capacity to continuously adapt to new standards and technologies (Bessen, 2015). These skills are especially relevant for the potential of technology to increase productivity and well-being to be realised.

42. To seize the benefits of technological change, economies must also have ICT specialists: workers with the ability to programme software, develop applications, manage networks and manage and analyse Big Data, among other skills. They allow for innovation in a digital economy to flourish, but also to support the infrastructure that firms, governments, commerce and users rely on (OECD, 2015f; Rimini and Spiezia, 2016).

Figure 7. There are strong returns to problem solving skills in technology-rich environments

Wage premium compared to workers performing below Level 1 in Problem Solving in Technology-Rich Environments



Notes: Data for the United Kingdom correspond to England and Northern Ireland. Data for Belgium correspond to the Flemish Community. The wage premium is defined as the percentage difference in mean hourly wages relative to workers performing below Level 1 in problem solving in technology-rich environments; for example, workers performing at Levels 2 and 3 in the United Kingdom and the United States earn more than 50% more than workers performing below Level 1.

Source: OECD (2015c), Adults, Computers and Problem Solving: Where's the Problem?, OECD Publishing.

What policies are needed to confront these challenges?

43. Against this backdrop of changing skill needs, policies must ensure that the adoption of technologies yields better job quality, that workers can benefit from greater labour mobility and that both employers and workers have the means to take advantage of the new opportunities that open up.

44. Part of the task lies in ensuring that initial education equips students with solid information processing (literacy, numeracy and problem-solving) and complementary skills as well as some ICT skills. These are the foundation for workers to engage in further learning and crucial for labour market success, as shown by studies that follow students' skills and their transition into the workplace (e.g. Rosdahl, 2014). Many of these skills are also acquired outside the walls of formal schools and training institutions, enhancing the need for recognition systems for skills acquired outside the formal channels. Moreover, the skills that people have also need to be put to effective use to avoid skills deterioration (OECD, 2013).

45. A key task for education and training systems is to better assess and anticipate changing skill needs as well as to provide better guidance to students on their choice of field of study and education pathway. Big data and analytics can be harnessed to complement labour market information systems and monitor changing skill needs. The inclusion of all key stakeholders in the development of the instruments and the process through which skill needs information translates into actual policies and programmes can ensure that the information collected is useful to stakeholders and that the policies adopted respond to actual needs (OECD, 2016).

46. As skill demands change continuously, training for workers to keep up with new skill requirements should be a policy priority. This requires devising better incentives for workers and firms to up-skill, particularly when considering that low- and medium-skilled workers are the least likely to receive

training. It also means using the possibilities of new technologies to adapt new job tasks to the skills sets of incumbent workers.

47. In terms of innovations in learning that digitalisation also brings, MOOCs (massive open online courses) and OERs (open educational resources) can expand the opportunities to learn for many workers, though their use still remains below their potential. The low perceived quality, lack of incentives and lack of recognition of competencies acquired through these and informal and non-formal means hinder take-up and the opportunity it brings for re-skilling and up-skilling among workers.

48. Effective and well-targeted active labour market programmes are also needed for jobseekers who are at the risk of losing their job or already jobless and facing difficulties finding a new job because of outdated or inadequate skills. Through training, job search assistance, subsidies to employment to hire displaced workers and entrepreneurship or direct job creation, when well-designed active labour market programmes can reduce the effects of displacement, limit skills loss among jobseekers and facilitate transitions to new jobs and careers (OECD, 2015g).

49. A combination of policies to strengthen initial learning, improve incentives for further learning and reinforced active labour market programmes for the unemployed will allow workers to keep their skills up to date, help them move between jobs and allow employers to have a skilled and highly productive and innovative workforce. It will also be crucial to tackle skills mismatch and ensure that employers fully use the skills of their workers, which may enhance productivity and has the potential for reducing inequality (Adalet McGowan and Andrews, 2015; OECD, 2015a).

50. As discussed in the paper on "The Productivity-Inclusiveness Nexus" [C/MIN(2016)3], digitalisation offers an opportunity to enhance productivity and inclusive growth. But seizing this opportunity assumes that digitalisation takes place in the first place. The adoption of technology depends on several factors, including, first and foremost a skilled working population as well as the industry structure of the economy Institutional factors related to innovation and the adoption and diffusion of technological advances (e.g. low corruption levels and low regulatory barriers) imply that digitalisation as an avenue for productivity and inclusive growth requires a concerted policy approach (Berger and Frey, 2016).

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