Preparing for the Changing Nature of Work in the Digital Era

The digital transformation is profoundly affecting the ways in which people contribute to societies, live and work, including in terms of the number and types of jobs available. While worries of widespread technological unemployment may be overstated, the impact of digital transformation on the nature of work and the skills required is very real and already upon us.

Many new, productive and rewarding forms of work and jobs are being created as part of the digital transformation, but at the same time, many jobs have disappeared and more are likely to go in the future. The impact of digitalisation on the workforce depends on technological innovations and uptake of these new technologies but OECD estimates suggest that some 14% of workers face a high risk that their tasks will be automated. Another 32% face major changes in the tasks required in their job and, consequently, the skills they would need to do their job (Nedelkoska and Quintini, 2018). These workers will need to significantly adapt to succeed in the new digitally enabled work environment.

With this transformation comes the rare opportunity to fundamentally improve work and the nature of employment. Dangerous, dirty and dull work can be drastically reduced while jobs that celebrate creativity, flexibility and purpose can be enhanced. There is currently a window of opportunity to shape the future of work with foresight so that inequalities are reduced and well-being is bolstered. To achieve this, all stakeholders, but especially policy makers, need to be aware of the shifts underway, formulate a vision of the desired outcome and plan so that the opportunities are seized and the problems that emerge are addressed.

Policy implications

Prepare workers for new jobs and for changes to existing ones

- Digital transformation will lead to jobs being lost, and others being created. Four out of ten jobs created in the past ten years were in digital-intensive sectors while for those countries that experienced declines in employment, most of the job loss were in less digitally-intensive sectors. As labour markets transform, it is imperative to promote successful and fair transitions from declining to expanding work opportunities.

Empower people with a mix of skills to succeed in a digital world of work

- To succeed in the digital world of work, people need sound cognitive skills including digital skills, social and emotional skills, job-specific skills and importantly the ability and motivation to cope with change and keep learning, both in and out of the workplace.

Get ready for a massive training challenge

- Life-long learning opportunities need to be promoted, particularly for low-skilled workers, and barriers to training need to be addressed. This can be achieved through strengthening career guidance, assessing individual skill gaps, enhancing opportunities for distance learning, simplifying skills validation systems and increasing and targeting financial incentives and funding of life-long learning initiatives.

1. The digital transformation is changing the labour market

Digitalisation creates jobs both directly, for example new jobs like data analysts, social media marketeers or Internet of Things architects, and indirectly by raising productivity, lowering prices and thereby stimulating demand. Between 2006 and 2016, four out of ten new jobs in the OECD were created in highly digital-intensive sectors and total employment in the OECD increased by about 30 million jobs. But these aggregate numbers conceal the churning that has occurred as new technologies both create and destroy jobs. This "creative destruction" phenomenon is likely to continue, and possibly increase, in the future.

Figure 1. Digital-intensive sectors provide a major contribution to job creation

Contributions to changes in total employment, by digital intensity of sectors, 2006-16

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Source: OECD (2019a), *Measuring the Digital Transformation*, https://doi.org/10.1787/9789264311992-en, based on OECD, *STAN Database* (http://oe.cd/stan), National Accounts Statistics, national sources and *Inter-Country Input-Output Database* (http://oe.cd/icio).

The impact of digitalisation on jobs will not be evenly distributed nor happen at a steady pace. It is most likely to be concentrated in certain jobs, selected sectors and particular geographical areas, and may move in fits and starts. For example, machine learning, which underpins advancements in artificial intelligence (AI), is already being adopted by a range of industries, affecting even high-skill jobs like finance or law. Other workers or sectors, for example long-haul truckers, are not predicted to be affected immediately, but when adoption of automated trucking begins, the change may be sudden as cost savings of up to 30% could result in a drop of demand for truckers in Europe and the United States of up to 4.5 million over five years. (ITF, 2017).

Significant geographical disparities can also be found both in the likelihood of digitally-induced job creation and in job automation within many countries, which may exacerbate inequalities between regions (Sorbe, Gal and Millot, 2018). Evidence from the United States shows that new industries have mainly appeared in urban locations that have a large share of high-skilled workers (Berger and Frey, 2017), and that regions which are most exposed to the adoption of robots have seen negative effects on employment and wages (Acemoglu and Restrepo, 2017). Indeed, regions with lower risk of automation tend to have more jobs in services, and to be highly urbanised (OECD, 2018a).

Not all workers stand to benefit from the digital transformation to the same extent. The low-skilled, older workers, and workers in jobs at high risk of automation will bear the brunt of the changes and benefit little from the jobs created in high-tech industries (OECD, forthcoming a). Given this, raising the low-skilled participation in training is crucial, since analysis has shown that training of low-skilled workers can significantly improve the diffusion and use of digital technologies in firms and, in turn, productivity (Andrews, Nicoletti and Timiliotis, 2018). Nevertheless, these groups receive very little training compared to their better skilled and younger counterparts: only about 20% of low-skilled adults receive job-related training, a staggering 40 percentage points below that of high-skilled adults, in the OECD on average. This significantly raises the risk of some workers being left behind.

It is also more difficult for low-skilled workers to move to occupations that are not at high risk of automation than high-skilled workers. They either have to move to higher-skilled jobs or to low-skilled jobs at lower risk of automation. The former requires significant retraining, but even the latter can be difficult. High-skilled workers move more easily between jobs than low-skilled workers because skill distances[11], in terms of literacy and numeracy skills, between high-skilled occupations tend to be smaller than between low-skilled occupations (Bechichi et al., 2018).

The scale and the speed of these changes wrought by digital transformation remain unclear, placing a premium on improving our awareness of the changes underway, the shifts in how value is generated and the skills needed by digitally-enabled firms. A policy response to review, update and enact policies that will cushion and facilitate this transition, especially for those least equipped to navigate the changes, needs to start now.

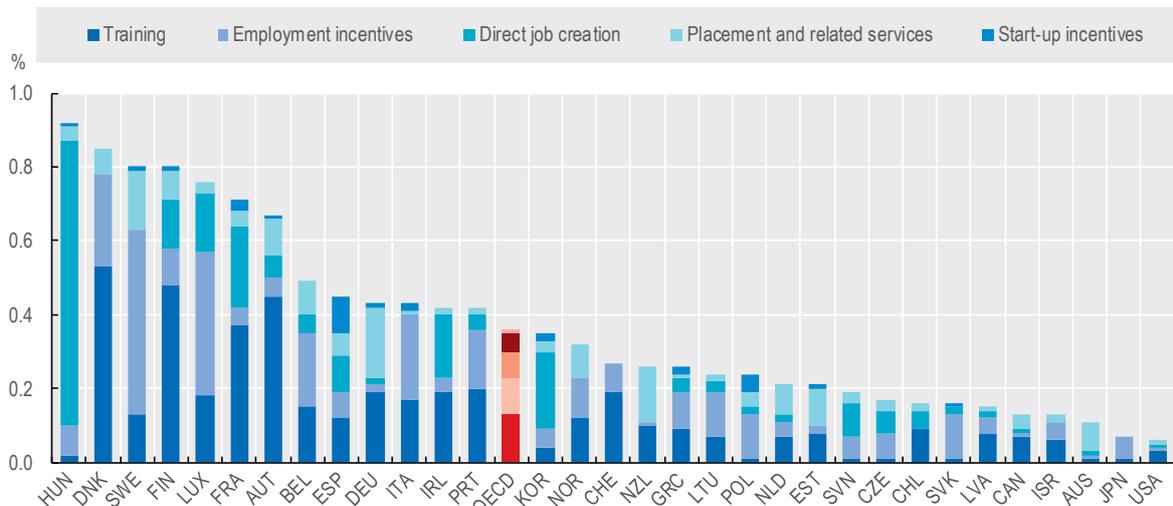## 2. We need to work on the transition

The types of jobs that are being created are not the same as those that are disappearing, and the workers affected by job destruction in declining activities may not be those benefitting from job opportunities in expanding businesses. Many of the jobs being lost are middle-skill jobs, many of which were based on routine tasks, and have typically constituted a stepping stone and an opportunity for social mobility for workers without tertiary education as well as being an on-ramp to work for youth (OECD, 2018b). More generally, we appear to be on the cusp of a large shift away from these jobs and primarily towards jobs that involve work that is unpredictable and non-routine (Marcolin et al., 2018). These shifts could exacerbate and worsen inequalities if the people affected are not supported.

As labour markets transform, it is imperative to promote transitions from declining to expanding work opportunities, e.g. by striking a balance between flexibility of firms and mobility of workers, on the one hand, and job stability on the other. This includes the ease with which entrepreneurs can start or liquidate a business, firms can adjust their workforce in response to changing business conditions, and workers can move between firms and places in search of better matches for their skills and ambitions to enhance their career opportunities.

Labour market policies and institutions play a critical role in determining the flexibility with which firms can adjust their workforces, giving workers adequate protection, and facilitating the movement of workers across firms. The latter depends to an important extent on the transferability of skills, the portability of benefits, and the availability of effective employment services and active labour market programmes (ALMPs) to facilitate job-to-job transitions. ALMPs should provide all jobseekers with access to basic job search services, and target those with poor labour-market prospects, offering e.g. more intensive (re)employment services, retraining and career counselling. Public expenditure on ALMPs are quite low in some countries, considering the important effects of such spending (Figure 2).[2]

Figure 2. Large active labour market spending differences across countries

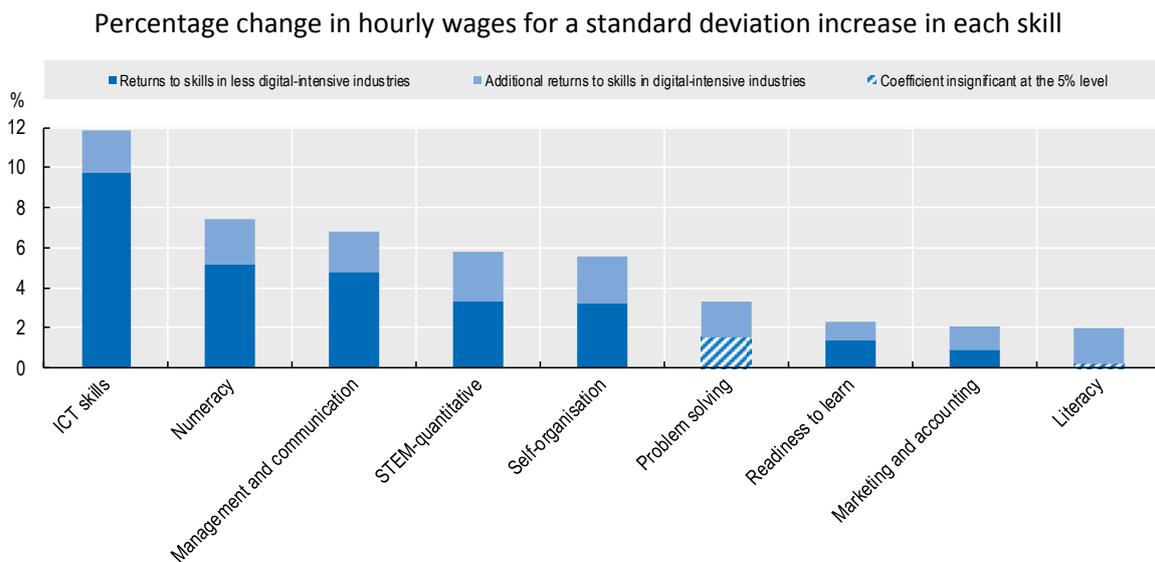Public expenditure on active labour market policies, 2016

Legend: Training · Employment incentives · Direct job creation · Placement and related services · Start-up incentives

Source: OECD (2019a), *Measuring the Digital Transformation*, https://doi.org/10.1787/9789264311992-en, based on OECD, *Labour Market Programmes* database (accessed October 2018).

These structural shifts require workers, businesses and governments to work together to prepare for this new world of work. A people-centred "transition agenda" needs to be formulated so that everyone may benefit from a positive, forward-looking plan that helps workers and societies to manage uncertainties, and that does not leave anybody behind and puts welfare at the forefront, ensuring both people and firms will benefit. If government and business are seen as sitting on the sidelines, devoid of plans that serve to aid those most affected, a tech backlash may ensue that prevents us from achieving many of the positive outcomes made possible by the digital transformation and which may also lead to an erosion of confidence in the ability of governments to cope with this change and to look out for people's welfare (Anderson and Rainie, 2018).

3. Empower people with a mix of skills to succeed in a digital world of work

To meet these challenges, a life-long approach is needed for skills development (OECD, forthcoming b). Initial education should focus on equipping young people with the knowledge, skills and attitudes needed for the new emerging opportunities in life and work while adult learning stands to play a crucial role in helping those already in the labour force acquire the skills needed in digitally enabled workplaces. For this to succeed, the notion of "digital skills" needs to be expanded beyond technical knowhow or STEM (science, technology, engineering and mathematics) to include skills such as complex problem solving, critical and creative thinking, social skills, and, not least, a strong ability to continue learning (Deming, 2015). OECD analysis shows that most skills are better rewarded in digital-intensive sectors (Figure 3) and that individuals with the certain skill bundles earn a premium in digital-intensive sectors (Grundke et al., 2018).

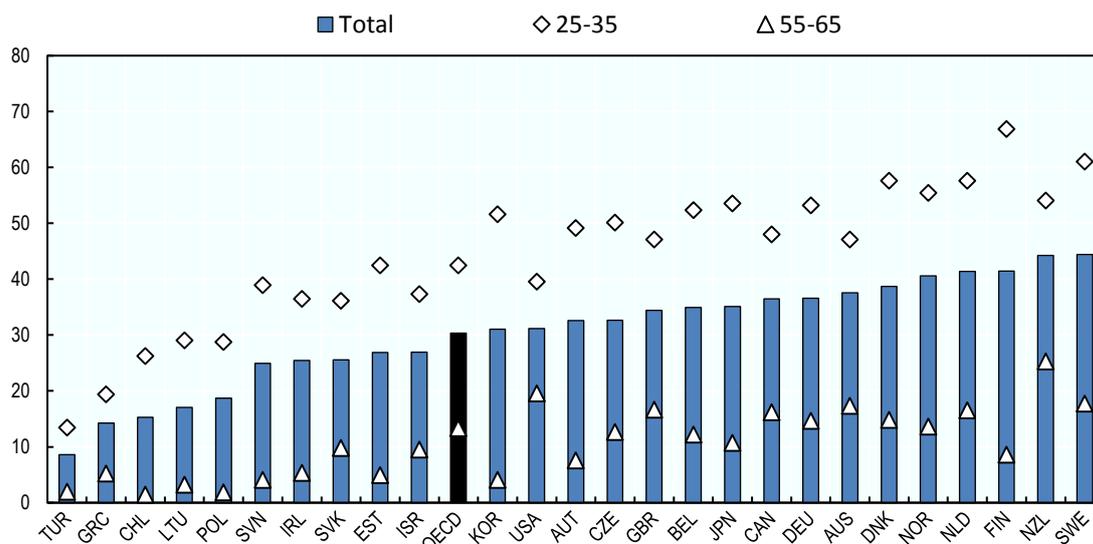**Figure 3.** Additional labour market returns to skills in digital-intensive industries, 2012 or 2015

Percentage change in hourly wages for a standard deviation increase in each skill

Legend: ■ Returns to skills in less digital-intensive industries ■ Additional returns to skills in digital-intensive industries ▨ Coefficient insignificant at the 5% level

Categories (x-axis): ICT skills, Numeracy, Management and communication, STEM-quantitative, Self-organisation, Problem solving, Readiness to learn, Marketing and accounting, Literacy

Note: See endnote 3.

Source: OECD (2017a), *Science, Technology and Innovation Scoreboard 2017: The Digital Transformation*, https://doi.org/10.1787/9789264268821-en, based on OECD, *Survey of Adult Skills (PIAAC)* database (accessed June 2017).

Addressing the digital skills shortfall will be a defining challenge of the digital era where it is estimated that at least half of the existing labour force will go through some re- and up-skilling and where only roughly 30% of adults (OECD average) is highly proficient in problem solving. This is especially the case for workers aged 55 and older (Figure 4).

Figure 4. Digital skills vary across countries and age groups

Share of individuals scoring at Level 2 or Level 3 in problem-solving in technology-rich environments, by age, PIAAC 2012 and 2015

Legend: ■ Total ◇ 25-35 △ 55-65

Countries (x-axis): TUR, GRC, CHL, LTU, POL, SVN, IRL, SVK, EST, ISR, OECD, KOR, USA, AUT, CZE, GBR, BEL, JPN, CAN, DEU, AUS, DNK, NOR, NLD, FIN, NZL, SWE

Notes: For the majority of countries, data is from 2012. For Chile, Greece, Israel, Lithuania, New Zealand, Slovenia and Turkey, data is from 2015. The OECD average is population weighted.

Source: OECD (2016), *Skills Matter: Further Results from the Survey of Adult Skills*, https://doi.org/10.1787/9789264258051-en, based on OECD, *Survey of Adult Skills (PIAAC)* database.

To undertake this reskilling campaign *en masse, i.e. for all,* will be a huge challenge and will require a range of co-ordinated efforts from actors across society:

- ***Improve the future readiness of adult learning systems***. Adult learning systems need to be significantly scaled up and reach adults most at risk of being left behind by the digital transformation. Training that is line with labour market needs is essential to ensure that learners see returns in terms of wages and employment opportunities to their participation. Policies should additionally aim to raise aspirations for learning, through career guidance, the assessment of individual skill gaps and transparent information on the quality of the training available (OECD, 2019b).

- ***Develop digital tools to assist in re- and up-skilling***. Digital tools can help tailor, accelerate and inject far more flexibility in the process, with the aim to give individuals more ownership over what, how, when and where they learn. As a lack of time and the location of training are often cited as a major barrier by non-participants, digital tools have a significant role to play in increasing training participation.

- ***Develop new standards to recognise the skills acquired through lifelong learning***. Non-formal and informal learning represent the bulk of training among adults, yet they often go uncertified, limiting the value of the skills acquired when changing jobs or enrolling in further formal education. New accreditation mechanisms – including those that accredit learning in much more granular ways ("micro-credentials") – that provide an assessment of skills should be developed (OECD, forthcoming c; 2018c).

- ***Encouraging participation through targeted incentives***. Target financial incentives for training, to employers and participants, and on the groups least likely to benefit. Individual learning accounts have been proposed and implemented in a few countries as one way to empower workers to make their own training decisions. If vulnerable workers are to benefit fully from these schemes, they need to be complemented by targeted support.

- **Share the financial burden of scaling up adult learning systems**. Because training benefits all, the responsibility of provision and funding needs to be shared between employers and individuals, as well as governments, and built on co-operation between all stakeholders.

4. Take a multi-faceted approach: There is no one path for navigating the digital transformation

Existing employment and labour policies will need to adapt to ensure that existing protections and values are preserved in the digital age. Digitally-enabled businesses may increase the already sizable number of workers (one-third of the OECD labour force) in non-standard forms of employment: temporary, part-time, and self-employment. Women and disenfranchised groups, such as disadvantaged youth, migrants and the least-skilled, are over-represented in non-standard forms of employment. Already, non-standard work is often a poor fit with traditional social protection systems predicated on the archetype of full-time, permanent work for a single employer. Workers who do not conform to this norm – because they combine incomes from different sources or work in temporary or independent forms of employment – often lack coverage or risk losing accumulated benefit entitlements as they move between jobs or in and out of employment spells. At the same time, existing social protection systems may create incentives for non-standard employment if the way that social protection is financed implies significantly lower labour costs for those with non-standard contracts (OECD, forthcoming a).

These challenges require addressing how existing workplace policy objectives – safe working conditions, minimum wages, support during out-of-work periods, training, labour taxes, health care – can be extended to as many workers as possible. For example, own-account workers are significantly more likely than employees to earn less than the minimum wage (OECD, 2018d). Such workers are less likely to be covered by collective bargaining arrangements and some labour regulations, and tend to receive less training and be exposed to more job strain. Many might also not be protected at all by the standard rules for hiring and firing applying to open-ended contracts. Oftentimes, less strict rules apply (e.g. in cases of temporary employment, temporary work agency work or dependent self-employment) while in others, workers are excluded from employment protection legislation altogether (e.g. the self-employed). For some of the emerging new forms of work, it is not even clear what the status of workers is, who the employer is, and what rules should apply to them. It will therefore be critical for countries to examine their legal frameworks to determine whether they need to be updated and/or adjusted to remain fit for purpose so that all workers, regardless of contract type, receive adequate rights, benefits and protections.

A fundamental shift, underpinned by digital transformation, is a change in focus from the employer to the worker (both current and prospective) and with it the provision of benefits to the individual that ensures greater portability between employers across firms and borders.

- *Tying social protection entitlements to an individual, instead of a job,* would facilitate transitions between jobs and sectors. This can be done in the context of existing redistributive social protection systems, e.g. by enhancing the portability of built-up benefit entitlements across jobs. Several OECD countries also intend to introduce "individual activity accounts" (e.g. France and Germany), which are not only portable but can be used flexibly according to needs. When designing protection focussed on individuals, care should be taken to preserve an adequate degree of redistribution and risk sharing between disadvantaged and better-off workers.

- *Incorporate non-standard workers into existing social protection systems*. Several countries already do this, but a number of challenges persist, such as defining who pays the employer contribution.

- *Income support may need to be made more accessible*. Income support schemes should be designed to provide income security and compensate for lost earnings while not undermining work incentives, thus allowing jobseekers to return to work rapidly by accepting a new job at a lower pay level (OECD, 2018b).

- *In many countries, existing social protection systems are very effective at furthering inclusiveness*. Major departures from existing social protection strategies require very careful consideration in order to prevent unintended effects. For instance, several countries are experimenting with various forms of basic income schemes which, besides being simple, have the advantage of not leaving anyone without support. They would, however, typically require large tax increases and may redirect support away from disadvantaged groups (OECD, 2017b).

- *Labour taxes need to be reviewed to ensure neutrality and reduce arbitrage opportunities*. If not, tax differentials across employment types may have the potential to produce significant labour market effects and revenue consequences. If a particular type of work has a different tax treatment, this should be a specific policy choice (OECD, 2018e).

- *Foster social dialogue and collective bargaining*. Anticipating future challenges and opportunities, finding solutions, managing change proactively, and shaping the future world of work can be achieved more easily and effectively if employers, workers and their representatives work closely together with governments in a spirit of co-operation and mutual trust. It will be important to understand how to promote workers' representation in a world where flexible forms of employment may become more common.

5. Paying for the worker transition to the digital era

Overcoming the training and social protection challenge will require additional resources in an era when public budgets are under pressure. Andrieu et al. (2019) estimate that the country-level minimum cost of moving workers in occupations at high risk of automation (on average, 14% of the labour force) to occupations where they are not at such risk ranges between 1% and 5% of a single year's GDP, on average across the countries considered. These cost estimates include both the direct costs of training as well as the indirect costs of foregone wages, as workers undertaking full time training may be unable to work. This 1% to 5% of one-year GDP is to be considered in addition to existing training and social protection expenditures. Clearly, this will be a non-trivial undertaking.

Obviously this cost would increase as training provision is extended beyond the 14% of the labour force thought to be at a "high risk" to the additional 32% estimated to be at a "significant risk" of automation, although this may imply a lower average cost per worker. These estimates involve a number of assumptions[4] and intend to provide an analytical framework for thinking about the challenges and a baseline of the potential scale of the coming demand for training to up-grade workers. Also, the estimated cost does not need to be incurred all at once, given the pace and intensity of the transformation is likely to differ widely by sector, task and location, as so does mobility of workers out of "high risk" occupations. Countries have yet to determine how to split these costs between employers, governments, and workers and which incentive mechanisms may be needed.

Governments may also need to adapt revenue sources to cover the costs. In the area of taxation, we have seen a number of recent initiatives, from the use of digital tools to improve compliance and detect fraud and evasion to the OECD/G20 Base Erosion and Profit Shifting (BEPS) project that seeks to address the tax avoidance of multinational enterprises. These initiatives and others that will emerge such as AI provide governments with the tools necessary

to broaden their tax bases and strengthen their tax systems against abuse. Non-tax sources of revenue can be considered as well such as the issuing of permits or certificates for automated production and/or activities, like automated trucks. All revenue-raising initiatives should be carefully evaluated in a broader fiscal and innovation policy context to ensure that the revenue gains do not come at the unintended expense of other policy goals such as technology diffusion and adoption.

Additional revenues raised from these initiatives may increase the capacity of governments to fund the transition agenda and help reconnect the many who feel left behind. All stakeholders should participate, including businesses who badly need workers with the appropriate skills. This collaboration could lead to the creation of new public-private partnerships to help achieve this goal.

Notes

1. Skill distances between different jobs are measured in terms of underlying skill needs and task contents of different jobs and hence the "distance" is measured in the skills needs to move from one to another.

2. OECD (forthcoming a) analyses these issues in detail.

3. The figure shows the percentage changes in wages for an increase in skills by one standard deviation, estimated separately for each skills. Skill measures based on PIAAC are taken from Grundke et al. (2017). Shaded bars signal that the coefficient is not significant at the 5% level. Labour market returns to skills are based on Ordinary Least Squares wage regressions using data from PIAAC and the pooled set of 31 OECD countries and partner economies, and controlling for a number of individual-related control variables (including age, years of education, gender and the cognitive skills literacy and numeracy) as well as country, industry and occupation dummy variables. Digital-intensive industries are defined using new measures of digital penetration proposed by Calvino et al. (2018).

4. See in particular the Introduction, as well as Section 8 and Annex B in Andrieu et al. (2019), detailing the assumptions made and their possible implications for measurement.

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