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Technology and the future of work in emerging economies: What is different?

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Abstract

Technological developments are likely to bring many new opportunities, which may be even larger in emerging economies and may allow them to "leapfrog" certain stages of development. Notwithstanding these opportunities, emerging economies face significant challenges associated with rapid technological progress. Many of these challenges are the same as in advanced economies, but differences in starting conditions may result in a greater threat for the emerging world. This study explores the benefits and risks brought by this new technological wave from the perspective of thirteen key emerging economies: Argentina, Brazil, Colombia, Costa Rica, Chile, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa and Turkey. In particular, it examines: the risk of automation; whether labour markets are polarising; and the potential benefits (but also challenges) of the platform economy.

Résumé

Les développements technologiques sont susceptibles de créer de nombreuses opportunités nouvelles, peut-être même plus importantes dans les économies émergentes, qui pourraient leur permettre de «sauter» certaines étapes du développement. Malgré ces opportunités, les économies émergentes sont confrontées à des défis importants liés aux progrès technologiques rapides. Bon nombre de ces défis sont les mêmes que dans les économies avancées, mais les différences en termes de point de départ pourraient impliquer une plus grande menace pour le monde émergent. Cette étude explore les avantages et les risques apportés par cette nouvelle vague technologique dans treize économies émergentes clés: Argentine, Brésil, Colombie, Costa Rica, Chili, Chine, Inde, Indonésie, Mexique, Russie, Arabie Saoudite, Afrique du Sud et Turquie. En particulier, elle examine: le risque d'automatisation; si les marchés du travail se polarisent; et les avantages potentiels (mais aussi les défis) de l'économie des plateformes.

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Introduction

1. Driven by a new technological wave, the future of work is likely to offer many benefits, which may be even larger in emerging economies as they are not locked into the existing technologies, enabling them to "leapfrog" the traditional development path (Lee, 2013). A number of recent technological breakthroughs - especially in artificial intelligence (AI), machine learning, and robotics - are unleashing new capabilities and promise higher productivity and greater job quality in areas ranging from precision agriculture to advanced manufacturing. The increasing pace of ICT penetration combined with the proliferation of digital platforms may favour the rise of the "on-demand" economy and create opportunities for workers in emerging economies, especially as the ability to de-bundle jobs into smaller tasks will allow work to be carried out more efficiently on a truly global, digital assembly line. New technologies can also reduce information asymmetries, which helps financial inclusion for people without credit histories and can improve job-matching. In addition, the increased flexibility generated by new forms of work can provide greater opportunities for under-represented groups, such as women, to participate in the labour market, helping to close the marked gender gaps that exist in emerging economies.

2. Notwithstanding these opportunities, emerging economies also face significant challenges associated with rapid technological progress. There are fears that technologies could potentially displace human labour (Brynjolfsson & Mcafee, 2011; Mokyr, Vickers, & Ziebarth, 2015; OECD, Good jobs for all in a changing world of work: The OECD Jobs Strategy, 2018), widen income inequality (Acemoglu & Autor, Skills, Tasks and Technologies: Implications for Employment and Earnings, 2011), and further increase the share of informal and/or contingent work affecting the quality of jobs that are created (OECD, 2016). Many of these challenges are the same as in advanced economies, but differences in starting conditions may result in a greater threat for the emerging world. In many emerging countries labour forces are rapidly growing in relation to the overall population, raising concerns that not enough jobs will be created to employ bulging working-age populations. Recent developments in robotics and 3D printing allow firms in advanced economies to relocate production closer to domestic markets in more fully automated factories. As a result, some emerging economies are experiencing "premature deindustrialisation" (Rodrik, 2016). Adjustment costs may be significant and are more likely to be borne by the low-skilled as well as those currently performing more routine tasks that are more likely to be automated. Combined with a general increase in the demand for higher level skills, these trends may lead to further increases in already high levels of inequality in emerging economies.

3. Many studies and initiatives have examined what these changes mean for advanced economies. However, much less work has been done from the perspective of developing and emerging economies (a few exceptions being Chandy (The Future of Work in the Developing World, 2017); African Development Bank Group et al. (The Future of Work: Regional Perspectives, 2018) and World Bank (World development report 2019: The changing nature of work, 2019).While much has been written about how advanced economies should prepare for the future of work, policy advice for emerging economies is rare. The choice and combination of policies will depend on the impact that technology is likely to have on the labour market and, therefore, the policy response in emerging economies might have to be different from that in more advanced countries. Ultimately, how these changes play out and whether the benefits in terms of income, health, flexibility,

and employment will outweigh the costs will depend to a large extent on the policies that countries implement to take advantage of these technologies, mitigate their adverse effects, and share benefits among the whole population.

4. This study contributes to fill the knowledge gap on how technology is impacting labour markets in emerging economies and explores the potential benefits and risks brought by this new technological wave from the perspective of thirteen key emerging economies (OECD emerging economies, accession countries and G20 emerging economies): Argentina, Brazil, Colombia, Costa Rica, Chile, China, India, Indonesia, Mexico, the Russian Federation, Saudi Arabia, South Africa and Turkey.

5. While from the technological standpoint many jobs are theoretically automatable in many emerging economies, actually automating them is not yet economically attractive or feasible due to an abundance of cheap labour and slower technology adoption (Section 1). Since technology adoption is sluggish, there are few signs of pervasive labour or wage polarisation related to technology and the labour polarisation observed in some emerging countries is largely driven by structural change (in particular, the decline in the agricultural sector - Section 2). As a result, the potential labour market disruption associated with the expanding scope of automation and labour polarisation is likely to affect emerging economies later than advanced ones. However, high levels of self-employment and sizeable informal sectors, the lower coverage and generosity of social protection systems, along with a tax system that delivers only modest redistribution, make these challenges even harder to tackle in emerging economies. Technology, however, might be also part of the solution. In particular, the "platform" economy could bring important opportunities for emerging economies. Not only could it help to formalise large pools of informal workers, it could also boost labour market participation and improve working conditions (Section 3).

1. The risk of automation in emerging economies

1.1. Introduction

6. There is evidence to suggest that, in advanced economies, the penetration of robots has had negative effects on both employment and wages (Acemoglu & Restrepo, Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation, 2017) – at least in the short- to medium-run – and that automation puts some workers' jobs at risk (Nedelkoska & Quintini, 2018). Low-skill jobs that are intensive in routine tasks, whether cognitive (e.g. clerical work, bookkeeping, basic paralegal work and reporting) or manual (like those used in manufacturing and construction) are most susceptible to automation and offshoring. Thus, workers involved in routine tasks that are "codifiable" are most vulnerable to replacement. Displaced workers are likely to compete with (other) low-skilled workers for jobs with low (and possibly decreasing) wages.

7. Ongoing technological advances such as the advent of Big Data, artificial intelligence (AI) and ever-increasing computing power (i.e. the digital revolution) are expanding the range of tasks that can be automated, including non-routine tasks. These advancements have ignited fears that technology will create mass labour displacement, increase technological unemployment, and continue to widen inequality and polarise the labour market into good jobs (stable jobs with benefits), on the one hand, and precarious ones, on the other.

8. Notwithstanding these threats, technology also brings opportunities. In the past, technology has opened new sectors and brought higher labour productivity by reducing the need for workers in routine tasks and allowing them to dedicate time to other, more productive ones. On balance, technology has so far created more jobs than it has destroyed (OECD, 2015; Mokyr, Vickers, & Ziebarth, 2015). Thus, the important insight provided by history is that productivity-enhancing but job-destroying technological changes trigger adjustment processes. These create new jobs because they expand output and generate new economic activities, products, and industries (Perez, 2016). Thus, if history is anything to go by, overall employment is unlikely to decline as a result of technological change.

9. However, there is more uncertainty about the effects of automation on emerging economies since the debate on automation and jobs has been mainly focused on more advanced countries and emerging countries have different initial conditions. Automation will also affect the future of work in emerging countries and, middle-income countries, in particular, have the potential to benefit from it. Many emerging economies have become major players in the world market, both as exporters and importers. The rapid fall in the cost of communication and transportation has not only promoted the integration of goods and services markets, but has also facilitated an accelerated pace of technological dissemination. These developments have been accompanied by innovations in business organisation which are allowing distant economies to be integrated into the global market (OECD, 2012). Thus, as developing economies are increasingly integrated into international markets and production systems, robot technologies may affect developing countries by either creating new opportunities for industrial development or new risks of losing manufacturing activities. Hence, in emerging countries, the issue is whether robot technologies will limit or expand the potential for catching up in productivity and jobs.

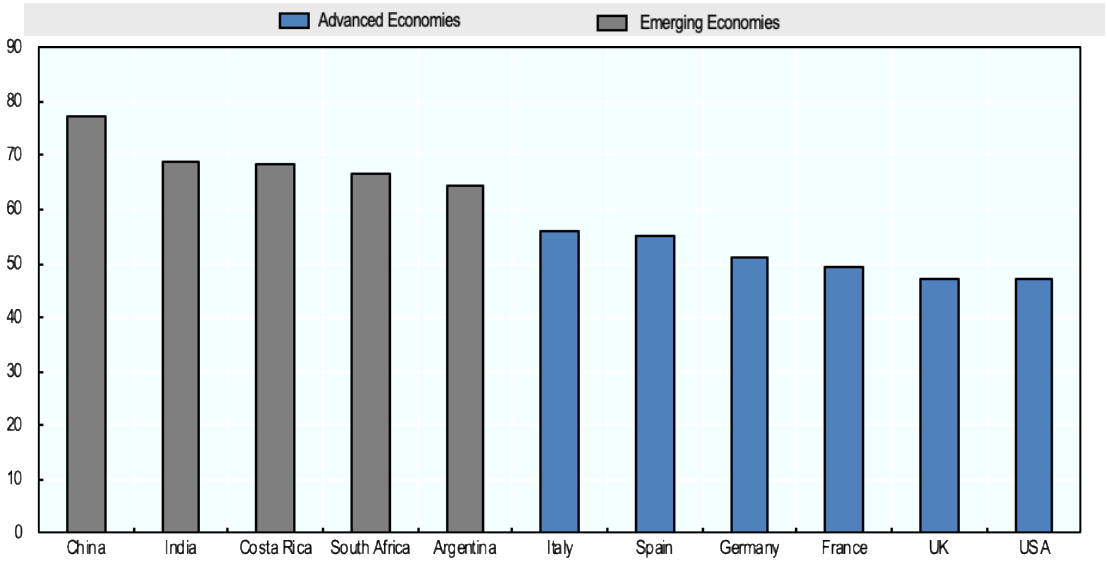
1.2. Estimating the risk of automation in emerging economies

1.2.1. Initial estimates predicted great risks of automation across all countries, with much higher risk in emerging economies

10. Initial estimates of the risk of automation fuelled fears that technology would create mass labour dislocation and showed that emerging economies were particularly at risk as they are more specialised in low-wage, low-skilled occupations, which are easier to automate. Frey and Osborne (The future of employment: How susceptible are jobs to computerisation?, 2013) classified occupations in the US with respect to the risk of automation by asking experts about the technological potential for automation in the near future. The study suggests that 47% of all persons employed in the US are working in jobs that could be performed by computers and algorithms within the next 10 to 20 years. Several follow-up studies applied the risk of automation at the level of occupations to other countries, thereby assuming that the risk of automation for a particular occupation is comparable across countries. For example, Bowles (The computerisation of European jobs, 2014) extended the analysis to EU-28 countries and the World Bank (World Development Report 2016: Digital dividends, 2016) to several emerging and developing countries. The results show that the share of employment that could experience significant automation is higher in emerging countries than in more advanced ones, where many of these jobs have already disappeared (Figure 1.1)

Figure 1.1. According to early estimates, the risk of automation is higher in emerging economies

Estimated share of employment that is susceptible to automation



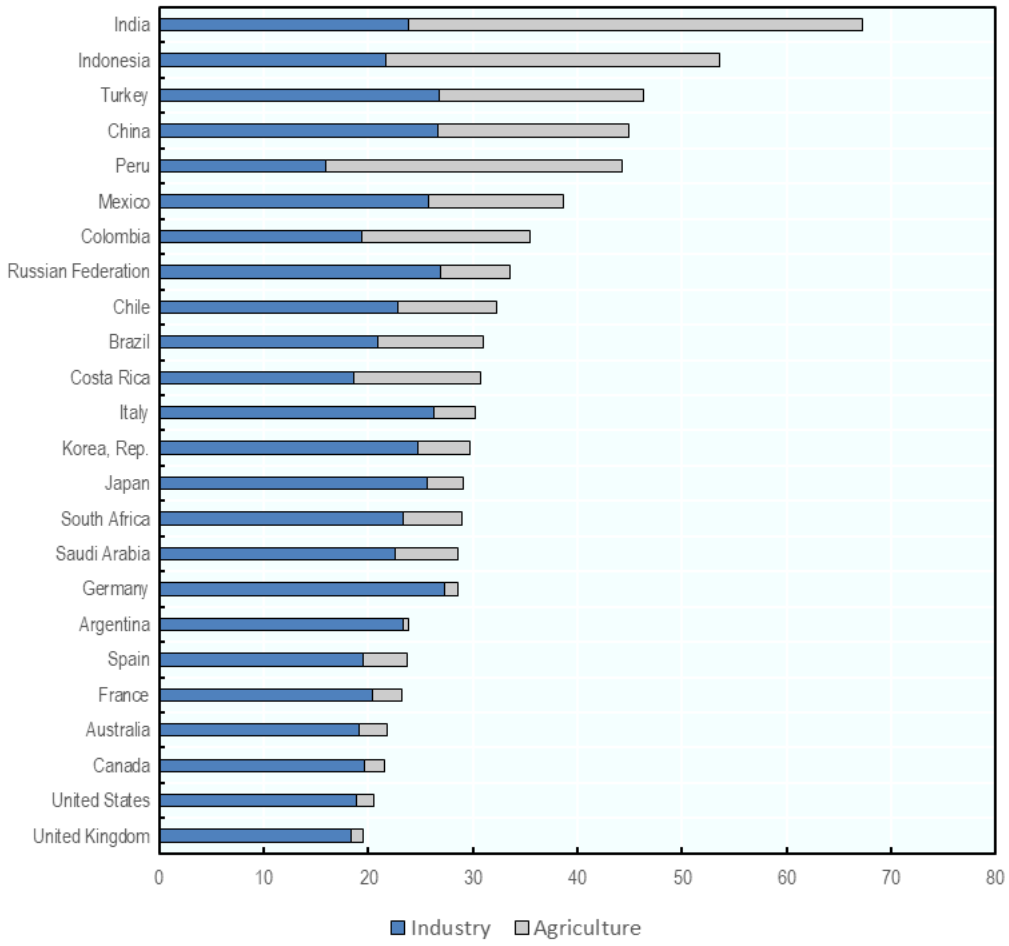
Source: Bowles (2014) for European countries, Frey and Osborne (The future of employment: How susceptible are jobs to computerisation?, 2013) for United States, and World Bank (World Development Report 2016: Digital dividends, 2016) for emerging economies.

11. The level of development has been considered one of the main factors explaining differences across countries in the potential for automation. Due to their current stage in development, a large share of employment in emerging economies is in sectors with higher

risk of automation such as manufacturing and agriculture (Figure 1.2). As economies develop, the sector mix of employment follows a predictable path. The share of agriculture tends to decline in the early stages of economic development. Then, in the middle-income stage, manufacturing industries typically experience an inverted U-shaped trend in employment share as these sectors peak and then begin to decline. Services grow continuously as a share of employment as nations move along the income and economic development curve, including government and regulated sectors such as education and health care. As a result of this structural process, countries grow by shifting labour from low productivity activities, often in agriculture, to higher productivity ones, mostly in manufacturing and some in the service sectors.

Figure 1.2. Agriculture and industry make up a large share of employment in many emerging economies

Employment in industry and in agriculture (% of total employment), 2017



Source: World Bank. WDI 2018

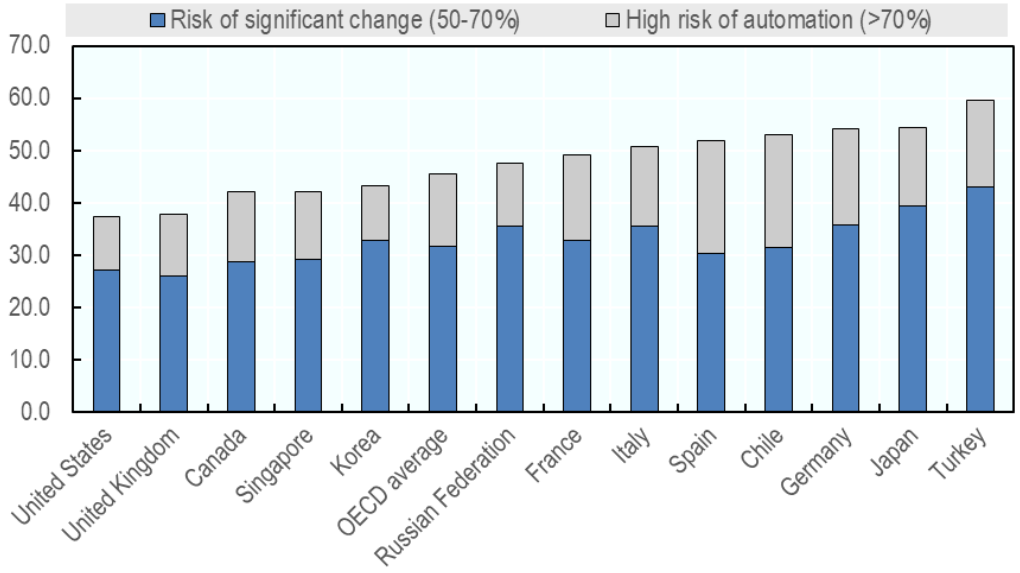
1.2.2. More recent estimates, based on tasks or work activities approaches, show lower risks of automation - but emerging economies still face a higher risk

12. More recent estimates, based on tasks (Arntz, Gregory, & Zierahn, 2016); (Nedelkoska & Quintini, 2018)) or work activities (McKinsey Global Institute, A future that works: Automation employment and productivity, 2017) argue that the share of jobs at risk of automation may have been significantly overestimated by the initial studies. These more recent studies show that there is considerable variation in the tasks involved in jobs having the same occupational title and that accounting for this variation is essential to gauge the extent of the problem. For example, a study commissioned by the OECD (The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, 2016), exploiting the Survey of Adult Skills (PIAAC), suggests that it is highly unlikely that entire occupations will be automated given that, in practice, even occupations labelled as high-risk are likely to still contain a substantial share of tasks that are hard to automate and, also, that there is a lot of heterogeneity in the tasks performed within each occupation. A more recent study (Nedelkoska & Quintini, 2018), that builds on the work done by Arntz, Zierhan and Gregory (The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, 2016), also exploits PIAAC to account for the variation in tasks within narrowly-defined occupational groups. In this study, the coverage is expanded to all 32 countries that have participated in the Survey of Adult Skills and the engineering bottlenecks[1] identified by Frey and Osborne (The future of employment: How susceptible are jobs to computerisation?, 2013) are more closely matched. Taking this task- (rather than occupation-) based approach it is estimated that, on average across the OECD countries that participated in PIAAC, 14% of jobs face a high risk of automation (i.e. where at least 70% of the tasks could be automated), as opposed to the 47% estimated by Frey and Osborne (The future of employment: How susceptible are jobs to computerisation?, 2013) and 9% estimated by Arntz, Zierhan and Gregory (The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, 2016).

13. Even these revised estimates, however, imply that emerging economies still face a higher risk of automation than more advanced economies. For example, according to McKinsey (A future that works: Automation employment and productivity, 2017), which also uses a task-based approach, Mexico, Colombia, Brazil, India, China and the Russian Federation have a higher share of activities that could be automated than most advanced economies. Similarly, for the three emerging economies participating in PIAAC: the Russian Federation, Chile and Turkey, Nedelkoska and Quintini (Automation, skills use and training, 2018) show that the risk of automation in Turkey and Chile is higher than for the OECD on average, although the Russian Federation shows lower susceptibility to automation than several advanced economies such as Germany or Japan (Figure 1.3).

Figure 1.3. Task-based estimates still find a higher risk of automation in most emerging economies

Cross-country variation in the risk of automation, percentage of jobs at risk by degree of risk



Source: Nedelkoska and Quintini (Automation, skills use and training, 2018)

14. According to Nedelkoska and Quintini (Automation, skills use and training, 2018) the cross-country variation in the risk of automation is better explained by the differences in the organisation of job tasks within economic sectors, than by the differences in the sectoral structure of economies. While cross-country differences in the structure of economic sectors are important, they account only for 30% of the cross-country variance. The remaining 70% can be explained by the fact that, within these sectors, countries employ different occupational mixes. Moreover, within the same occupations, there is variation in the frequency of perception and manipulation tasks as well as in cognitive and social intelligence tasks. Within industry and occupation differences in the task content of jobs may reflect the extent to which automation has already taken place and jobs have adapted as a result. Countries where the adoption of labour-substituting technologies has not yet taken place would show a structure of job tasks that is more prone to automation. For example, Nedelkoska and Quintini (Automation, skills use and training, 2018) find that some advanced economies and emerging economies such as the Russian Federation, Chile and Turkey are on average more susceptible to automation than Canada[2] - not only as a result of different industry and occupational structures, but also as a result of differences in job content within nominally the same industries and occupations.

1.3. Factors lowering the risk of automation in emerging economies

1.3.1. Many jobs are technically automatable in emerging economies but automation is slowed down due to lower wages and slower technology adoption

15. While many jobs are technically automatable in the developing world, automating them is often not yet economically feasible or attractive. According to the World Bank (World Development Report 2016: Digital dividends, 2016), two-thirds of all jobs are theoretically susceptible to automation in developing economies but the effects are

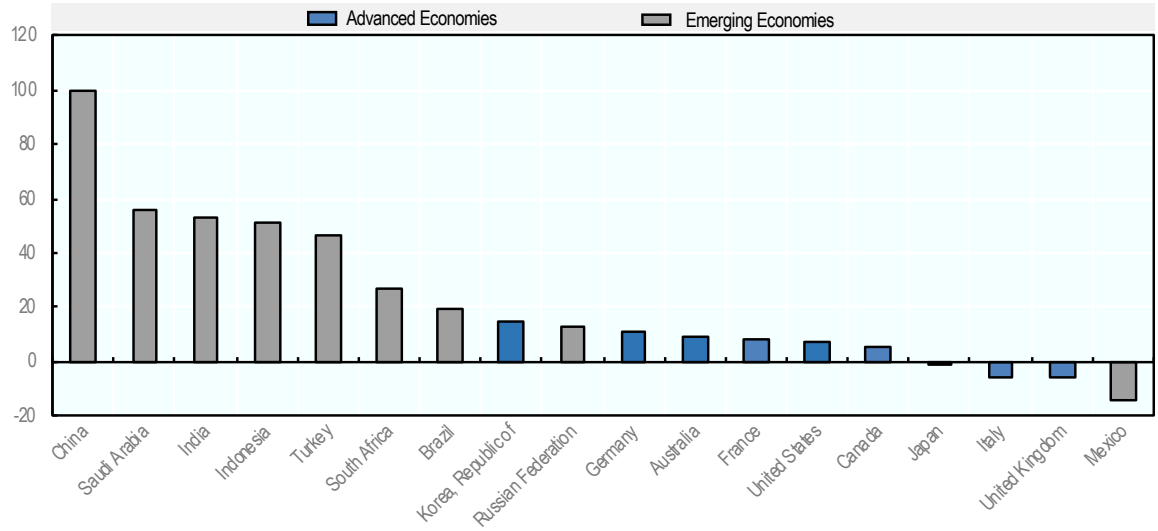
moderated by lower wages and slower technology adoption. For example, in China and India 77% and 69% of jobs respectively were estimated to be at risk of being automated – but these estimates drop to 55% and 44% when adjusted for potential adoption speed. Similarly, the McKinsey Global Institute (Jobs lost, jobs gained: Workforce transitions in a time of automation, 2017) shows that in emerging economies the estimates of the percentage of current work activities likely to be displaced by automation over the next decade are below those in more advanced economies when adjusted for factors that influence the pace and extent of automation adoption.[3] Results differ significantly by country, ranging from 9% in India to 18% in the Russian Federation among emerging economies, and from 20% in the United Kingdom to 26% in Japan among more advanced economies.

Despite recent wage growth in emerging economies, wages and labour costs are still far from reaching the levels observed in more advanced economies

16. Countries with higher wage levels and/or rising dependency ratios may experience greater incentives to automate (Acemoglu & Restrepo, Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation, 2017). While wages tend to be lower in emerging economies on average, the cumulative real wage growth has been significantly higher in emerging economies compared to developed ones over the past decade (Figure 1.4). From 2012 onwards, wage growth in emerging economies decelerated and, at the same time, average wage growth increased in developed G20 economies. As a result, the differential in wage growth between developed and emerging G20 economies declined sharply after 2012 (ILO, 2016) There are also substantial differences among emerging economies, with countries like China and the Russian Federation that have experienced large cumulative wage growth, and countries with modest increases (Colombia) or even with negative growth (Mexico).

Figure 1.4. Most emerging economies have experienced significantly higher cumulative wage growth than advanced economies

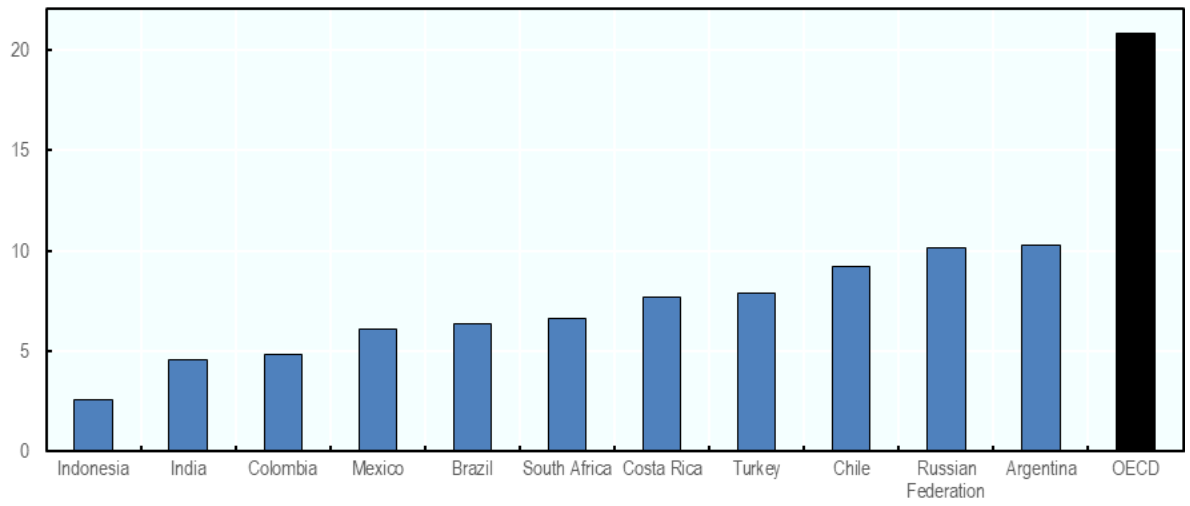
Cumulative real wage growth, 2008-2017



Source: ILO Global Wage Report 2018/19

17. Despite this wage growth in emerging economies, wages are still far from reaching the levels observed in more advanced economies (Figure 1.5). Thus, automation is not yet economically attractive in many emerging countries due to an abundance of cheap labour and the recent slowdown in wage growth. Because of differences among countries in how exactly wage data are collected and measured, statistics on average wage levels are not strictly comparable across countries. Nonetheless, converting countries' average wages into USD by using purchasing power parity (PPP) exchange rates shows a large gap in hourly earnings between more advanced and emerging economies.

Figure 1.5. There are large differences in earnings between more developed economies and emerging ones

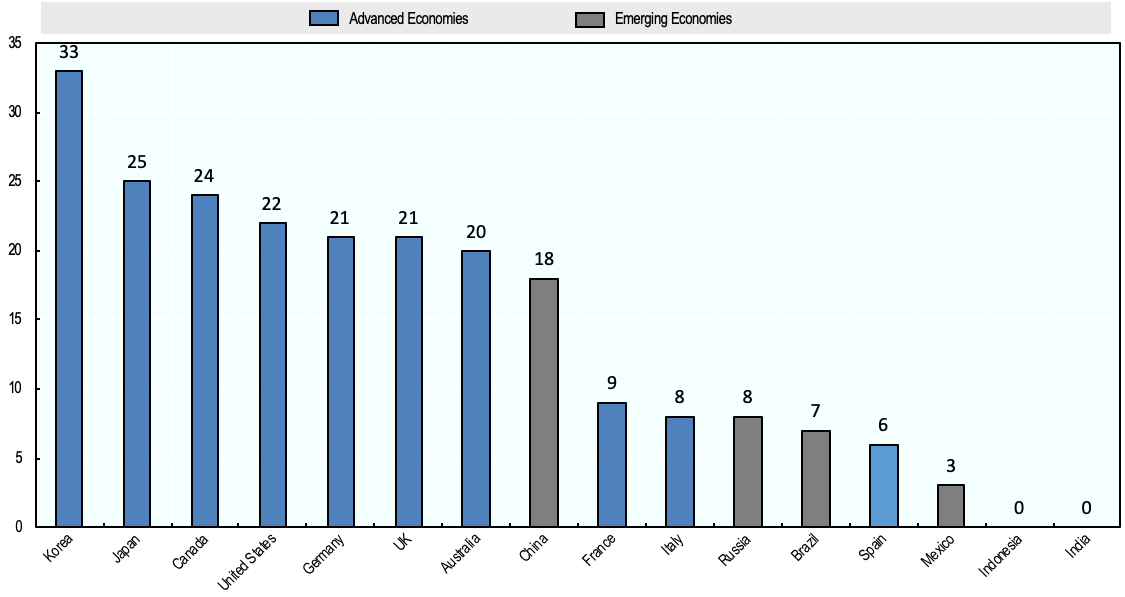


Note: Calculations are based on gross hourly earnings for 2015 except for Costa Rica and Indonesia (2016), Argentina and the Russian Federation (2013) and India (2012). OECD average includes Chile, Mexico and Turkey.
Source: (OECD, 2018)

18. Higher wages lead to higher labour costs and, therefore, to potentially higher cost savings of replacing people with robots. At the same time, the incentives to automate rise as the cost of industrial robots continues to decline. According to the Boston Consulting Group (The Shifting Economics of Global Manufacturing: How a Takeoff in Advanced Robotics Will Power the Next Productivity Surge, 2015), in 2025, the global average labour-cost savings of replacing people with robots will be 16%, thanks to the lower costs of manufacturing robots. The highest cost savings of using robots in manufacturing will be in advanced economies, like South Korea, Japan and the United States, where manufacturing labour costs are highest. But even businesses in emerging markets where labour costs are lower, such as Mexico and Brazil, and particularly in China where labour costs are expected to continue to increase, are expected to see the cost of using robots to be lower than using humans by 2025 (Figure 1.6). However, countries with very low labour costs and expanding young workforces like India and Indonesia are unlikely to benefit from replacing humans with robots in the near future.

Figure 1.6. The highest cost savings of using robots is in advanced economies

Labour-cost savings from adoption of advanced industrial robots (%, 2025)



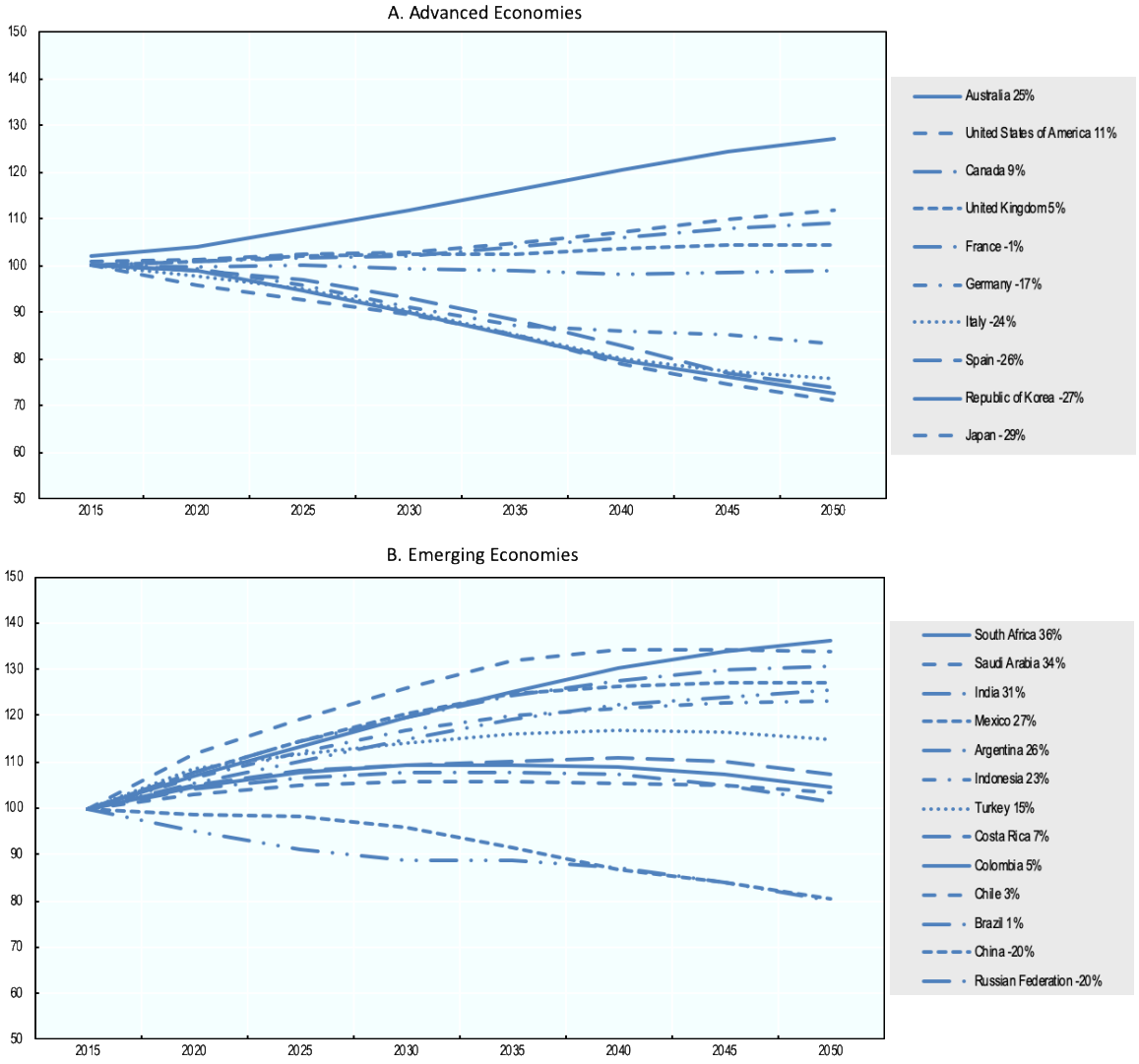
Source: The Boston Consulting Group (The Shifting Economics of Global Manufacturing: How a Takeoff in Advanced Robotics Will Power the Next Productivity Surge, 2015)

In many emerging economies, the pressure to automate will be smaller because they have expanding young working age populations

19. Individual countries will experience very different demographic developments (Figure 1.7). While many advanced economies will see shrinking working age populations, most, but not all, emerging economies will experience population growth. Among emerging markets, the working-age populations in South Africa, Saudi Arabia, India, Mexico, Argentina and Indonesia, are likely to expand significantly by 2050. Most of these nations are going through a demographic transition that offers a window of opportunity to invest in skills and will enable these economies to grow more rapidly in the future. The length of that window of opportunity varies depending on the trajectory of declining fertility. However, some emerging countries like China and the Russian Federation are much more similar to many advanced economies and will undergo a dramatic decline in the share of the working age population by 2050 (Figure 1.7). This may raise the speed at which these countries adopt automating technologies because shortages of qualified labour might arise as large cohorts of older workers retire.

Figure 1.7. Most emerging economies will experience expanding young working age populations

Change in the working age population (15-64) in selected countries 2015-2050 (2015=100)



Note: Medium fertility variant.
Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision.

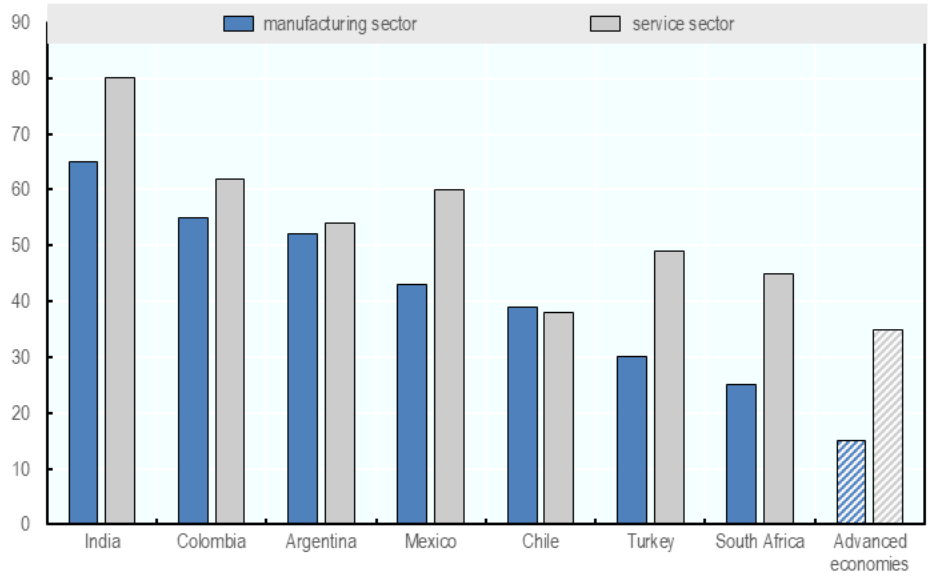
A productive structure biased towards unproductive, small- and medium-sized enterprises might further slowdown automation in emerging economies

20. In emerging economies, a productive structure biased towards unproductive, small- and medium-sized enterprises also limits the penetration of technology in the workplace. This might further slowdown automation in emerging economies. Emerging and more advanced economies vary significantly in terms of the distribution of employment among enterprises of different sizes. In emerging economies, microenterprises[4] employ a large share of total employment, ranging from 25% to 65% in the manufacturing sector and from 45% to 80% in the service sector, while the share on average is less than 15% and

35% respectively in more advanced economies (Figure 1.8). Evidence shows that SMEs in advanced economies are lagging behind in adopting digital technologies (OECD, 2015) and in emerging economies, where a high proportion of small firms are informal, they face even greater difficulties to adopt technology (Sudhir & Talukdar, 2015).

Figure 1.8. A large share of employment in emerging economies is in small firms, which have fewer incentives and capacity to adopt new technologies

Share of employment in microenterprises (less than 10 workers), circa 2005



Note: Microenterprises are firms, formal or informal, with fewer than 10 workers. Advanced economies: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom over 2005–07.
Source: World Bank (2013)

Limitations in the skill base of the population may also be constraining technology adoption in emerging economies

21. In addition to lower wages and younger workforces, lower skill levels of the population may be constraining technology adoption in emerging economies. Access to technology alone is not enough; even in countries where a large majority of the population has access, both basic and more advanced skills needed to adopt technology are sometimes limited. Results from the Survey of Adults Skills (OECD, 2013) show that Chile and Turkey (i.e. all participating emerging economies except for the Russian Federation) have poorer reading and numeracy skills than advanced economies (Figure 1.9). Besides, most of the workforce in these countries has either no experience using computers, has extremely limited ICT skills (OECD, Skills for a Digital World: 2016 Ministerial Meeting on the Digital Economy Background Report, 2016), or has low proficiency in problem solving in technology-rich environments (Figure 1.9). Thus, the adjustment to technological change might be especially challenging in emerging economies because many of the new jobs require significantly higher levels of human capital, particularly those related to the use of ICT.

Figure 1.9. Emerging economies lag behind advanced economies in literacy, numeracy and problem solving skills

Mean proficiency scores of 16-65 year-olds in literacy and numeracy, and the percentage of 16-65 year-olds scoring at Level 2 or 3 in problem solving in technology-rich environments.

Significantly **above** the average
Not significantly different from the average
Significantly **below** the average

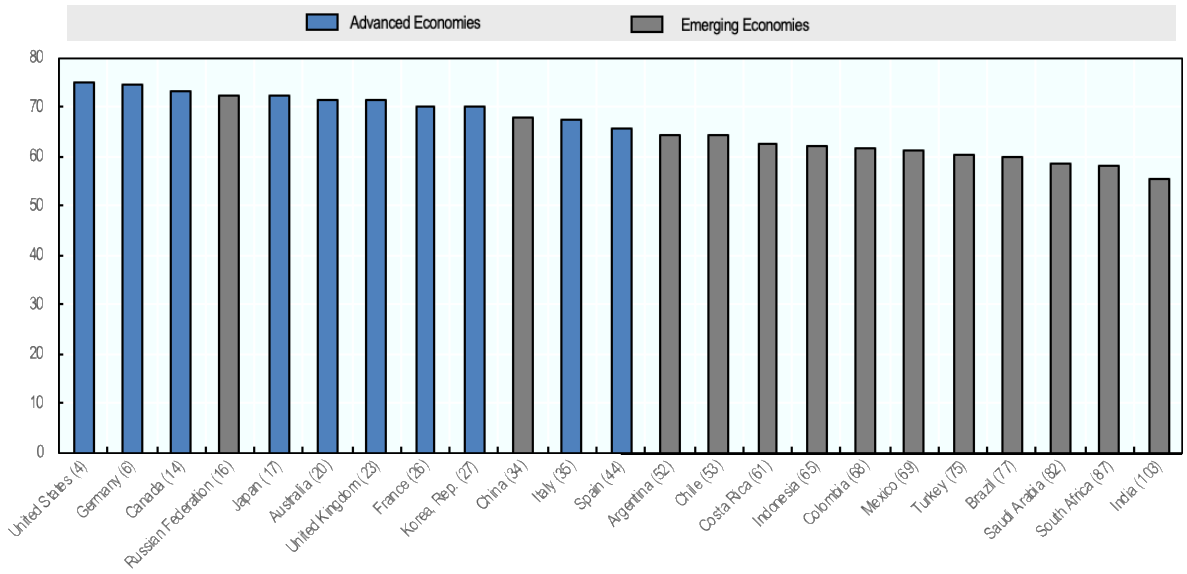
Countries/economies	Literacy (mean score)	Numeracy (mean score)	Problem solving in technology-rich environments (% at Level 2 or 3)
OECD Advanced countries and economies			
Australia	280	268	38
Canada	273	265	37
England (UK)	273	262	35
France	262	254	m
Germany	270	272	36
Italy	250	247	m
Japan	296	288	35
Korea	273	263	30
Northern Ireland (UK)	269	259	29
Spain	252	246	m
United States	270	253	31
OECD average	**268**	**263**	**31**
Emerging economies			
Chile	220	206	15
Russian Federation	275	270	26
Turkey	227	219	8

Note: The sample for the Russian Federation does not include the population of the Moscow municipal area. France, Italy, Jakarta (Indonesia) and Spain did not participate in the problem solving in technology-rich environments assessment.
Source: Survey of Adult Skills (PIAAC) (2012, 2015), Tables A2.3, A2.5 and A2.6.

22. However, there are significant differences in the skills base of the workforce in emerging economies. According to the Human Capital Index of the World Economic Forum (The Global Human Capital Report 2017 Preparing people for the future of work, 2017), the Russian Federation and China have the highest skills levels, followed by Latin American countries and Indonesia, while Saudi Arabia, South Africa and India have the lowest. The ranking is a little different if skills are measured using the Human Capital Capacity Index (rather than the aggregate Human Capital Index), which measures the percentage of the workforce that has attained tertiary, secondary and primary education, as well as the percentage that has a basic level of literacy and numeracy (Figure 1.10).

Figure 1.10. Emerging economies tend to trail at the bottom of the Human Capital Index

Human Capital Index (0-100 scale)

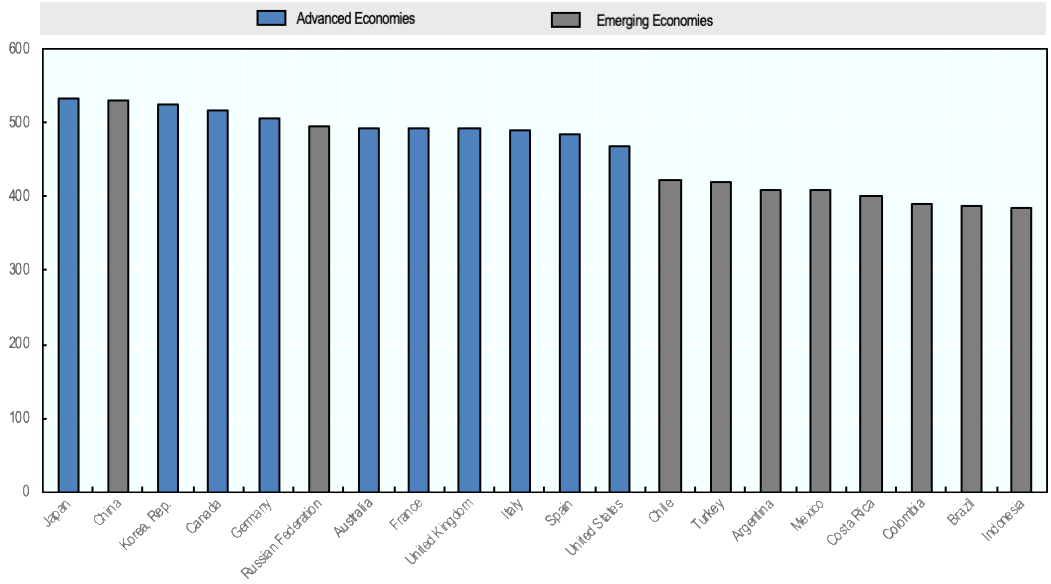


Note: Country rank in brackets
Source: (World Economic Forum, 2017)

23. Not only are the skills of the current workforce limited in many emerging economies, but the basic skills of the future workforces are also below those of more advanced economies. The results from the Programme for International Student Assessment (PISA) (PISA 2015 Results in Focus, 2016) show that the basic skills of 15 year-olds in emerging economies are below those in more advanced economies. Basic skills such as numeracy and literacy are important as they are the basis for employability and the ability to update and learn new skills and even more relevant for countries with a demographic dividend. However, these countries perform poorly, limiting the full potential of their future workforces (Figure 1.11).

Figure 1.11. The future workforce in emerging economies typically has low foundational skills

Averages for PISA mathematics scale: overall mathematics, age 15 years (2015)



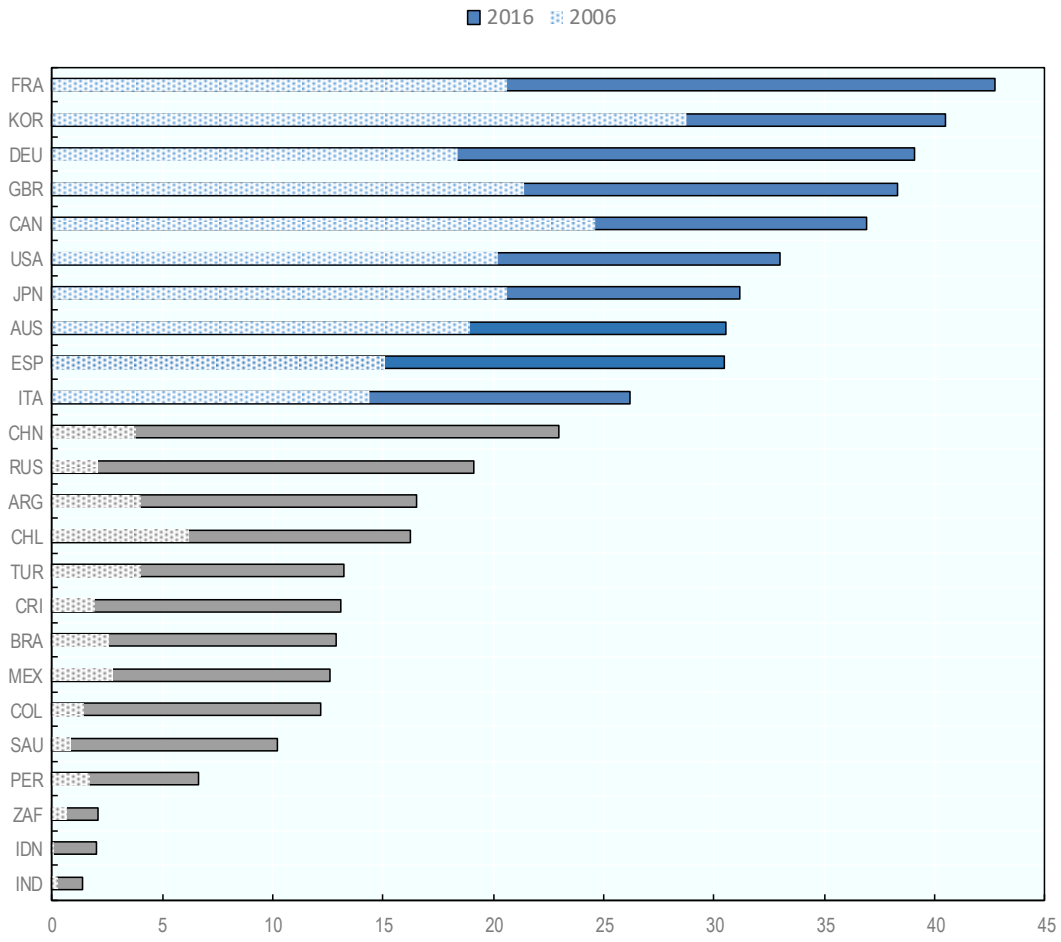
Source: (OECD, 2016)

Technology adoption and robotisation in emerging economies lag behind those in advanced economies

24. Information and Communication Technologies (ICTs) are expanding in emerging countries at a faster pace than in more advanced economies, although closing the gap remains a challenge in some countries, limiting the potential to benefit from digital technologies. For example, broadband development, considered a key ICT indicator closely related to economic development (Minges, 2015) is lower in emerging economies than in most advanced countries; on average the 13 emerging countries considered in this study had 11.5 fixed broadband subscriptions per 100 people in 2016, whereas the 10 most advanced economies averaged 34.9 (Figure 1.12). In terms of personal, business, and government adoption of ICTs, middle-income countries also scored lower than the subgroup of advanced economies (Baller, Dutta, & Lanvin, 2016). These statistics reflect the slow pace of ICT development in emerging economies. However, there is wide variation in the levels of ICT development among the group of emerging economies studied in this report: with China and the Russian Federation ranking ahead of the rest of emerging countries (Figure 1.12).

Figure 1.12. ICTs are expanding faster in emerging countries, although some countries struggle to close the gap with more advanced economies

Fixed broadband subscriptions (per 100 people), 2006 and 2016



Source: World Bank WDI

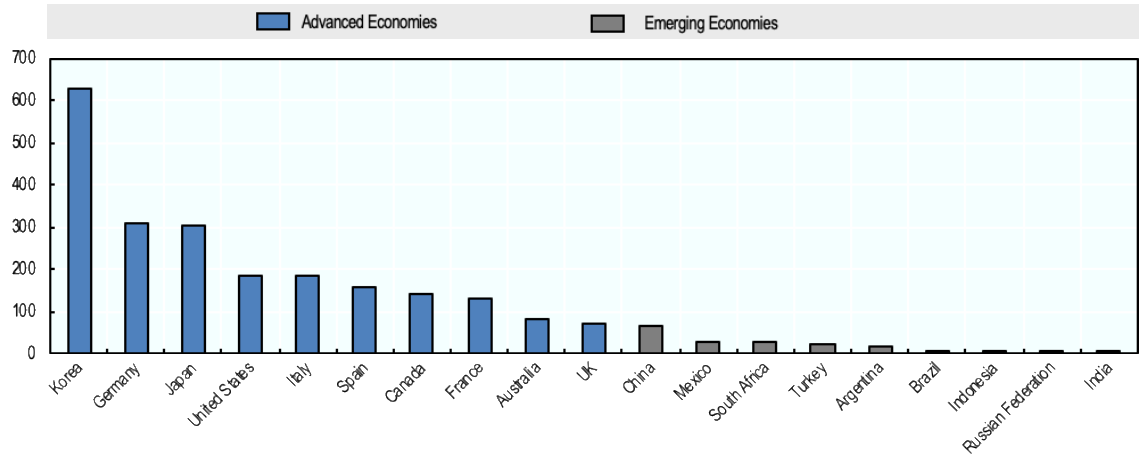
25. Access to ICTs provides a good glimpse of the potential of countries to benefit from technological progress, but another relevant indicator is the level of robotisation of countries, which gives a hint about the pace at which automation is taking place. According to the number of robots installed, automation is happening more slowly in emerging economies. Most robots are installed in developed countries (80%) and are highly concentrated in manufacturing, as service-sector robots have emerged only recently (IFR, 2017). Figure 1.13 shows significant differences across countries in terms of robot density, measured as the number of industrial robots per 10 000 manufacturing workers. It is striking to see the gap between more advanced and emerging countries, but also the differences between emerging economies. Most developing countries are far from reaching densities close to those from more advanced economies, with the exception of China. China has been the biggest robot market in the world in absolute terms since 2013 (IFR, 2017), and it has now reached a density of 68 industrial robots per 10 000 manufacturing workers

(just below the world average – and close to the levels observed in OECD countries like the United Kingdom and Australia).

Figure 1.13. Emerging economies are far from reaching robotisation levels observed in more advanced economies

Number of installed industrial robots per 10 000 employees in the manufacturing industry

Selected OECD and emerging countries, 2016

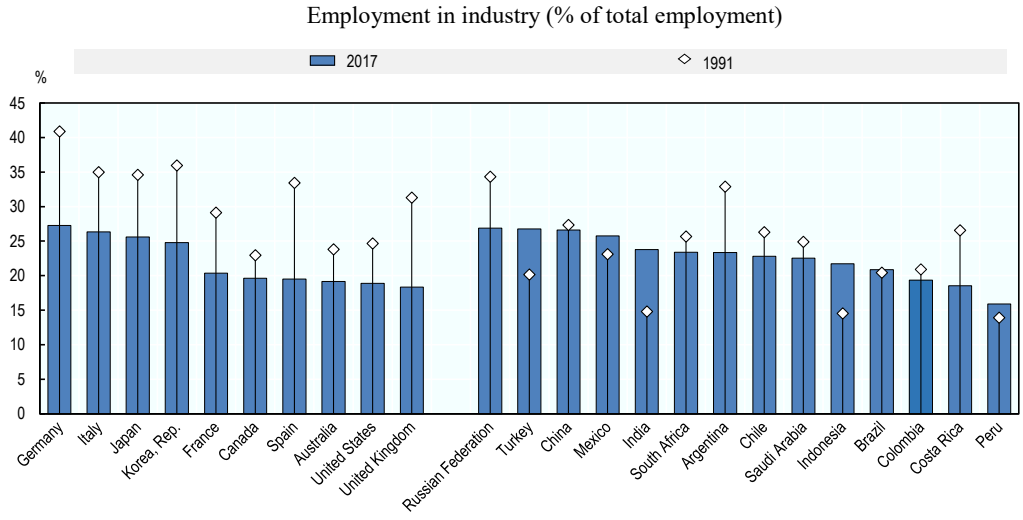


Source: World Robotics 2017

1.3.2. Automation is likely to occur later in emerging economies, but they are already indirectly affected by automation in more advanced economies

26. The decline in industrial employment in many advanced economies over the past two decades is a well-studied trend (see for example: Fort, Pierce and Schott (New Perspectives on the Decline of US Manufacturing Employment, 2018) and (Pierce and Schott, (The Surprisingly Swift Decline of U.S. Manufacturing Employment, 2012)). However, many emerging economies are also experiencing a decline in the share of employment in the industry sector. Moreover, even in countries where industry employment has increased significantly, such as Indonesia and Turkey, it is reaching its peak (Figure 1.14). As a result, manufacturing is becoming less labour-intensive in emerging economies, contributing to a growing concern over "premature deindustrialisation" - that is to say that the manufacturing share of employment is peaking well below the levels experienced by advanced economies in their early stages of industrial development, which leaves them in a middle-income trap (Rodrik, 2016). Rodrik (Premature deindustrialization, 2016) shows that over the course of the 20th century, peak manufacturing employment has declined among emerging economies. Manufacturing employment in the United Kingdom, for example, peaked at 45% of total employment just before World War I. Today's emerging economies, in contrast, including Brazil and India, have already seen manufacturing employment peak at no more than 25% (Figure 1.14).

Figure 1.14. Many emerging economies are experiencing a drop in the share of industrial jobs



Source: World Bank. WDI 2018

27. The reason for this premature deindustrialisation is that manufacturing processes, also in emerging economies, are more automated today than in the past. However, some emerging economies have experienced declines in manufacturing output which cannot be explained by production processes being increasingly automated. Rodrik (Premature deindustrialization, 2016) argues that globalisation provides an alternative and complementary explanation for countries experiencing premature deindustrialisation: as countries with a comparative disadvantage in manufacturing become exposed to international trade they start to import deindustrialisation. Crucially, while many 20th century technologies, including the telephone, the container ship, and the computer, contributed to the surge in international trade by allowing companies to shift production to locations with an abundance of cheap labour, recent developments in robotics and 3D printing allow firms in advanced economies to relocate production closer to domestic markets in more fully automated factories (a process also referred to as re-shoring (De Backer, Menon, Desnoyers-James, & Moussiegt, 2016)). As a result, automation in advanced economies is having an indirect effect on jobs in emerging economies. For example, a recent study (Kugler, Kugler, Ripani, & Rodrigo, forthcoming) shows that the increase in levels of robotisation in the car manufacturing sector in the United States is having a negative impact on employment and wages in Mexico and Brazil. Besides, the results are stronger in those industries with larger exports to the United States, suggesting that the transmission channel of automation to labour markets in these countries is international trade.

2. The changing nature of jobs in emerging economies

2.1. Introduction

28. In recent decades, labour markets in advanced economies have experienced profound transformations in their occupational and industrial structures. A process of de-industrialisation – which has implied significant shifts of employment from manufacturing to services – has taken place alongside one of labour market polarisation. Employment shares are mostly going to occupations at the top and bottom of the skill distribution, with the share of middle-skilled jobs declining, leading to a noticeable "polarisation" of the labour market in many advanced economies.[5]

29. The main drivers behind job polarisation in advanced economies are still subject to some debate, but almost all explanations focus on the disappearance of "routine" occupations and are based on demand-side factors. Two factors have been considered in particular: globalisation and technology. Globalisation impacts the number of routine jobs via offshoring (Blinder, 2009), while technology affects polarisation through two channels: *i)* the reduction of employment in routine manual and cognitive tasks, moving displaced workers to less-routine employment at the lower end of the skills spectrum; and *ii)* an increase in demand for workers in higher-skilled and (to a lesser extent) lower-skilled occupations, leading to growth at the upper and lower ends of the skill distribution. This process, called Routine-Biased Technological Change (RBTC) was formulated by Autor et al. (The skill content of recent technological change: An empirical exploration, 2003) and explains the lower demand for middle-skill jobs relative to both high- and low-skill ones, giving rise to the polarisation of occupational structures documented in advanced countries. According to the OECD (OECD Employment Outlook 2018, 2018), technology displays the strongest association with both polarisation and de-industrialisation in advanced economies, while the role of globalisation is less clear-cut, although there is some indication that international trade has contributed to de-industrialisation. There is also some evidence that changes in skills and task structures in employment may be driven by supply-side changes ((Salvatori A. , 2018); (Oesch, 2013)). Nevertheless, supply and demand changes are closely intertwined and it is difficult to disentangle their effects on polarisation, calling for further research.

30. In emerging economies the phenomenon of job polarisation has been less studied. However, there are reasons to believe that changes in the employment structure may be quite different in emerging economies. Several factors support this idea: different initial occupational distributions; a possible "de-polarisation" effect of off-shored jobs coming from advanced countries; the higher cost of information and communication technologies (ICT); the more limited feasibility of automation as discussed in the previous section; and the lack of skills to upgrade jobs (Maloney & Molina, 2016).

31. The aim of this section is to quantify the evolution of the employment structure and the task content of jobs in selected emerging countries during the past two decades and establish whether these countries have also been experiencing job polarisation; identify the drivers behind these changes; and explore the potential consequences and challenges ahead resulting from these structural changes for emerging economies.

2.2. Job polarisation in emerging economies

32. Existing evidence on job polarisation for emerging economies is mixed and depends very much on definitions used; methodology, as well as data sources and/or time range selected (See Table 2.1). Medina and Posso (Technical change and polarization in the labor market: The evidence from Colombia, 2018) build computer-use related task intensities to analyse the changes in occupation employment shares in Colombia, Mexico and Brazil between 1984 and 2009. In Colombia, the authors detect U-shaped dynamics in the changes of employment shares across occupations analogous to the job polarisation patterns seen in the U.S. and Europe. Similar developments are reported in the Mexican labour market (although less conclusively so), but not in Brazil. More recently, using labour force survey data, the World Bank (World Development Report 2016: Digital dividends, 2016) and Reijnders and de Vries (Job Polarization in Advanced and Emerging Countries: The Role of Task Relocation and Technological Change within Global Supply Chains Job Polarization in Advanced and Emerging Countries: The Role of Task Relocation and Technoly, 2017) documented that non-agricultural employment is also hollowing out in many developing and emerging countries, while Maloney and Molina (Are automation and trade polarizing developing country labor markets, too ?, 2016), using census data, only find polarisation in Indonesia, Mexico and Brazil out of 21 developing countries in Africa, Latin America and Asia.

Table 2.1. Evidence on job polarisation for emerging economies is mixed

Country	Study	Years	data	Agriculture occupations	Job polarisation
Argentina	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
Brazil	Medina and Posso (2010)	1991-2001	Household survey (PNAD)	Yes	No
	Maloney and Molina (2016)	2000-2010	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	Yes*
	Veridiana de Andrade Nogueira (2015)	1981-2013	Household survey (PNAD)	Yes	Yes
	Fiori (2007)	1984-2001	Household survey (PNAD)		No
	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
Colombia	Medina and Posso (2010)	1984-2009		Yes	Yes
China	Fleisher, McGuire, Su, Zhao (2018)	1995-2013	Survey data: CHIPS	No	Yes
	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
Costa Rica	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
Chile	World Bank (2016)	Circa 1995-circa 2012	ILO	No	Yes
India	Maloney and Molina (2016)	1983-2004	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	No
	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	No
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	Yes
Indonesia	Maloney and Molina (2016)	1971-2005	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	No
	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
Mexico	Medina and Posso (2010)	1990-2000		Yes	Yes
	Maloney and Molina (2016)	2000-2010	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	Yes*
	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
Peru	Maloney and Molina (2016)	1993-2007	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	No
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
Russian Federation	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
South Africa	Maloney and Molina (2016)	1986-2007	Integrated Public Use Microdata Series (IPUMS) censu:	Yes	No
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	No
Turkey	Reijnders, Laurie S.M.; de Vries, Gaaitzen (2017)	1999-2007	Labour Force Surveys	No	Yes
	World Bank (2016)	Circa 1995-circa 2012	ILO	No	Yes

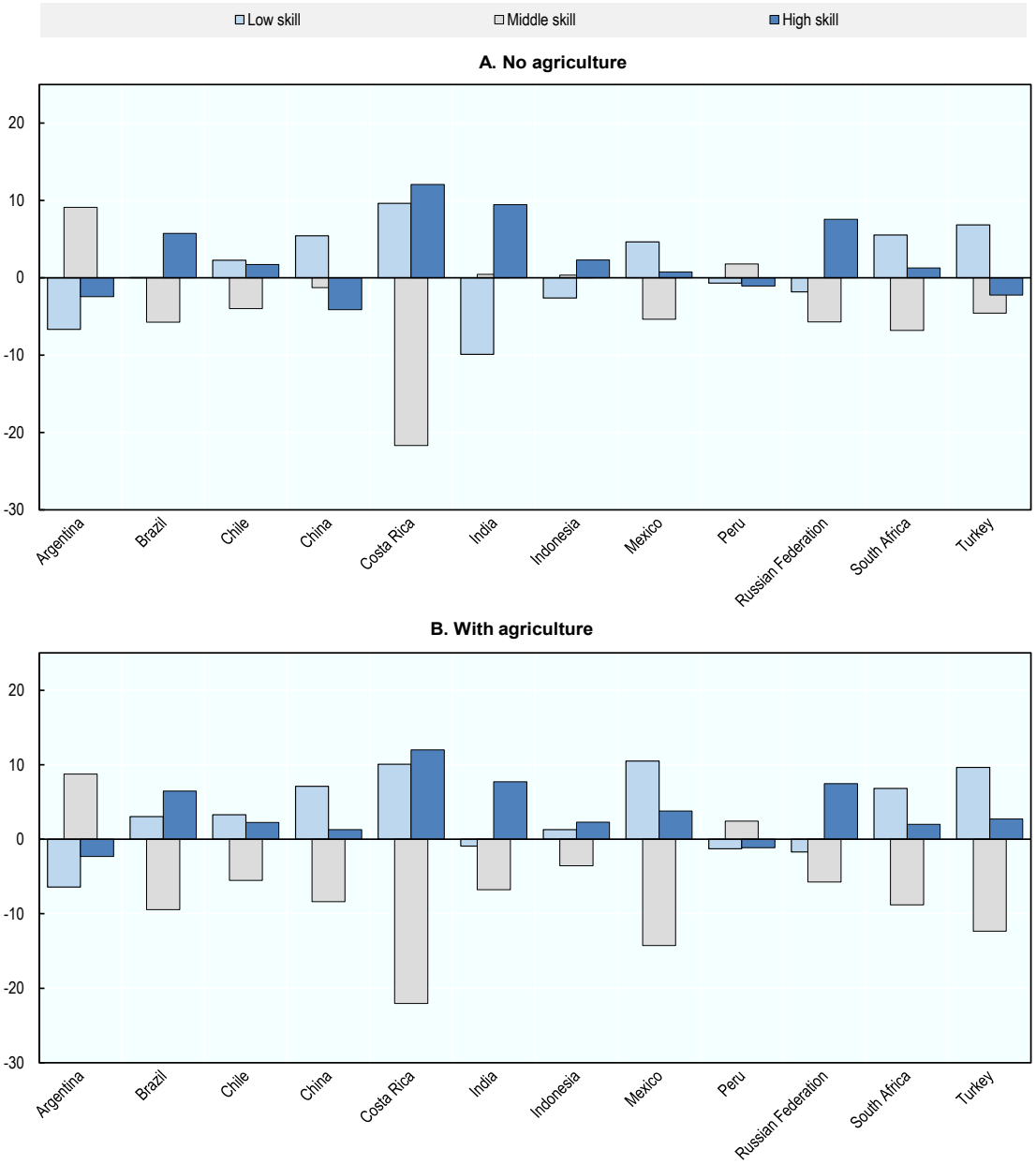
Note: *No polarisation before 2000

33. Labour markets are polarising in most (though not all) emerging countries. To be comparable with the evidence for advanced economies, Figure 2.1 uses a methodology consistent with Autor (Why are there still so many jobs? the history and future of workplace automation, 2015), Goos et al. (Explaining Job Polarization: Routine-Biased Technological Change and Offshoring, 2014) and OECD (OECD Employment Outlook 2017, 2017), and depicts changes in the occupational structure for selected emerging countries, with and without agricultural employment included (panels A and B, respectively). Overall, and unlike in more advanced economies (OECD, 2017), there are few signs of occupational polarisation in emerging economies when the agricultural sector is excluded. Despite the share of middle-skilled jobs having fallen in 8 out of the 12 countries included in the analysis, only Costa Rica, Chile, South Africa and Mexico exhibit a pattern similar to that of advanced countries, in the sense that low- and high-skill employment shares increased while middle-skill employment shares decreased over the past 15-20 years.

34. In more advanced countries, agricultural jobs usually constitute only a small fraction of the labour force (Figure 1.2) as they have already completed the transition to manufacturing and service sectors. In advanced economies, therefore, the inclusion (or not) of agricultural employment does not significantly impact the overall polarisation picture. In emerging economies, however, agricultural employment shares are still substantial (Figure 1.2), although often rapidly declining (Figure 1.2). Once agricultural employment is included in the analysis, most emerging countries also experience occupational polarisation (Figure 2.1, Panel B). This is because most agricultural occupations (ISCO group 6) are middle-skill.

Figure 2.1. Labour markets are also polarising in most emerging economies, but only when agricultural employment is considered

Percentage points change in share of working adults in each skill group, mid-1990s to mid-2010s



Note: 1. High-skill occupations include jobs classified under the ISCO-88 major groups 1, 2, and 3. That is, legislators, senior officials, and managers (group 1), professionals (group 2), and technicians and associate professionals (group 3). Middle-skill occupations include jobs classified under the ISCO-88 major groups 4, 6, 7, and 8. That is, clerks (group 4), skill agricultural and fisheries workers (group 6), craft and related trades workers (group 7), and plant and machine operators and assemblers (group 8). Low-skill occupations include jobs classified under the ISCO-88 major groups 5 and 9. That is, service workers and shop and market sales workers (group 5), and elementary occupations (group 9).
2. 2004-2017 for Argentina, 1995-2015 for Brazil, 1996-2009 for Chile, 2000-2010 for China, 1997-2010 for Costa Rica, 1994-2012 for India, 2007-2015 for Indonesia, 1995-2017 for Mexico, 2002-2017 for Peru, 1997-2017 for Russian Federation, 1996-2007 for South Africa, 2001-2010 for Turkey.

Source: *ILO KILM except China (Chinese Census).*

35. Although polarisation is also found in emerging economies, the actual changes in the job structure differ from those in more advanced countries. While advanced economies are primarily experiencing a shift in employment to more skilled occupations (i.e. upskilling) (OECD, 2017), there is not a clear pattern among the emerging economies studied. On the one hand, in China, South Africa, Mexico and Turkey the share of low-skill occupations increased much faster than the share of high-skill occupations. On the other hand, India, the Russian Federation and Brazil appear to be experiencing a shift to more skilled occupations (upskilling) (Figure 2.1 panel B).

2.2.1. Unlike in more advanced economies, polarisation in many emerging economies is largely driven by the reallocation of employment from less polarised to more polarised sectors and not by technology

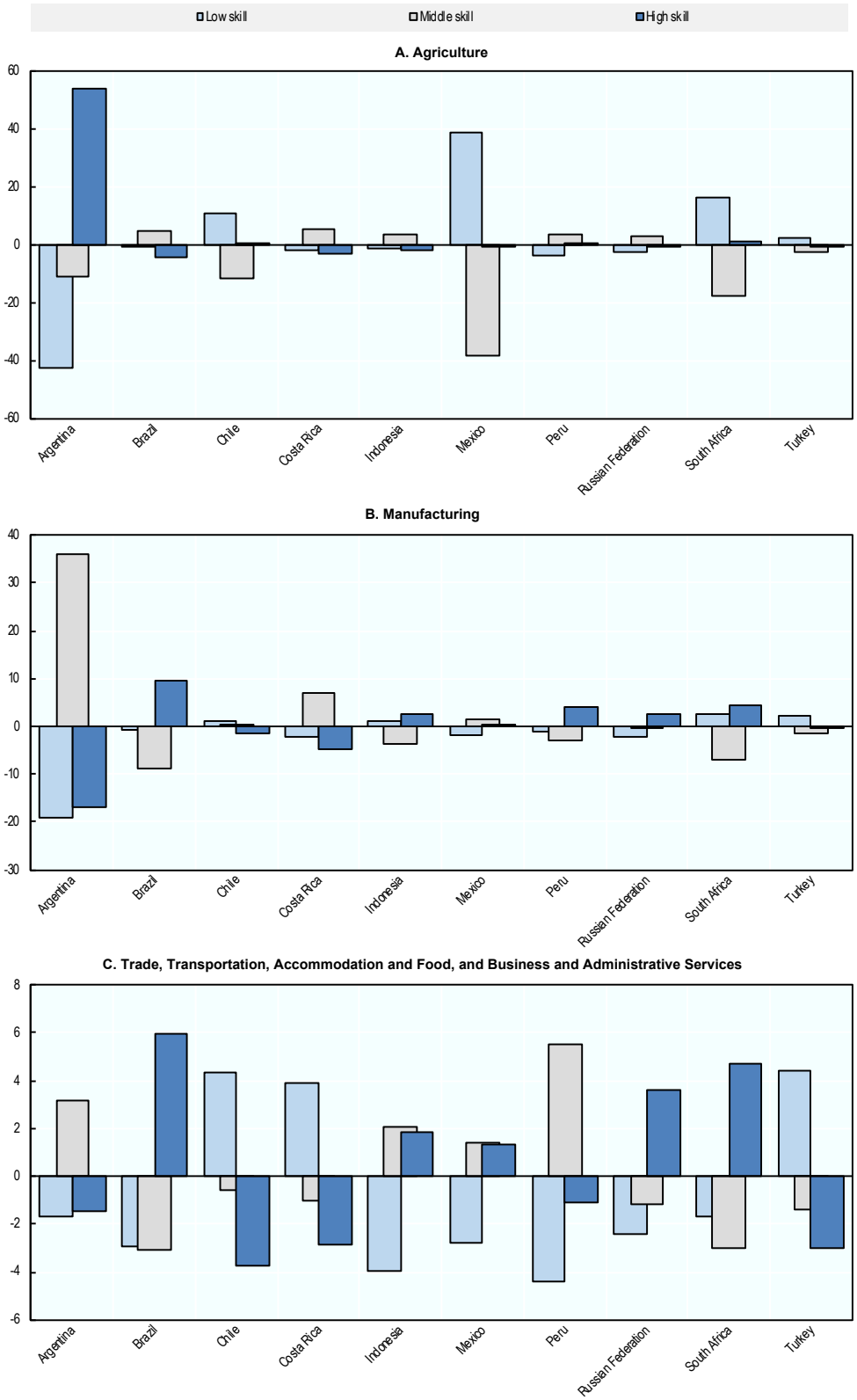
36. The shift of employment away from middle-skill jobs can occur in two ways. On the one hand, factors underlying job polarisation may contribute to a shift of employment within an industry, as middle-skill jobs are eliminated and the shares of high- and low-skill jobs increase. Technological advances tend to be the primary drivers of this aspect of job polarisation, as middle-skill jobs are made obsolete. On the other hand, employment may shift between industries when some industries experience increases in demand for their products and respond by hiring workers, while other industries contract in the face of weakening demand for their products. Worker reallocation contributes to job polarisation if the contracting industries have a larger share of middle-skill jobs and the expanding industries have a larger share of low- or high-skill jobs.

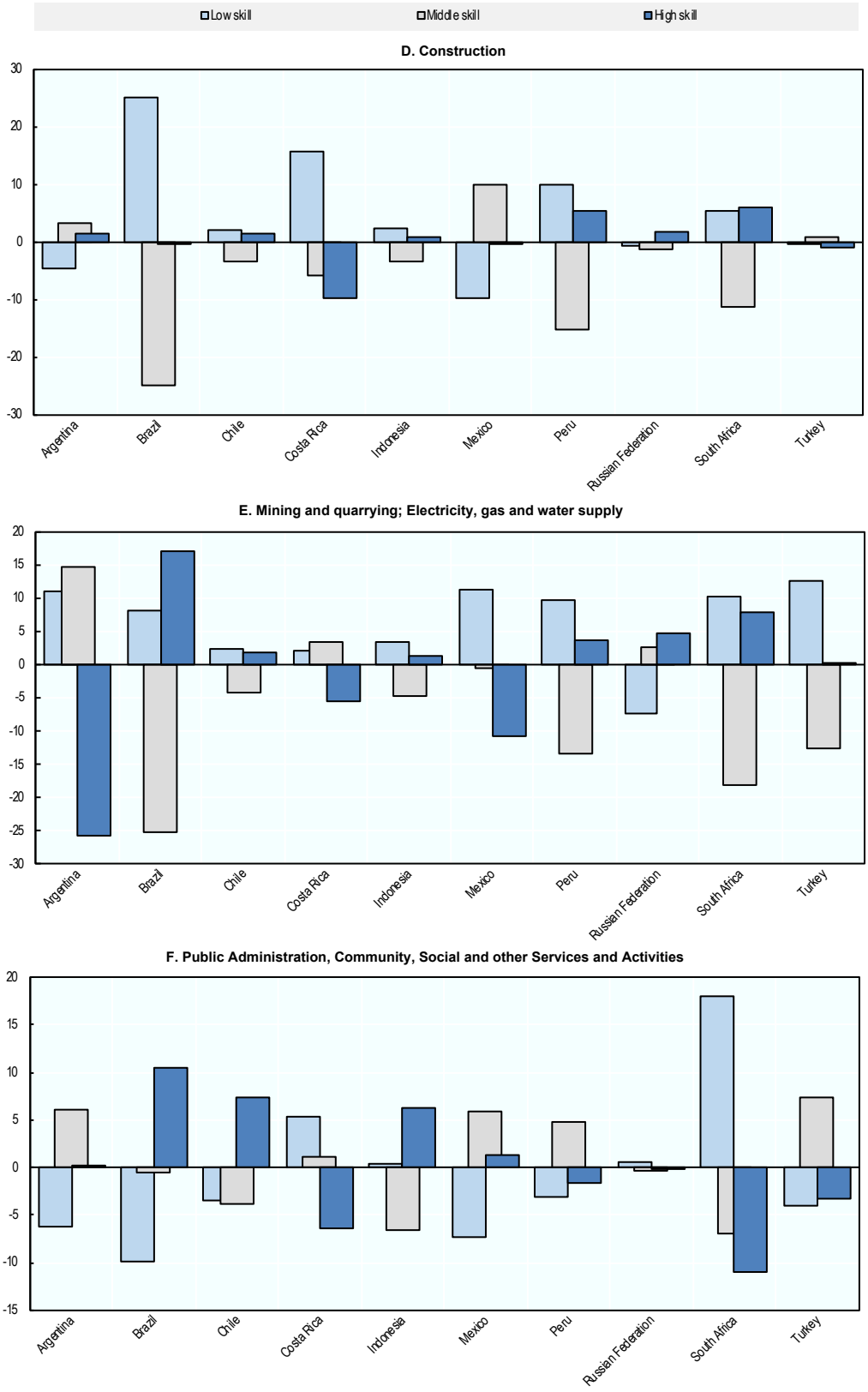
37. Distinguishing between these two types of shifts in employment patterns is especially important for the efficacy of labour market policy. If job polarisation is driven mainly by the contraction of sectors with larger shares of middle-skill jobs, then labour market policy needs to focus on helping displaced workers in shrinking sectors make the transition to other sectors where employment opportunities are growing. In contrast, if job polarisation is driven mainly by within-sector shifts in employment, then labour market policy should help provide incentives and opportunities for workers in middle-skill jobs to obtain the necessary skills to become qualified for high-skill jobs. While in both cases it involves a process of upskilling, the type of skills and support required differ. On the one hand, if polarisation is the result of changes within industries, technology is more likely to be involved so displaced workers are likely to require some specific technical skills training. Conversely, workers displaced from agriculture or manufacturing and transitioning to service sectors possess a completely different skills set than that required in the service sector.

38. To better understand the nature of polarisation observed in many emerging countries it is useful to begin by distinguishing transformations that have occurred inside individual industries (i.e. within-industry polarisation) from changes due to the reallocation of employment from less polarised manufacturing and agricultural sectors to more polarised service sectors (i.e. between-industry polarisation). Figure 2.2 documents within-industry polarisation across sectors and countries. While in more advanced economies the share of middle-skill occupations has declined in almost all sectors of the economy (OECD, 2018), this share has not declined in all sectors in emerging economies. Moreover, only the construction, manufacturing and energy sectors present some signs of polarisation in some emerging economies.

Figure 2.2. Within-sector polarisation is not common in emerging economies

Percentage points change in share of working adults in each skill group, early-2000s to mid-2010s




Low skill
Middle skill
High skill
D. Construction
30
20
10
0
-10
-20
-30
Argentina
Brazil
Chile
Costa Rica
Indonesia
Mexico
Peru
Russian Federation
South Africa
Turkey
E. Mining and quarrying; Electricity, gas and water supply
20
15
10
5
0
-5
-10
-15
-20
-25
-30
Argentina
Brazil
Chile
Costa Rica
Indonesia
Mexico
Peru
Russian Federation
South Africa
Turkey
F. Public Administration, Community, Social and other Services and Activities
20
15
10
5
0
-5
-10
-15
Argentina
Brazil
Chile
Costa Rica
Indonesia
Mexico
Peru
Russian Federation
South Africa
Turkey

Note: 1. High-skill occupations include jobs classified under the ISCO-88 major groups 1, 2, and 3. That is, legislators, senior officials, and managers (group 1), professionals (group 2), and technicians and associate professionals (group 3). Middle-skill occupations include jobs classified under the ISCO-88 major groups 4, 6, 7, and 8. That is, clerks (group 4), skill agricultural and fisheries workers (group 6), craft and related trades workers (group 7), and plant and machine operators and assemblers (group 8). Low-skill occupations include jobs classified under the ISCO-88 major groups 5 and 9. That is, service workers and shop and market sales workers (group 5), and elementary occupations (group 9).
2. Average of select emerging economies and years: 2004-2017 for Argentina, 1995-2015 for Brazil, 1996-2009 for Chile, 2000-2017 for Costa Rica, 2007-2015 for Indonesia, 2002-2017 for Mexico, 2002-2017 for Peru, 2009-2016 for Russian Federation, 2000-2007 for South Africa, 2006-2010 for Turkey.
Source: *Author's own elaboration based on ILO KILM*

39. To understand the relative importance of between- and within-industry effects, one can also apply a formal decomposition of the change in overall polarisation over the period analysed (Goos, Manning, & Salomons, 2014).[6] The results are reported in Table 2.1. Across all emerging countries considered (and including the agricultural sector), the share of high- and low-skill occupations in total employment increased on average by about 2.6% between 2000 and 2015. This is a small shift – half the size of that observed in more advanced economies (OECD, 2017), which is not surprising as in emerging countries polarisation and de-polarisation forces are at play simultaneously (and patterns also vary significantly countries). The last row in Table 2.2 shows that 78% of this increase is associated with changes in the relative size of different industries while the remaining 22% is accounted for by changes in polarisation within industries. The large and positive between-industry component is driven by a shift of employment towards more polarised industries – in particular from agriculture to services. In addition, although more limited, polarisation has also increased within some sectors. As a result of these two forces, the trade, transportation, accommodation and food, and business and administrative services sectors emerge as the industries making the largest contribution to aggregate polarisation (85% of the overall increase).

Table 2.2. Industry contributions to within- and between-industry polarisation in emerging economies, early-2000s to mid-2010s

Average industry contributions expressed in percentage points

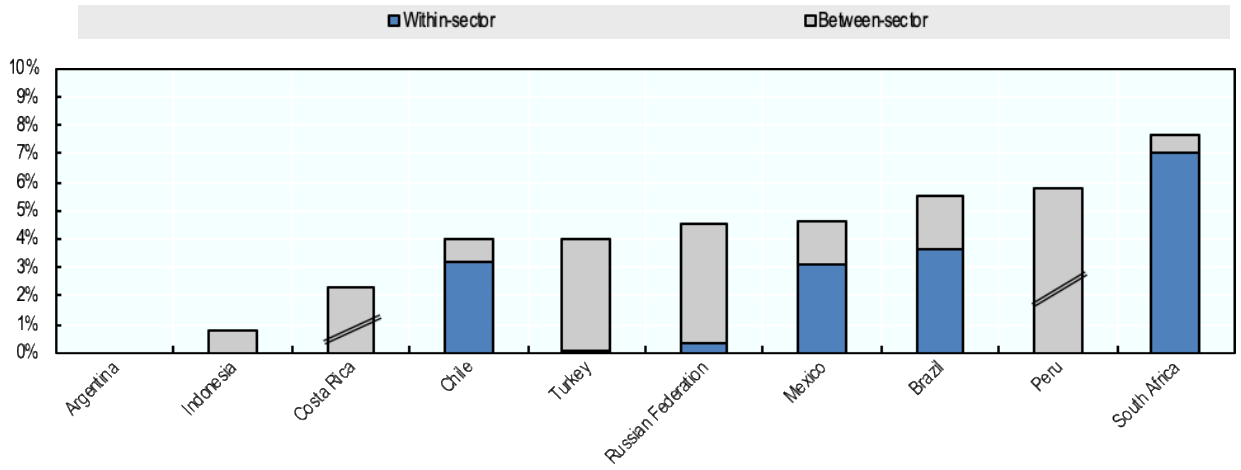
Industry	Within	Between
Public Administration, Community, Social and other Services and Activities	-0.19	1.17
Manufacturing	-0.15	-0.50
Trade, Transportation, Accommodation and Food, and Business and Administrative Services	-0.07	2.31
Mining and quarrying; Electricity, gas and water supply	0.12	-0.05
Construction	0.34	0.52
Agriculture	0.53	-1.38
Total	0.570	2.066

Note: In this table, overall polarisation is calculated as the sum of high and low skill workers over total employment. Within-sector polarisation is the increase in the share of high and low skill jobs within an industry, while between-sector polarisation is the reallocation of employment towards more highly polarised industries. Within-industry polarisation is calculated as the change in polarisation by industry over the time period, multiplied by the average share of employment of that industry. Between-industry polarisation is calculated as the change in the employment share of an industry over the time period, multiplied by the average polarisation of that industry.
Countries and years included in the analysis: 2004-2017 for Argentina, 1995-2015 for Brazil, 1996-2009 for Chile, 2000-2017 for Costa Rica, 2007-2015 for Indonesia, 2002-2017 for Mexico, 2002-2017 for Peru, 2009-2016 for Russian Federation, 2000-2007 for South Africa, 2006-2010 for Turkey.
Averages are calculated at the country level.
Source: *Author's own elaboration based on ILO KILM*

40. Figure 2.3 shows that the decline of specific sectors has played a major role in the loss of middle-skill jobs relative to high- and low-skill occupations in many but not all emerging countries considered. The prevalence of the between-industry component is observed in Indonesia, Costa Rica, Turkey, the Russian Federation and Peru, whereas the within-industry component is more relevant in Chile, Mexico, Brazil and South Africa. Hence, the polarisation observed in many emerging countries is the result of a process of structural change, which consists in the reallocation of employment from less polarised sectors (agriculture, but also manufacturing in some countries) to more polarised service sectors. While service sectors are becoming slightly less polarised, these sectors are more polarised than agriculture and manufacturing sectors. In addition, the agricultural sector is becoming more polarised too. In Chile, Mexico, Brazil and South Africa, however, within-sector polarisation is more important - suggesting that technological advances might be the primary drivers of job polarisation in these countries.

Figure 2.3. There are large differences among emerging countries in what is driving polarisation

Percentage-point change in polarisation between early-2000s and mid-2010s



Note: Polarisation is defined as the sum of high- and low-skill workers over total employment. Within-sector polarisation is the increase in the share of high- and low-skill jobs within an industry, while between-sector polarisation is the reallocation of employment towards more highly polarised industries. Within-industry polarisation is calculated as the change in polarisation by industry over the time period multiplied by the average share of employment of that industry. Between-industry polarisation is calculated as the change in employment share of an industry over the time period multiplied by the average polarisation of that industry.
2004-2017 for Argentina, 1995-2015 for Brazil, 1996-2009 for Chile, 2000-2017 for Costa Rica, 2007-2015 for Indonesia, 2002-2017 for Mexico, 2002-2017 for Peru, 2009-2016 for Russian Federation, 2000-2007 for South Africa, 2006-2010 for Turkey.
Source: *Author's own elaboration based on ILO KILM*

2.3. The impact of structural change in emerging economies

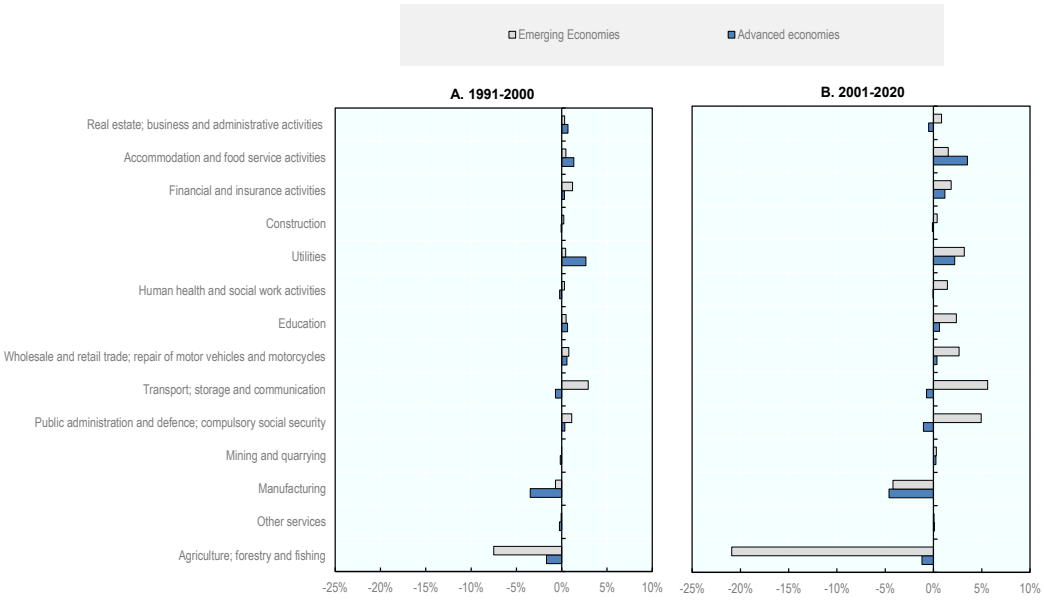
2.3.1. Structural change has improved working conditions and has not led to higher inequality in (most) emerging economies

A large share of employment has shifted from low-pay, low-productivity agricultural jobs to better-paid jobs in the service sectors

41. As a central part of their development, emerging economies have been shifting large shares of labour from agriculture to service sectors (Figure 2.4). This process started in the 1980's (Figure 2.4, panel A) but has accelerated over the last two decades (Figure 2.4, panel B). While the manufacturing and, in particular, the agricultural sectors have seen a large drop in employment shares, all service sectors have experienced an increase in their share of total employment, with the largest growth recorded in "Transport storage and communication". These shifts in economic activity are part of a natural development process of "structural transformation." As people get richer, they consume more services - such as health and financial services. The main difference with respect to more advanced economies is that, in many emerging economies, workers are shifting from agriculture straight into services, bypassing the manufacturing sector (International Monetary Fund, 2018)

Figure 2.4. Emerging economies have experienced a large shift in employment from agriculture to service sectors

Percentage point change in share of total employment by sector



Note: Average change of share of employment by sector and period for select emerging and advanced economies: Emerging economies: Argentina, Brazil, Chile, Colombia, Costa Rica, India, Indonesia, Mexico, Peru, the Russian Federation, South Africa and Turkey. Advanced economies: Australia, Canada, France, Germany, Italy, Japan, Korea, Republic of, Spain, , United Kingdom and United States.
Source: *Author's own elaboration based on ILO KILM*

42. This structural transformation has supported economic growth and reduced poverty in emerging economies as a large share of employment has shifted from low-pay, low-productivity agricultural jobs to better-paid jobs in the manufacturing and service sectors (Baymul & Sen, 2017). In fact, while in advanced economies the lowest paid employment tends to be in elementary occupations in services, the lowest paid employment in emerging economies tends to be agricultural. Table 2.3 shows that wages in agricultural occupations in emerging economies are far below the median, while in more advanced economies they tend to be nearer the middle. Thus, shifting employment away from agriculture seems a crucial means to increase incomes and improve job quality in emerging economies.

Table 2.3. In emerging economies the worst jobs are found in agriculture

Mean wage relative to overall median wage of the economy and share of employment by Occupation (ISCO at 1 digit)

		Advanced economies				Emerging economies			
		Wage/Median		Share of employed		Mean wage/Median		Share of employed	
ISCO 88 code (1 digit)	Occupation	2008	2015	2008	2015	2008	2015	2008	2015
1	Legislators, Senior Officials and Managers	1.66	1.65	8%	8%	1.99	2.06	4%	4%
2	Professionals	1.53	1.51	17%	19%	2.31	2.28	9%	10%
3	Technicians and Associate Professionals	1.18	1.16	16%	16%	1.40	1.36	7%	7%
4	Clerks	0.96	0.96	11%	11%	1.24	1.24	7%	8%
5	Service Workers and Shop and Market Sales Workers	0.79	0.83	17%	18%	0.77	0.75	19%	21%
6	Skilled agricultural and fishery workers	0.81	0.76	2%	2%	0.61	0.58	8%	8%
7	Craft and Related Trades Workers	0.96	0.99	12%	11%	0.86	0.85	14%	13%
8	Plant and Machine Operators and Assemblers	0.93	0.93	7%	6%	0.95	0.93	9%	9%
9	Elementary Occupations	0.72	0.73	11%	12%	0.66	0.64	21%	19%

Note: Unweighted average. **Advanced economies:** Australia, Canada, France, Germany, Italy, Spain, United Kingdom and United States. **Emerging economies:** Argentina, Brazil, Chile, Mexico, Peru, South Africa and Turkey. Wage / Median indicates the mean wage of the occupation relative to the median wage across all occupations.
Source: Author's own elaboration based on LFS

Structural change has not led to higher income inequality in (most) emerging economies

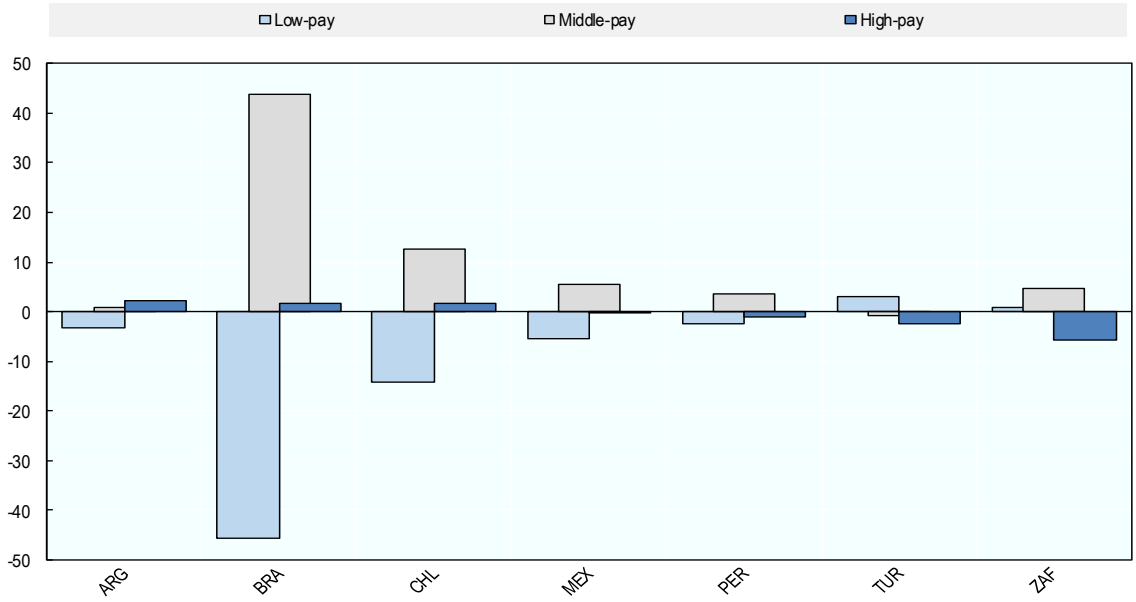
43. Structural change could have an impact on income inequality in a number of ways. The first and most obvious effect would be via occupational wage differentials: if differences between the average wages of occupations become larger over time, this could drive up overall wage inequality even if within each occupation the distribution of wages remains stable. However, as shown in Table 2.3, neither advanced economies nor emerging ones experienced growth in occupational wage differentials over the period 2008 and 2015.

44. A second channel through which structural change could lead to higher inequality is if employment expanded in high-paid and low-paid occupations relative to the middle-paid ones (called wage polarisation). However, like in more advanced economies, there are few signs of wage polarisation among emerging economies. According to Salvatori and Manfredi (Job polarisation and the middle class: New evidence on the

changing relationship between skill levels and household income levels from 18 OECD countries, 2019) only six OECD countries (across the 31 OECD countries considered) experienced full wage polarisation (defined as a decrease in the share of middle-paid jobs - i.e. those paying more than two thirds and less than 1.5 times of the median wage - and a simultaneous increase in low- and high-paid jobs). Among the emerging economies considered in this study, there are no signs of wage polarisation either (Figure 2.5). In fact, two countries - Mexico and Peru – even experienced an increase in job compression - defined as a simultaneous increase in middle-paid jobs and a decrease in low- and high-paid jobs. Moreover, contrary to most advanced economies, which experienced an increase in the share of middle-pay jobs and a decrease in the share of high-pay ones (Salvatori and Manfredi, (Job polarisation and the middle class: New evidence on the changing relationship between skill levels and household income levels from 18 OECD countries, 2019), many emerging countries have undergone an employment shift from low-pay to middle-pay jobs and, to a lesser extent, to high-pay jobs.

Figure 2.5. There is no evidence of wage polarisation in emerging economies

Percentage point changes in the share of jobs by level of pay, 2005 to 2015



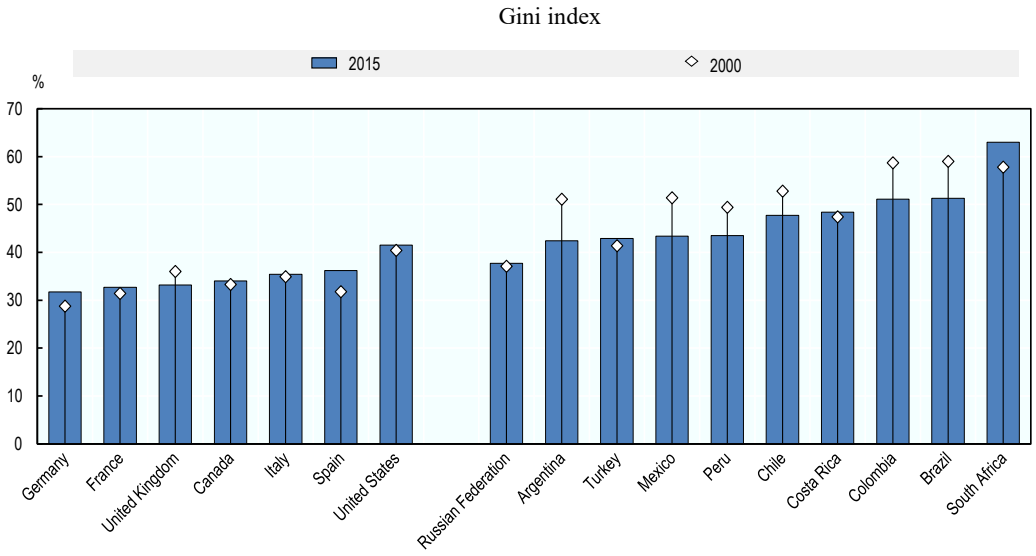
Note: Low-pay jobs are those paying less than two thirds of the median wage, while high-pay jobs are those paying more than 1.5 times the median wage.
Source: Author's own elaboration based on LFS

45. Finally, overall inequality could also expand if employment in the most unequal occupations grew faster than in the most equal ones. Thus, shifting employment from usually more equal agricultural and manufacturing sectors to services, where the distribution of wages tends to be more unequal, could result in higher income inequality overall. However, income inequality is not on the rise in emerging economies on average (Figure 2.6). In fact, unlike in most advanced countries, which have observed a significant rise in income inequality in terms of both market and disposable income (OECD, 2015), inequality has been falling in many emerging countries.

46. Nevertheless, inequality in emerging economies remains very high compared with more advanced economies (Figure 2.6). Moreover, while structural change may not have

increased inequality overall, it might (along with polarisation) lead to greater geographical disparities given that new jobs are more likely to be created in areas where there is a high concentration of high skilled workers, which are usually very different from those areas experiencing employment losses (Berger & Frey, 2016). Geographical disparities are particularly clear between rural and urban areas. Business creation rates are higher in urban areas, but more importantly, urban and rural areas display very different sectoral composition and characteristics of new firms. Urban areas tend to attract more knowledge-intensive firms, which are likely to have the best future prospects (OECD, 2018). Thus, new jobs tend to be created in urban areas and in different regions from those where jobs are disappearing, potentially exacerbating the high regional divides and the urban-rural gaps that already exist in many emerging economies (OECD, 2011)

Figure 2.6. Many emerging economies are experiencing a drop in income inequality, but levels remain high



Source: WDI. World Bank

2.3.2. Structural change is exposing many emerging countries to labour-displacing technologies

47. One drawback of analysing labour polarisation by grouping occupations is that it is based on the assumption that broad groups of "middle-skilled" occupations are necessarily routine-intensive, which disregards the heterogeneity of routine intensity within occupations. To address this, some authors use a "task content" approach to analyse job polarisation. While most studies based on this approach focus on advanced economies, there is a growing literature focusing on emerging economies (see for example (Hardy, Keister, & Lewandowski, 2017) and (Das & Hilgenstock, 2018)).

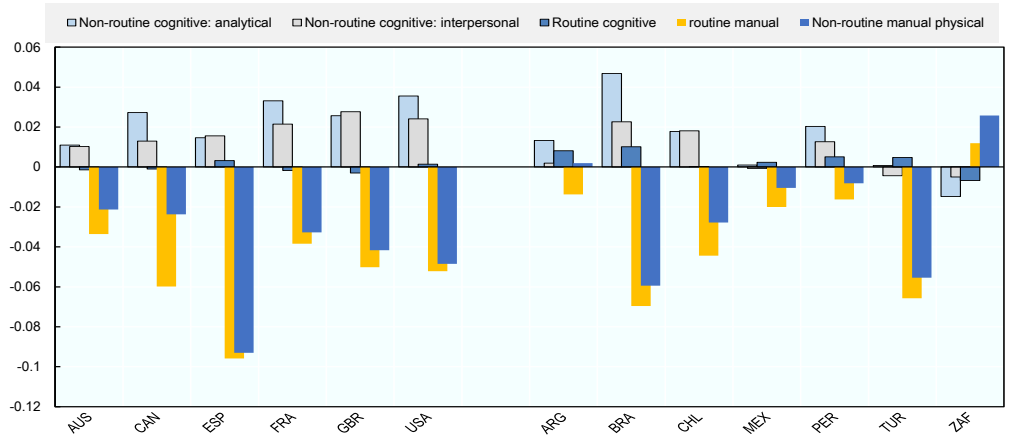
48. In what follows, the analysis uses the standard approach of combining the Occupational Information Network (O*NET) database as a source of information on the task content of occupations with country-specific labour force survey data to analyse changes in task content of jobs over time. The analysis looks at five different task content

groups: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual and non-routine manual physical[7].

49. The analysis shows that physical tasks (both routine and non-routine) are declining in emerging and advanced economies (Figure 2.7). However, a more diversified picture emerges with respect to routine and non-routine cognitive tasks. Contrary to more advanced economies, routine cognitive tasks have not declined in most emerging economies and not all emerging countries have recorded a significant increase in the average intensity of non-routine cognitive tasks. In fact, the average routine cognitive content of jobs declined only in South Africa; while in Argentina and Brazil it increased the most. Other studies show a similar growth of routine cognitive tasks in some other emerging countries around the world. For example, Aedo et al. (From occupations to embedded skills : a cross-country comparison, 2013) find routine cognitive tasks growth in Brazil, India, Turkey and Costa Rica. Apella and Zunino (Technological change and the labor market in Argentina and Uruguay : a task content analysis, 2017) document a similar trend for Argentina and Uruguay. Finally, (Ge, Sun, & Zhao, 2018) find that the share of routine cognitive jobs increased significantly from 1990 onwards in China as well.

Figure 2.7. Contrary to most advanced countries, the share of routine cognitive tasks has increased in many emerging economies

Change in the intensity by task content measure, 2005 to 2015



Note: Having assigned the O*NET task items to the LFS data, in line with Arias et al. (Back to Work: Growing with Jobs in Europe and Central Asia, 2014) and Dicarlo et al. (The skill content of occupations across low and middle income countries: evidence from harmonized data, 2016), the values of each task item within countries are standardised to make them comparable over time. Then, using the Acemoglu and Autor (Skills, Tasks and Technologies: Implications for Employment and Earnings, 2011) methodology, five task content measures are constructed, namely: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual and non-routine manual physical.
Source: Author's own elaboration based on O*NET and LFS

50. Overall, the results show that emerging countries recorded a substantial shift from manual to cognitive tasks, with a varying degree of non-routine content among the latter. This is partly in line with the routine-biased technological change (RBTC) hypothesis. RBTC predicts an increase in the share of non-routine cognitive work, both analytical and interpersonal. These tasks are not yet replaceable by machines and are complementary to ICT and automation. On the other hand, RBTC predicts a drop in routine work, both manual and cognitive, which can be replaced by machines. However, contrary to more advanced

countries, the routine cognitive content of jobs has increased in many emerging countries. Only Chile appears to be experiencing a polarisation pattern in line with RBTC (Figure 2.7).

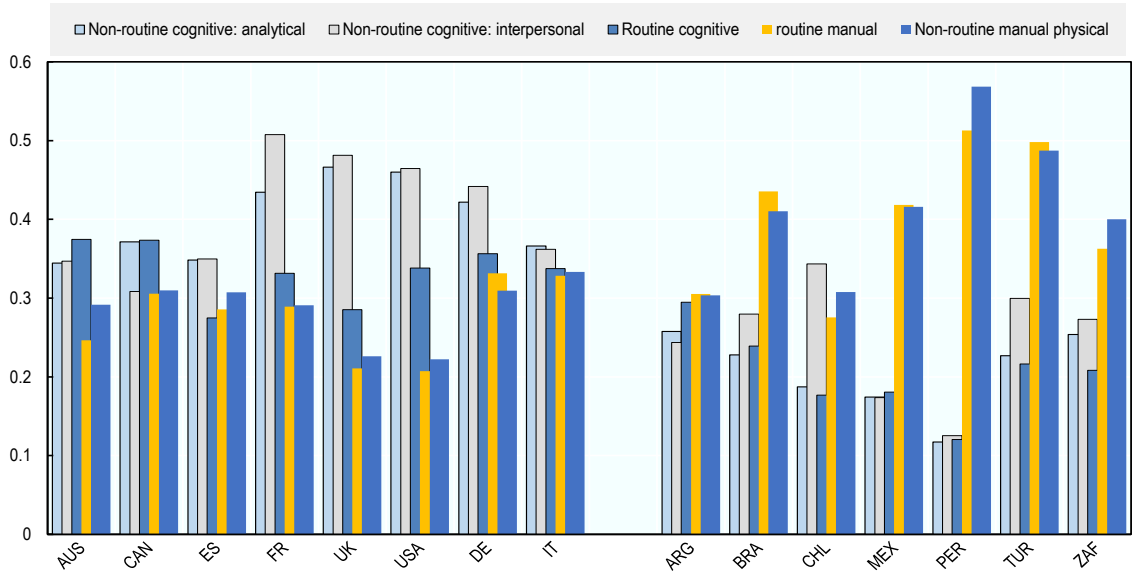
51. Structural change has been the main factor behind the increasing intensity of routine cognitive tasks, and the crucial driver of the decreasing intensity of manual tasks. This in turn can be assigned to the medium-term, steady trend of falling employment in agriculture, which is a sector heavily based on manual work. The substantial contribution of aggregate restructuring to changes in routine cognitive tasks forms the other side of the coin. The stronger the decline in agricultural employment, the larger the between-sector effect, and the larger the routine cognitive task growth. Accordingly, gross reallocation from agriculture to other sectors translated into increasing cognitive demands of an average job in emerging countries.

52. A smaller, albeit noticeable, role in the reduction of the manual content of jobs was played by de-industrialisation and the moderate decrease in manufacturing employment observed in several emerging countries (Figure 1.14). De-agrarianisation and deindustrialisation were compensated by rising employment in services, which is a sector, unlike in more advanced economies, largely based on routine cognitive work (Vashisht & Dev Dubey, 2018). On balance, these sectoral shifts have contributed significantly to the growth of routine cognitive work in many emerging economies. Finally, aggregate restructuring also contributed substantially to the growth in non-routine cognitive analytical tasks, mainly because of the increasing share of services employing highly-skilled workers. Altogether, the task content developments in emerging economies were driven primarily by structural changes.

53. Despite the drop in the manual content of jobs, many emerging economies still have a substantial share of employment in occupations with a high content of manual tasks (Figure 2.8) which, along with the increase in the routine cognitive content of jobs (Figure 2.7), leave many emerging countries vulnerable to RBTC and technology-driven worker displacement in the future. Moreover, in emerging economies, production techniques that already exist in the most developed countries can be rapidly adopted. As a result, structural and occupational changes can occur more quickly than in advanced economies, and thus pose more severe challenges for workers, firms, and policymakers.

Figure 2.8. Large share of employment in emerging economies is still in occupations with high content of manual tasks

Share of total employment in occupations with high content of each task measure, 2015



Note: Occupations with high content of a particular task measure are those above the 66 percentile for that task measure. Occupations can score high (above 66 percentile) in two or more task indices. Hence, the sum of shares do not sum up to 100. See Figure 2.7 for more details on the methodology.
Source: Author's own elaboration based on O*NET and LFS

3. The platform economy: A new opportunity for emerging economies?

54. Technology is making it increasingly feasible to outsource tasks from companies to individuals, which the latter perform as freelancers. Unbundling of jobs into sets of smaller tasks creates opportunities for workers to enjoy the flexibility of freelancing and to top up their incomes. This trend has led to the flourishing of the "gig", "sharing" or, more generally, the "platform" economy. These terms refer to transactions mediated by an app (i.e. a specific purpose software programme, often designed for use on a mobile device) or a website, which matches customers and clients, by means of an algorithm, with workers who provide services in return for money.

55. Platform work can differ along several dimensions, including the relationship between the worker and the platform. A distinction is often made (as in a recent publication on measuring the platform economy (OECD, 2019) between services performed digitally (i.e. micro tasks, clerical and data entry, etc.) and services performed physically or on-location (i.e. transport, delivery, housekeeping, etc.). It is important to stress that platform work is not in and of itself a form of employment, but rather refers to the means through which the work is obtained and (sometimes) carried out. In theory, platform workers could be engaged in any kind of employment relationship. In practice, many are (rightly or wrongly) classified as self-employed and, in particular, as independent contractors (or own-account workers/solo self-employed).

56. To date, the debate surrounding applications like Uber, Lyft, Deliveroo, Amazon Mechanical Turk, and the like, has largely focused on more advanced economies. However, platform work is becoming increasingly important in emerging economies and its effect on emerging labour markets is likely to be different. In particular, platform work may have an impact on the quantity of jobs; on the quality of jobs (including formalisation); and on gender gaps in emerging economies.

3.1. Platform work presents employment opportunities in emerging economies

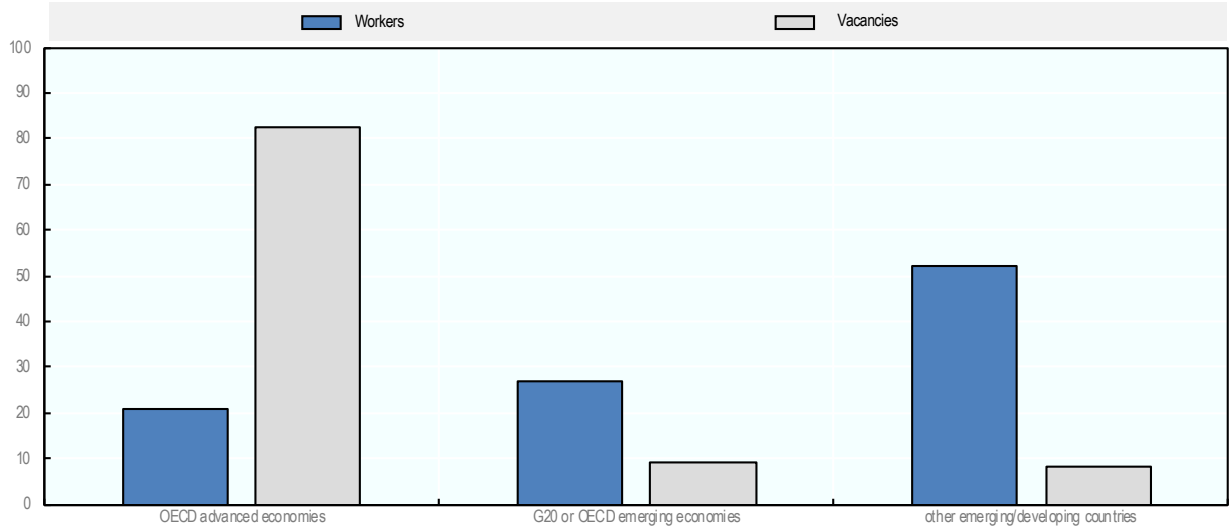
57. Well-known, international platforms such as Uber, Cabify, and Airbnb are becoming more established in emerging economies and various observers consider that emerging economies (and Asia in particular) offer the best prospects for growth for platforms. For example, Uber's second largest market is Brazil (Hook & Schipani, 2017) and there were nearly 50 000 registered drivers and two million active users in Chile by 2017 (Hidalgo & Morales, 2017). In addition, there is a growing number of local companies active in these markets. Examples of locally developed digital services include GoJek (Indonesia) and Tappsi (Colombia) for taxis, Arriendas (Chile) for car rentals, Fondeadora (Mexico) and Catarse (Brazil) for crowdsourcing, and Aliada (Mexico) for domestic services (Sundararajan, 2017).

58. A particularly interesting development within the platform economy is the phenomenon of online work (one type of platform work which is carried out entirely online). Although this still represents a minor share of workers (Katz & Krueger, 2019), online work is growing fast and it is seen as a potential driver of employment and wage growth in emerging countries. The argument is based on a number of stylised facts. First, while the majority of employers in online labour markets are based in high-income countries, the majority of workers are based in middle- and low- income countries (Figure 3.1). This simple fact suggests that workers in emerging and developing economies may

be able to earn higher (hourly) wages relative to opportunities in local labour markets. Second, online markets dramatically expand the number and types of labour opportunities, facilitating access to employers in higher-wage countries and increasing the likelihood that individual skills will be matched with available jobs. Third, online labour platforms allow employers to break down large processes into "microtasks," enabling individuals or small firms in developing countries – who do not enjoy economies of scale - to compete alongside traditional offshoring firms.

Figure 3.1. Most online gig vacancies are posted in advanced economies, while most workers are based in emerging countries

Country distribution of new posted online labour vacancies and active online workers



Note: For vacancies, the country distribution refers to where the vacancy arose; and, for active online workers, it refers to where they are located. Data are for January 2018 - January 2019.
Source: http://ilabour.oii.ox.ac.uk/online-labour-index/; for further details, see Kässi and Lehdonvirta (Online Labour Index: Measuring the Online Gig Economy for Policy and Research, 2018)

3.2. Platform work may help to formalise informal workers

59. In more advanced countries, the emergence of platform employment has raised concerns that it may be expanding the share of non-standard workers who tend to enjoy fewer protections and benefits than regular employees. In some cases, it has also raised concerns around increases in undeclared, informal work. By contrast, many emerging countries already exhibit high levels of informality and poor employment outcomes even in the formal economy (OECD, 2015). In such a context, the platform economy may offer opportunities for workers to move from unorganised forms of informal self-employment to more formal, if not regular, work arrangements.

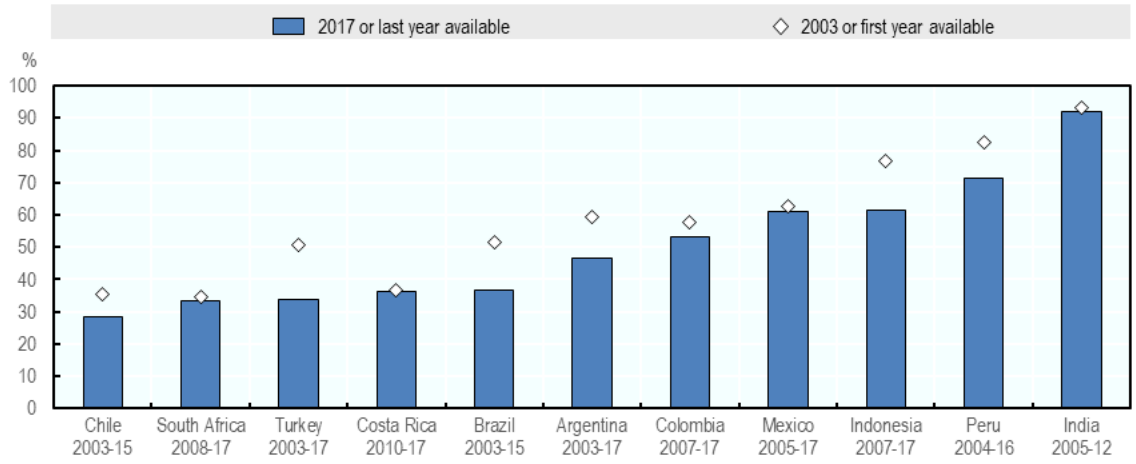
60. While informality tends to shrink as an economy develops, this is not an automatic process, as informality depends on many different factors. The economic literature has analysed extensively the causes of this phenomenon and seems to agree that the level and quality of regulation and the effectiveness of enforcement efforts play a major role on the existence of informality. However, other social, demographic and macroeconomic factors have been identified as relevant to the development and extent of informality in developing countries. These factors include, but are not limited to, low economic development,

survival reasons to fight mass poverty and unemployment, availability of skilled labour, a production structure heavily based on agriculture and other rural activities (Vuletin, 2008). Moreover, rapid population growth, especially among the poor, can slow formalisation, as it sustains the supply of low-skilled informal workers and the demand for low-quality goods (La Porta & Shleifer, 2014). Governments have had limited success in tackling informality (Bruhn & McKenzie, 2014). Although informality rates have declined somewhat in all the emerging economies considered here, levels of informal employment remain persistently high (Figure 3.2).

61. With the digitalisation of transactions (facilitating transparency and traceability of operations), the platform economy represents a very good opportunity to formalise the economy in emerging countries by reducing formalisation costs and generating a digital business environment with a larger number of recorded transactions. Perhaps more importantly, the platform economy represents an opportunity for emerging countries to link large pools of informal workers to government benefits and tax systems.

Figure 3.2. Informality rates have only decreased slowly in emerging economies

Informally employed persons as a % of the employed population aged 15-64



Note: Informality is defined to include: i) employees who do not pay social security contributions; and ii) self-employed who do not pay social security contributions or whose business is not registered.
Source: (OECD, 2018)

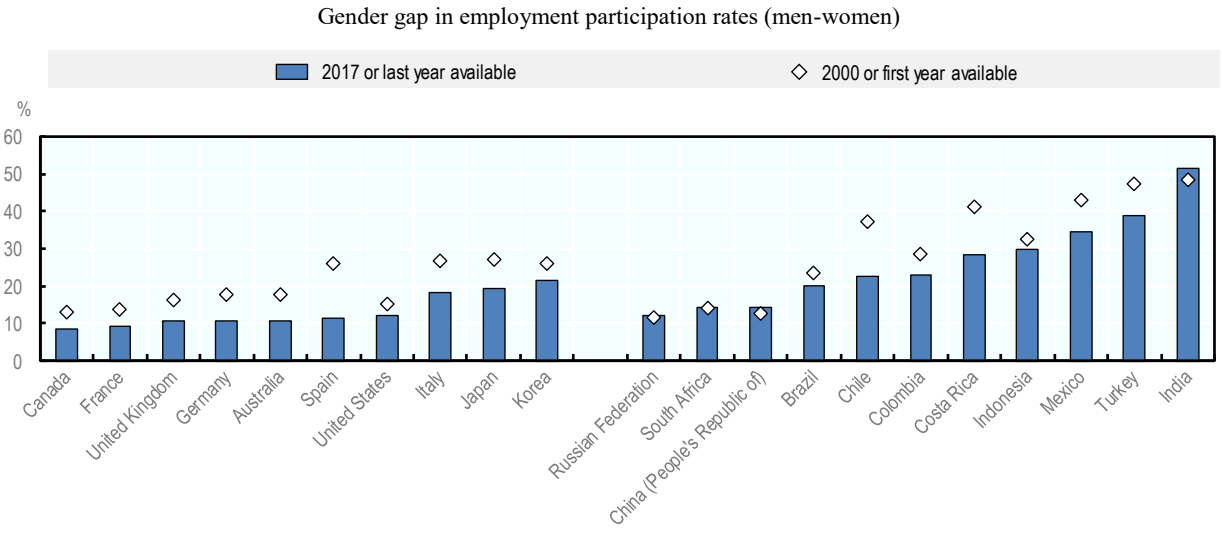
62. A good example of the potential benefits of the platform economy can be found in Indonesia. In a recent study, Fanggidae et al. (On-Demand Transport Workers in indonesia: Toward understanding the sharing economy in emerging markets, 2016) interviewed 205 drivers of "ojek" (motorcycle taxis) active on one of the platforms available in Jakarta (mainly the "GoJek" and "Grab Bike" platforms). This case is interesting because it operates in a country where almost 60% of the workforce is active in the informal sector and where at least a third of formal jobs are of poor quality (Fanggidae, Sagala, & Ningrum, 2016). Although limited in time and space, the results of the study show that platform work is not always synonymous with deteriorating working conditions in emerging countries. Moreover, the study highlights the role played by the platforms in facilitating access to social protection for workers. For example, GoJek offers help to its drivers to subscribe to the government health insurance program, while at Grab Bike, workers are automatically enrolled in the government's professional insurance programme.

63. The platform economy cannot resolve the issue of informality by itself, and it will need to be accompanied by a comprehensive strategy that simultaneously addresses all the main factors that drive it (OECD, 2018). However, the platform economy may nonetheless help to reduce the incidence of informality and facilitate access to social protection in emerging economies. Governments should work directly with platform companies to enrol all workers on their platform in social protection systems, and expect these companies to pay the individual contributions of workers. If governments fail to adequately regulate the platform economy, technological change may expand the informal sector. If platforms remain entirely unregulated, there is the risk that platform workers remain employed informally. Moreover, since platform work may attract not only many workers from shrinking agricultural and manufacturing sectors, but also many formal (and informal) workers from the expanding services sector, these new forms of employment are likely to continue to expand. As a result, the chances that a larger share of workers are not covered, or not fully covered, by social protection systems increase.

3.3. The platform economy may help to reduce gender gaps in emerging economies

64. Over the past three decades, women throughout the emerging world have been catching up with men in a number of labour market outcomes. One of the most notable improvements has been an unprecedented increase in female labour force participation, but progress has been very uneven across emerging economies (Figure 3.3). The most significant improvements have been recorded in Latin America, particularly in Chile and Costa Rica, where the participation gap has fallen by more than 10% since the early 2000s. However, large gaps remain in many emerging countries, particularly in India, Turkey, Mexico, Indonesia and Costa Rica.

Figure 3.3. Gender gaps in labour force participation are shrinking, but remain high in many emerging countries



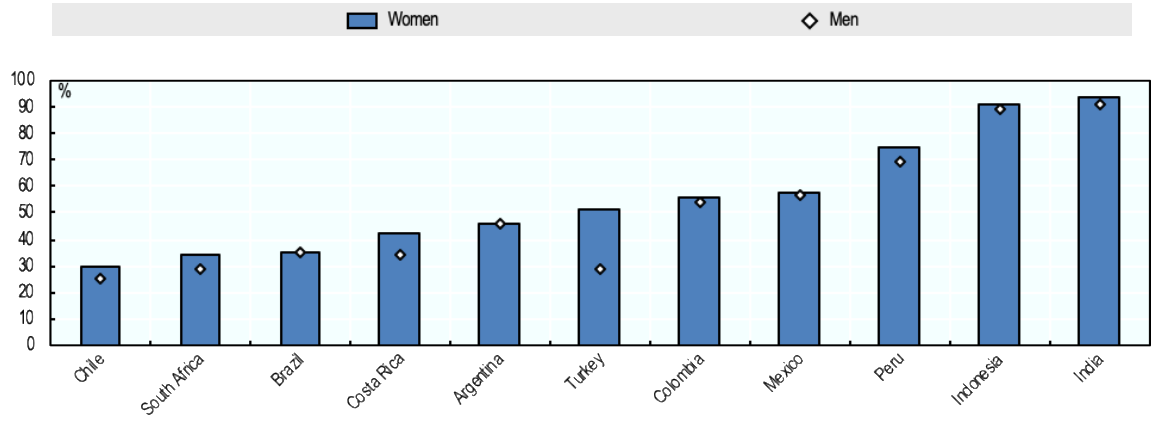
Source : Authors' own calculations based on OECD stat

65. Notwithstanding these improvements, there are still large gender gaps in labour force participation in emerging economies and women tend to have lower quality jobs than men. The sectors and occupations where women most typically work tend to be less

productive and pay lower wages. This is related to the fact that women are more likely to have informal jobs than men (Figure 3.4). Moreover, a large share of working women (often the majority) are self-employed, and they typically own smaller, less successful, and more often informal businesses than men. Credit constraints, as well as gaps in financial literacy and business-related knowledge, are among the key drivers of gender gaps in entrepreneurship. As a result, the gender pay gap in emerging economies is even larger than in OECD countries (OECD, 2016). Most worryingly, wide gender pay gaps persist when comparing workers with the same level of education and in similar jobs. Women in emerging economies also have less secure jobs, facing higher risks of both unemployment and extreme low pay (OECD, 2015).

Figure 3.4. Informality is more common among women in the majority of emerging economies

Percentage of employed persons working informally aged 15-64 by type of employment, 2014 or latest available year



Note: Informality is defined to include: i) employees who do not pay social security contributions; and ii) self-employed who do not pay social security contributions (Chile, India, Indonesia and Turkey), or whose business is not registered (Argentina, Brazil, Colombia, Costa Rica, Mexico, Peru and South Africa).The figure for India is based on the assumption that all employed workers with missing information on paying social contributions work in the informal sector. Informality rates for China and the Russian Federation are missing given the unavailability of comparable data on social security contributions and business registration.
Source: (OECD, 2016)

66. The platform economy provides emerging countries with innovative ways of promoting labour market participation and improving working conditions, especially for those who would otherwise not work or those who can choose the time and place of work (OECD, 2016). Women, in particular, can benefit greatly from these new forms of work, helping to close the marked gender gaps that exist in emerging countries (OECD, 2016). A key driver of gender inequality in emerging economies continues to be the uneven distribution of household and family care between men and women (OECD, 2016). Thus, more flexible ways of working brought by platform work may help women to combine paid work with caring responsibilities and increase women's employment. For example, Rossotto et al. (New frontiers and opportunities in work : ICT is dramatically reshaping the global job market, 2012) argue that flexible schedules enable workers to balance online labour with other responsibilities such as childcare and education. For example, women (42%) were more likely than men (29%) to say that their main reason for driving with Uber

is that they "can only work part-time or flexible schedules" because of a "family, education, or health reason" (Hall & Krueger, 2018).

3.3.1. So far, however, women do not appear to be more present in the platform economy than men as there are barriers limiting their access

67. Data for the United States indicate that most of the participants in the online platform economy are men (JPM, 2016) and, although the proportion of female drivers is higher for Uber than for traditional taxis, it remains a male-dominated occupation. Similarly, in the United Kingdom, an estimated 69% of gig workers are male (RSA, 2017). One of the main barriers for women to sign up in platform work is the lack of benefits. The nature of self-employment means that women who enter platform work are probably unable to access a range of benefits; for example, maternity leave, paid holidays, and sick pay.

68. However, conditions for women in more advanced and emerging countries are different and so are the employment barriers they face. While in more advanced economies only a small fraction of women work in the informal sector, a large share of women in emerging countries do (Figure 3.4). Since benefits are typically not available in the informal sector, not having benefits in the platform economy is not such an important barrier for the large share of women working in the informal sector in emerging countries. In fact, according to a recent report, none of the Uber women drivers surveyed cite a lack of benefits as a challenge in India and Mexico, where the proportion of women employed informally is 94% and 57%, respectively (Figure 3.4), compared with 31% in South Africa and 29% in the United Kingdom (IFC, 2018). Still, women in emerging economies face cultural and administrative barriers, similar to those faced in more traditional workplaces, limiting their access to platform work. For example, in many emerging countries, women's ability to own and access vehicles is held back by social, financial, and legal barriers (Nielsen, 2014) - limiting their ability to work as drivers in the platform economy. According to a recent report (IFC, 2018), at 5.2%, Mexico has the highest proportion of women drivers currently using the Uber app of the six countries studied in the report[8]. The proportion of women drivers rises to over 20% in Canada and the United States, but together these two markets account for 75% of all women drivers globally who drive with Uber.

3.3.2. Online work may help women overcome barriers they face both in the local platform economy and more traditional workplaces

69. Some scholars have suggested that digital work is particularly promising for groups facing higher barriers in traditional labour markets, including women. For example, Raja et al. (Connecting to work : how information and communication technologies could help expand employment opportunities, 2013) suggest that, by making location irrelevant, digital labour allows women to overcome biases that restrict their careers in more traditional workplaces. A recent Facebook, OECD and World Bank survey of online entrepreneurs operating on Facebook found that women-run firms exceeded the percentage run by men in Australia, Canada, the Philippines, the United Kingdom and the United States, and tied with men in Thailand (OECD, FUTURE OF BUSINESS SURVEY GENDER MANAGEMENT IN BUSINESS, 2017). And, in contrast to the offline world, female entrepreneurs on Facebook had, on average, similar business confidence scores as men – while in Malaysia and the Philippines women tended to be significantly more optimistic (OECD, FUTURE OF BUSINESS SURVEY GENDER MANAGEMENT IN BUSINESS, 2017). The study concluded that digital businesses may help level the playing

field for women and men since customers can be reached across the world and cultural norms are avoided.

3.3.3. But there are barriers that prevent women (and men) in emerging economies from accessing online platform employment

70. While internet-based labour platforms have been hailed for their ability to connect skilled workers in poor countries with better employment opportunities in developed economies, these platforms are not frictionless, and remain far from global. In fact, there are significant barriers that may prevent workers in emerging economies from accessing online platform employment. The main barriers include the lack of soft (i.e. institutions) and hard infrastructure (i.e. the physical networks necessary for the functioning of a modern industrial nation) and language barriers. While there is still a home advantage (i.e. clients often prefer workers who are based in the same country), a more important barrier is having the right skills and tools (affordable broadband connections, smart phones etc.)

71. Online platform work is only available to those with internet access. Many emerging countries are lagging behind in internet access (Figure 1.12). Yet, given the rapid expansion in access, this may not be a key constraint in the future. Moreover, internet access in developing countries is increasingly driven by the cost of mobile tariffs (Kuek, Paradi-Guilford, Fayomi, Imaizumi, & Ipeirotis, 2015). Thus, by increasing access to mobile broadband, governments can ensure last-mile internet access without requiring the slow installation of high-cost fixed broadband lines. Finally, access to computers and/or mobile devices is a fundamental requirement to engage in online platform work. However, many potential workers in developing countries still lack access to computers and while smartphone ownership is growing rapidly in emerging countries, to date, no market places appear to enable mobile phone-based work on a large scale (Kuek, Paradi-Guilford, Fayomi, Imaizumi, & Ipeirotis, 2015).

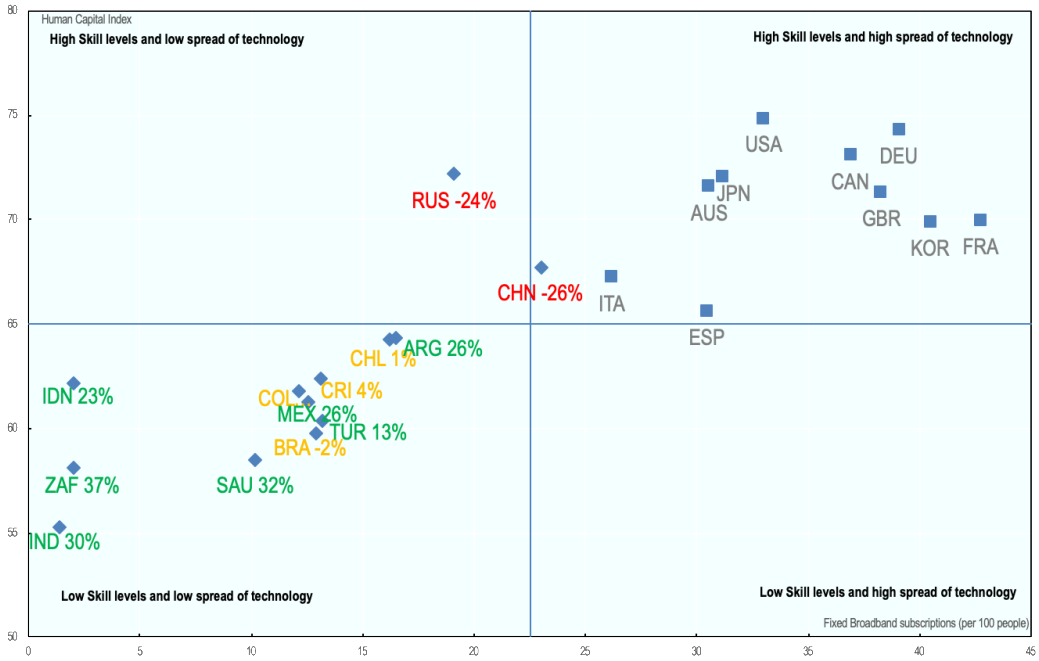
72. Equally important as providing the right tools is ensuring a supply of suitable workers. Skills demands for online work are still high for most workers in developing countries. Addressing this skills barrier requires additional training for potential workers to learn how to better navigate the system and learn new skills. And technology can help in this agenda. Some platforms, such as Samasource[9], have been providing such training in developing countries. The potential of combining access to these platforms with online learning can be large.

73. Finally, in online platform work there is still a home advantage and there are language barriers. While online labour platforms are presumed to be eroding the frictions that result in inferior labour outcomes for women, ethnic minorities and many other groups, recent studies show that information-related frictions long observed in traditional labour markets are exacerbated in online labour platforms, resulting in a significant penalty for job seekers in developing countries (see for example, (Galperin & Greppi, 2017). Moreover, most of the platforms operate in English. Thus, without English language skills, it is difficult to navigate the system, communicate with clients, and perform work. Setting up local platforms could mitigate this challenge, but is more efficient to do this in sufficiently large language-based markets.

4. Conclusions

74. On average, workers in emerging economies spend around half of their time on tasks that could be automated. However, while many jobs are technically automatable, actual automation may not yet be economically attractive due to an abundance of low-cost labour and slower technology adoption. While ICTs are expanding faster in emerging than in advanced economies (Figure 1.12), most emerging countries remain fairly low-tech, have low skill levels and expanding labour forces (Figure 4.1), with a larger share of manual, non-routine labour (Figure 2.8). This means that investments in technology are currently less profitable for firms in emerging economies.

Figure 4.1. Most emerging economies are low skilled, low-tech and have young and expanding labour forces so incentives to replace human labour with technology are low



Note: The % variation in the working age population in 2050 and in 2015 is shown next to the country name. In red, countries with a decrease in the working age population of more than 10%. In green, countries with an increase of more than 10% and in yellow, countries with no significant variation in their working age populations.
Source: WDI and United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision.

75. Since technology adoption is sluggish in many emerging countries, there are few signs of pervasive labour or wage polarisation related to technology in these countries and the labour polarisation observed in some emerging countries is largely driven by structural change (in particular by a move away from the agricultural sector).

76. However, differences in economic structures across emerging economies imply differences in the way countries are affected by technological progress. Some emerging countries are already as exposed to automation as advanced ones. Led most prominently by China, some emerging economies are among the leaders in industrial robotisation (IFR,

2017). In addition, the share of tasks that are routine (and therefore automatable) is rising in many emerging economies, which implies that currently labour-intensive industries may be getting increasingly exposed to technological disruptions, with potential for significant labour displacement. Moreover, unlike in advanced economies, polarisation and de-polarisation forces are at play simultaneously in emerging countries and patterns vary significantly across countries. On the one hand, globalisation is bringing many low- and medium-skill jobs of developed countries to some emerging countries (i.e. a "de-polarisation" of the skill distribution). On the other hand, technology is helping to automate tasks in emerging economies and to relocate production back to advanced economies, which may have a polarisation effect on some emerging labour markets.

77. While technological progress can be a source of disruption, emerging economies can also benefit from technological advances. For example, new developments in precision agriculture, based on automation and the use of the Internet of Things, offer great potential for increasing productivity in agriculture and speeding up structural transformation in India, Indonesia, or Peru where agriculture accounts for a larger percentage of employment. The deployment of sophisticated robots in manufacturing will help to increase productivity in countries with a large manufacturing sector such as Turkey, China, the Russian Federation and Mexico, but it needs to go hand in hand with investments to increase the productivity of service sectors. Otherwise, there is risk of shifting workers to low-productivity service jobs, causing the reverse effect: a slowdown of overall productivity growth.

78. Technology has also facilitated the emergence and growth of the "platform" economy, which offers opportunities for employment growth and job formalisation in emerging economies. The platform economy could also help promote labour market participation and improve working conditions for some groups of workers. Women in particular can benefit, helping to close the marked gender gaps that exist in emerging countries. A particularly interesting development within the platform economy is the phenomenon of online work. Although this still represents a very small share of total employment, it is growing fast and could boost both employment and wage growth in emerging countries. The majority of online workers are based in emerging economies, which means that workers in these countries may be able to earn higher (hourly) wages relative to opportunities in local labour markets. However, these opportunities are typically skill intensive, requiring complementary investments in education and training.

79. While the potential labour market disruptions associated with the expanding scope of automation and labour polarisation is likely to affect emerging economies later than advanced ones, it may be potentially more disruptive in countries with little consumer demand and limited social safety nets. As hosts to a significant fraction of the global labour force, the consequences of automation, when it eventually hits, could be profound. A specific concern is that technological dynamics could erode middle-skilled employment much earlier in the convergence process than it did in developed economies, bringing with it premature deindustrialisation, adverse consequences for productivity and growth, and potentially derailing income convergence.

80. Emerging countries should plan ahead of such an event. The experience of developed countries in managing the fallout from polarisation could hold important lessons for policymakers in emerging economies. Increasing the supply of high-skilled labour, raising investments in technological proficiency and building social safety nets are key policy challenges ahead. However, high levels of self-employment and sizeable informal sectors, the lower coverage and generosity of social protection systems, along with a tax

system that delivers only modest redistribution, make these challenges even harder to tackle in emerging economies.

81. In the end, technology might also be part of the solution. On the one hand, the potential adverse effects of automation may be (at least) partially outweighed by new opportunities offered by online platform work, which allows people to connect global digital labour markets. On the other hand, digitalisation of transactions may help to reduce informality and increase fiscal space through greater transparency of payments (Rogoff, 2016), strengthened tax administration, and improved exchange of information to fight tax evasion.

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Notes

[1] Frey and Osborne (The future of employment: How susceptible are jobs to computerisation?, 2013) refer to engineering bottlenecks to those skills that limit current technology to replace humans. In particular the identified three main bottlenecks: Creative intelligence, social intelligence and physical dexterity.

[2] To study this, Nedelkoska and Quintini (2018) conducted a shift-share analysis whereby all PIAAC countries are compared to Canada, the reference country, and the difference in the risk of automation is decomposed into differences in the structure of industries (between variance) and differences in the job content within industries (within variance).

[3] These factors include the cost of developing and deploying automation solutions for specific uses in the workplace, the labour market dynamics (including quality and quantity of labour and associated wages), the benefits of automation beyond labour substitution, and regulatory and social acceptance.

[4] Firms, formal or informal, with fewer than 10 workers

[5] While many studies show evidence of polarisation, other studies report different and sometimes even contradictory results. To a large extent, these differences are driven by choices of definitions, methodology and/or data sources. Several studies show evidence of polarisation in the United States (see Acemoglu and Autor, 2011; Autor and Dorn, 2013; and Autor (2014) for a less technical discussion), the UK (Goos and Manning 2007; Salvatori 2015), Germany (Spitz-Oener 2006; Dustmann et al. 2009; Kampelmann and Rycx 2011), Sweden (Adermon and Gustavsson 2015), in Western Europe (Goos, Manning, and Salomons, 2014) and Harrigan, Reshef and Toubal (2016) document the same phenomenon in France, using firm-level data. More recently, the OECD (2018) confirmed that the decline in the share of middle-skill jobs is a pervasive phenomenon affecting all OECD countries with only two exceptions in Central Europe (Hungary and the Czech Republic). However, other authors (Oesch and Rodriguez Menes, 2011; Fernández-Macías, 2012) and more recently Eurofound (2017) have argued that job polarisation is not so pervasive across developed economies.

[6] The decomposition can be expressed as follows: $\Delta Polar_c = \underbrace{\sum_i \Delta S_{i,c} \overline{Polar_{i,c}}}_{Between} + \underbrace{\sum_i \Delta Polar_{i,c} \overline{S_{i,c}}}_{Within}$, where Polari,c captures within-industry polarisation of industry i in country c, and Si,c is the employment share of the industry i relative to total employment in all considered industries in country c.

[7] Having assigned the O*NET task items to the LFS data, in line with Arias and Sánchez-Páramo (2014) and Dicarlo et al. (2015), the values of each task item within countries are standardised to make them comparable over time. Then, using the Acemoglu and Autor (2011) methodology, five task content measures are constructed, namely: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual and non-routine manual physical.

[8] Egypt, India, Indonesia, Mexico, South Africa, United Kingdom.

[9] http://impacthub.org/players/issp/samasource/