

ISSUE BRIEF

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Cluster 3: Technology for social, environmental and economic development

The impact of technology on the quality and quantity of jobs

The establishment of the Global Commission on the Future of Work in August 2017 marked the start of the second phase of ILO's Future of Work Centenary initiative. The six thematic clusters provide a basis for further deliberations of the Global Commission. They focus on the main issues that need to be considered if the future of work is to be one that provides security, equality and prosperity. A series of Issue Briefs are prepared under each of the proposed clusters. These are intended to stimulate discussion on a select number of issues under the different themes. The thematic clusters are not necessarily related to the structure of the final report.

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Introduction

Increased digitalization and automation is expected to significantly affect both the quality and quantity of jobs. New types of jobs and employment are changing the nature and conditions of work by altering skills requirements and replacing traditional patterns of work and sources of income. They open opportunities, especially for developing countries, to enter new, fast-growing sectors and catch up with more advanced economies. At the same time, new technologies are affecting the functioning of labour markets and challenging the effectiveness of existing labour market institutions, with far-reaching consequences for the number of jobs, their quality and the diversity of opportunities they offer.

This Issue Brief discusses the potential of technological change for job creation and destruction and its implications for inequality and job polarization. It also highlights the opportunities for economic development and labour market efficiency and inclusion.

Key findings

Technology and jobs

Current studies emphasize the disruptive nature of technological changes, stressing the potentially wide-ranging implications for job destruction (ILO, 2017). Evaluations of the extent of labour market disruption vary widely and range from a low of less than 10 per cent of all jobs to a high of more than 60 per cent (see Balliester and Elsheikhi, forthcoming, for an overview). Frey and Osborne (2017) estimate that 47 per cent of US jobs are susceptible to potential technological replacement. However, such assessments tend to overestimate the potential adverse effects of automation by focusing exclusively on the technical feasibility of substituting labour by capital. Thus, they ignore economic feasibility, i.e. whether the investment in new technologies is at least as profitable as existing (labour-intensive) alternatives (Kucera, 2017).

Future automation is unlikely to destroy complete occupations but will rather change the types and number of tasks in most occupations. According to the World Bank, less than 20 per cent of jobs are predicted to disappear completely (World Bank, 2016a; see also Autor and Handel, 2013). A recent study by McKinsey Global Institute that looked at both sides of the debate estimated that by 2030, in about 60 per cent of occupations, at least one-third of constituent activities could be automated (MGI, 2017). While this is likely to have a differential impact in different countries, the full-time equivalent of work potentially displaced by automation is estimated at a midpoint of 15 per cent. In addition, between 3 and 14 per cent of the global workforce would need to switch occupational categories (see Issue Brief No. 8). Thus, while there might well be sufficient job creation to compensate for technological unemployment, the realization of these opportunities will depend on ensuring that workers can move to newly created jobs. In short, a bigger challenge may well be how to manage this transition (see Issue Brief No. 7).

History points to similar experiences. An often-cited example is the impact of the introduction of ATMs on jobs for bank tellers in the United States in the 1970s. Instead of – as one might have assumed – bank teller jobs being eliminated, their number rose modestly despite the rapid roll-out of ATMs (Bessen, 2015). In France, the Internet is thought to have destroyed some 500,000 jobs within 15 years after its introduction; at the same time, it has created 1.2 million new jobs (MGI, 2011). One important reason for this is the reduction in operating and transaction costs resulting from these technological innovations, which can indirectly stimulate the demand for labour. Technological change can also create a range of new tasks; for instance, from a bank teller to a financial services advisor. In the United States, for example, 30 per cent of the jobs created since the late 1990s were types that did not exist before, such as IT administration, hardware manufacturing and development of smartphone applications (MGI, 2017).

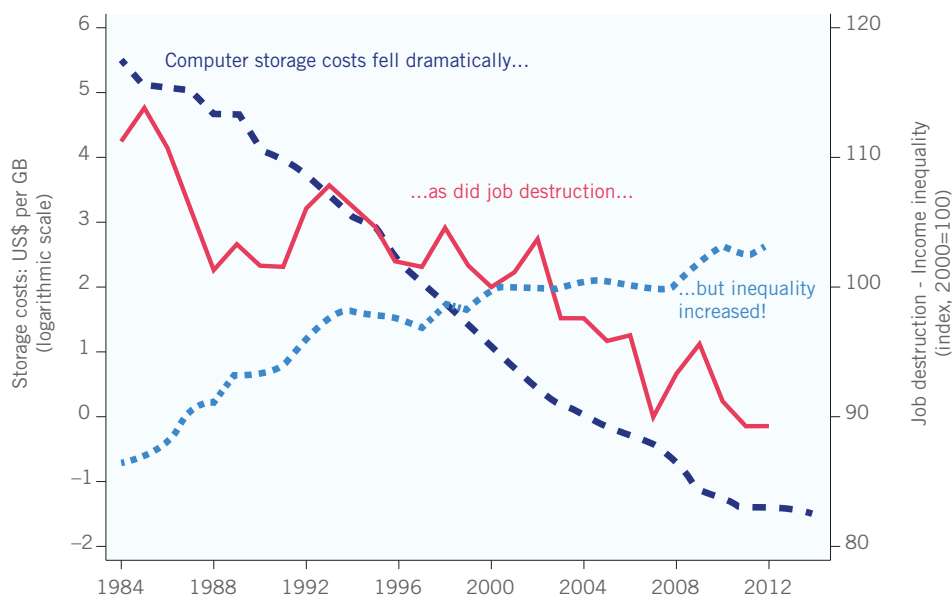
Jobs are typically made up of both readily automatable and not readily automatable tasks. This raises the question of whether the automation of work processes will result in a reduction of the workforce, or whether the remaining tasks might be shared among the existing workforce. The answer to this question depends on how work is organized in a given workplace and on the extent to which tasks that are not readily automatable can be bundled together to create a new job (Kucera, 2017). The automation of work processes need not present an “all or nothing” scenario; different options do exist. As with work-sharing arrangements implemented by some countries in the wake of the global financial crisis, social dialogue can play an important role in exploring the options and mediating the impact of new automation technologies on workers (see Issue Brief No. 7).

In the aggregate, technological change does not seem to have led to a significant increase in joblessness (Atkinson and Wu, 2017). Global employment continues to expand in line with the labour force, bringing global unemployment rates down to 5.6 per cent (ILO, 2018). In advanced economies, the costs of digitalization have declined dramatically, but job destruction rates have actually fallen over the longer term (see figure 1; Davis and Haltiwanger, 2014).

Sharing technological dividends

How to share technological gains (“technological dividends”) broadly in terms of jobs and income has also become a pressing issue. These distributional concerns reflect the experience of the previous wave of technological changes in which technological gains were distributed in favour of capital owners and skilled workers (IMF, 2017). The large economies of scale that exist in digital industries have often led to oligopolistic structures, in which a few emerging players are dominating large shares of the market (Christiaensen, 2017; Parker, Van Alstyne and Choudary, 2017). As it stands now, there is no reason to think that the new wave of technological changes will be different. Income inequality is increasing at the same time as the costs of “big data” storage are falling (see figure 1). While the rise of new “big data” platforms that are able to accumulate ever-increasing information on consumer behaviour and preferences certainly enhances the efficiency of the economy, there is a question as to whether these productivity gains are benefiting societies or being captured by a small number of dominant firms. While it is not yet clear whether the market power these large players enjoy is a temporary or inherent feature of Internet markets (Haucap and Heimeshoff, 2013), this does raise distributional questions. Moreover, the generation of economic value from low-cost unpaid labour each time a user turns on their device and accesses computer-mediated networks raises additional questions about who ultimately benefits from this new form of digital capital (Berg, forthcoming).

Figure 1. Inequality increased as digitalization costs declined in line with job destruction rates

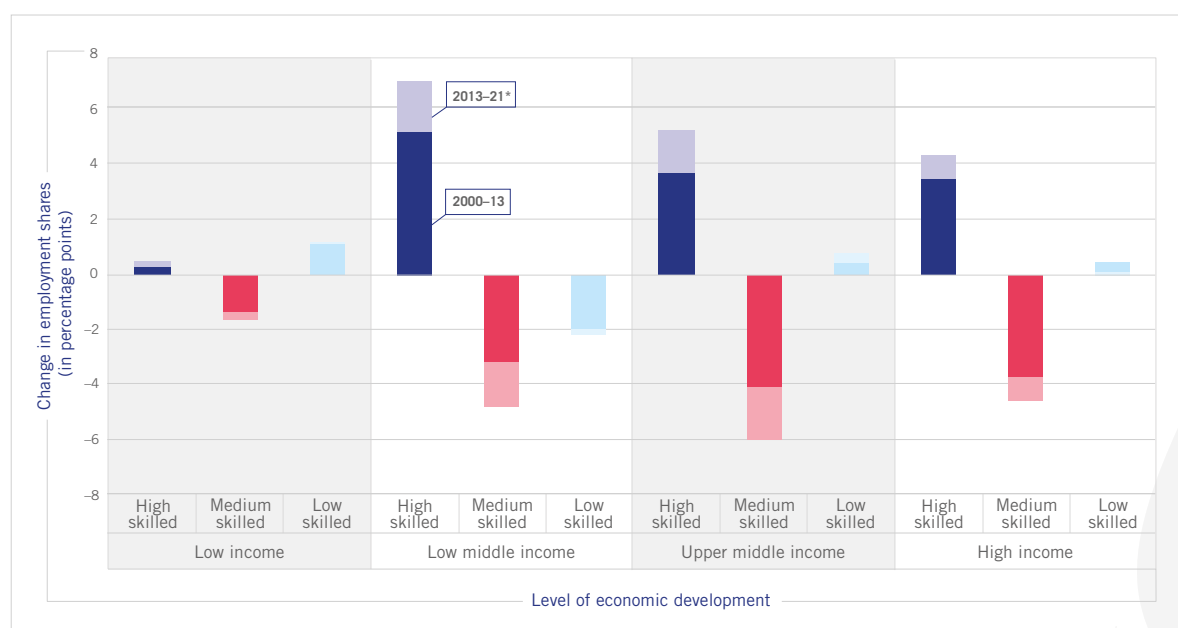


Note: Job destruction rate is a weighted average of Australia, Belgium, Canada, Denmark, France, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Sweden, United Kingdom and United States.

Sources: ILO, Labour Flows database, 2013; OECD, Labour Force Statistics; Muehlhauser, 2014.

Our baseline projection suggests that there is a risk of further job polarization in the years to come (see figure 2). As jobs are being destroyed in manufacturing and parts of services sectors, employment in both low- and high-skilled occupations has risen. Studies on robotization show that displacement is high for routine tasks (i.e. tasks that can easily be translated into software-driven robots), including in many services sectors where digitalization and artificial intelligence have come to play a bigger role. In the absence of effective transition policies, including adequate opportunities to acquire new relevant skills (see Issue Brief No. 8), many of those who are at risk of job loss may be forced to accept lower-skilled and lower-paying jobs, thus putting further pressure on wages in the low-wage sector (Dauth et al., 2017). Indeed, a majority of middle-skilled routine task jobs that were associated with standard employment contracts with regular working hours have been replaced by non-standard forms of employment in both non-routine cognitive and manual task jobs (OECD, 2015).

Figure 2. Job polarization around the globe



Notes: Change in employment shares, in percentage points. * Forecasts after 2016.
Source: ILO Trends Econometric Models, November 2016.

Technological dividends are being unevenly distributed between firms. A small group of firms are taking advantage of new technology (“frontier firms”), while many others are being left behind. In addition, entrepreneurs and micro-, small and medium-sized enterprises (MSMEs) may face challenges with technology adoption. The gaps between frontier firms and the rest are large and growing in many countries (OECD, 2017). This phenomenon has been accompanied by the rise of highly concentrated product and services markets in which a very limited number of “superstar” firms tend to dominate, as mentioned earlier with respect to “big data” (Autor et al., 2017). Not surprisingly, the rise of such market power is associated with falling labour income share.

Potential for development

Sharing technological dividends is an issue of global scale. How can we ensure that all countries, both developed and developing, benefit from the current technological changes? There are three channels through which new technology may have an impact on the world of work in developing countries: (i) automation and robotization; (ii) connectivity; and (iii) innovation (see Christiaensen, 2017). The degree to which developing countries will be able to take advantage of and benefit from these channels remains an open question.

The automation of production processes and the increased deployment of robots require significant investments. In countries with relatively low labour costs, such investments might still be unprofitable. However, with increasing income, the likelihood of adopting automating technologies and hence replacing humans by machines will increase. From a purely technological standpoint, about two-thirds of jobs could be automated in developing countries over the following decades (World Bank, 2016b). At the same

time, mobile and flexible robots are emerging which are supplied at comparably low prices. They are able to perform a wide range of different tasks and have opened up a window of opportunity to develop new industries and create jobs, in particular in developing countries. Experience from South-East Asia demonstrates that countries which had already developed the collective capabilities to innovate were successful in adopting robot technologies and developing robot-intensive industries. Such capabilities are embodied in the knowledge base of a society, including the composition and diversity of different technical skills and knowledge acquired by the labour force, as well as by the socially shared values and beliefs that shape expectations, choices and behaviour (Nübler, 2017). Nevertheless, developing countries might still experience disruption as a result of automation in more technologically advanced countries, which might result in reshoring of certain tasks and activities (see Issue Brief No. 10). Developing countries also might not have the capabilities needed to take advantage of the potential that new technologies hold for improving processes and products.

The Internet has enhanced connectivity, including to global markets. This has improved the development prospects for countries that are able to take advantage of this increased connectivity and supply their services from anywhere in the world. In contrast to previous waves of development and catching up which relied on a strong and expanding manufacturing base, services sector growth today plays an increasing role in the development process. Emerging and developing economies may well be able to mitigate the adverse effects from the potential reshoring of production by increasing their trade in services (see Issue Brief No. 10) (World Bank, 2016a). There may also be new opportunities for developing countries to become engaged in “remote repairing”. The increasing interconnectedness of physical devices and appliances allows location-independent technicians to support clients with direct troubleshooting via the Internet. In addition, the development of the platform economy allows developing countries to participate in this “trade in tasks” and thus to catch a larger share of global value added in services (see Issue Brief No. 5). However, platforms are mostly developed in advanced economies, and markets can become rapidly dominated by those who entered early in the process. There is thus a risk that developing countries will become increasingly dependent on enterprises located in developed countries.

Digitalization can also have a positive impact on the innovation strength of developing countries. Ecosystems for innovation, such as tech hubs and makerspaces, are accessible online and facilitate the exchange of knowledge and ideas among peers. Smartphone applications enable developers to deploy their ideas at relatively low costs and risks. And e-commerce platforms allow digital start-ups to market their products to a large number of customers worldwide.

Automation and artificial intelligence will also play an important role in agriculture, particularly with growth in the demand for global goods (OECD and FAO, 2016). As shown in a recent study by Jayne, Kwame Yeboah and Henry (2018), “smart farming” increases productivity by using the Internet of things, with sensors to collect real-time data and integrated monitoring systems to create optimal conditions for sowing, watering, fertilizing and harvesting. Unmanned agricultural drones and satellites, self-driving farm equipment, and robot pickers for fruits and vegetables are all expected to reduce the need for human work. At the same time, new technology offers better access to product innovations, new agricultural practices and market developments.

While commercial agriculture will benefit most from such innovations, smaller farmers of traditional food staples and subsistence farmers may also benefit. Innovations in crop

genetics, organic agriculture and irrigation as well as other infrastructure, for example, are credited with productivity improvements among small producers. Smartphone-based renting applications for agricultural machinery (e.g. “Hello Tractor” in Nigeria) enable small farmers to access modern technology at low cost. Apps are also used by small farmers to access agricultural extension services, as well as to improve planting and crop rotation. Research capacity and expertise, complemented by extension and commercialization, will be essential and still remain a big challenge in many developing countries.

A study across 21 emerging and developing countries and 11 developed countries revealed that there is still a large gap in Internet usage across the globe. While a median of 54 per cent of adults in emerging and developing countries reported using the Internet at least occasionally, this rate was 33 percentage points higher in advanced economies (PRC, 2016). Although Internet usage in emerging and developing countries has expanded steadily over the past years, increased efforts are needed to close the digital divide in order to make the benefits of technological advancement more inclusive.

Labour market efficiency and inclusion

As an additional benefit, new technologies are expected to improve the functioning of the labour market, which could help in addressing risks of mismatch and long-term unemployment. The analysis of “big data” can also serve as a forecasting tool. An analysis of social media conversations about work-related anxiety resulted in the prediction of an unemployment spike in Ireland three months before the release of official statistics (United Nations Global Pulse, 2013). Artificial intelligence and big data techniques, for instance, are increasingly being implemented (by large enterprises) to improve recruitment processes, thereby helping to correct skills mismatches. Time saved by automating parts of the hiring process and improved hiring quality from standardized job matching can help enhance labour market efficiency. Digital platforms, such as LinkedIn and Monster.com, are already connecting individuals with work opportunities in both traditional and digital workplaces, as well as in developed and developing countries, thereby taking over tasks traditionally carried out by headhunters. These platforms can bring significant gains at both the micro and macro levels. According to the McKinsey Global Institute, online platforms could match workers and employers, yielding 72 million jobs and spurring global GDP by 2 per cent within the next decade (MGI, 2015). First experiences suggest, however, that such digital hiring methods have the tendency to replicate existing recruitment biases, undermining efforts to promote broader labour market diversity (Mann and O’Neil, 2016).

The unequal impact that digitalization and automation have on sectors and locations runs the risk of worsening existing gender imbalances. Men may face larger job losses than women in certain industries exposed to automation, for instance in the automotive industry (Acemoglu and Restrepo, 2017). According to one study, however, men are expected to recover more from these job losses than women: men will lose about 4 million jobs by 2020 but are expected to gain another 1.4 million, i.e. roughly one job gained for every 2.9 jobs lost. In contrast, women will face 3 million job losses but only 0.6 million gains, or only one job gained for five jobs lost (WEF, 2016). Moreover, these alternative employment opportunities for women are often found in the care sector, which is expected to expand further as a result of population ageing. Jobs in this sector present, however, significant decent work deficits; along with unpaid care work, they prevent the development of a larger, diversified care services market, thereby perpetuating gender inequalities (see Issue Brief No. 3). This trend is not universal, however, and in some Latin American and South-East Asian countries the opposite might be true. In Argentina,

for instance, female jobholders face an automation probability of 61.3 per cent, while for men it stands at 66.1 per cent (MH, 2016). In ASEAN countries, women represent the majority in occupations that are judged as vulnerable to being automated and are thus more likely to become unemployed than men (Chang and Huynh, 2016). However, taking account of economic feasibility and low robot deployment in light manufacturing, such as in apparel where female employment tends to be concentrated, the gender impact of workplace automation could be mitigated.

Some considerations

The overall effects of technological change are likely to be context-specific, differing among countries, sectors and occupations. They will depend on the institutional set-up that influences the opportunity costs of automation and the capacity of the workforce to adjust to the new, robot-based work environment, as well as the potential for worker mobility across sectors and locations. Great potential for economic growth in developing countries exists, although challenges remain to take advantage of those possibilities.

- What policies are critical for sharing technological dividends broadly and avoiding increased labour market polarization and income inequality?
- What policies need to be enacted to enable developing countries to reap the full benefits of the current wave of technological change, including in the services sector?
- How can the current technological revolution be managed to improve the functioning of labour markets and strengthen inclusiveness?
- What measures need to be taken to mitigate the consequences of job destruction?

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Notes

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