

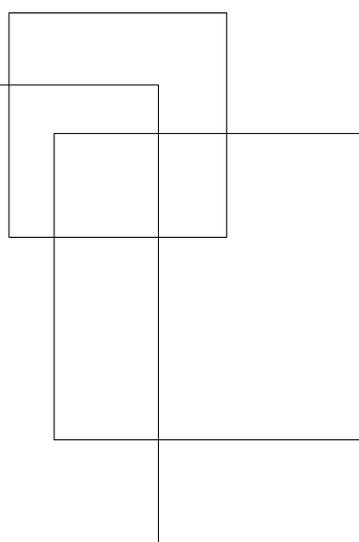


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# The Future of Work: A Literature Review

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## Abstract

An enormous amount of literature has emerged over the last few years in the context of the “Future of Work”. Academics, think tanks and policy makers have fuelled rich discussions about how the future of work might look like and how we can shape it. Indeed, labour markets in developing and developed countries are likely to undergo major transformations in the next years and decades. However, despite a growing body of research in this area, there exists no universally accepted definition of what exactly the “Future of Work” encompasses and what the most relevant drivers are. Accordingly, there is a vast variety of themes and methods covered by the literature on the Future of Work. Few papers cut across a multidimensional analysis of the different potential drivers of change. This literature review provides the first systematic and synoptic overview of topics discussed under the umbrella of the “Future of Work”. It not only highlights the trends of the most important drivers as discussed in existing studies, it also defines what the expected outcomes of the future of work might be. The review first devises a structure based on key labour market dimensions and then categorises findings from the literature conditioned on such dimensions. It also contains an assessment on the coverage of the studies on the future of work and perceived limitations and thematic gaps.

## Acknowledgments

This literature review was conducted in the context of the preparation of the inception report for the ILO's Global Commission on the Future of Work. The review was prepared by Thereza Balliester and Adam Elsheikhi under the guidance of Ekkehard Ernst and with inputs from Michela Esposito, Rossana Merola and Daniel Samaan. The preparation of the report benefited significantly from support by Anne Drougard and the ILO's Library Team. We are grateful for the helpful comments provided by Janine Berg, Youcef Ghellab, Jeff Lawrence Johnson, Sangheon Lee, Guillermo Montt, Maria-Luz Vega, and Sher Verick.

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## 1. Introduction

Developments in the world of work have attracted immense attention recently. Challenges and opportunities that current trends seem to bring are looming large, stirring significant debate among academics, scholars, policymakers, and the public alike. But uncertainty around what to expect from these developments remains, and observers regularly fall prey to bouts of either optimistic or pessimistic views on the future of work.

Indeed, despite the intensity of the debate, no commonly accepted vision on the future of work has yet emerged. Neither is there an agreement as to the key drivers that will influence future jobs and wages. At this point, most publications highlight the impact that the Fourth Industrial Revolution, with its focus on technological developments in robotics, artificial intelligence and genetics, might have for the labour market.<sup>1</sup> However, concurrent to this technological revolution there are a set of broader socio-economic, geopolitical and demographic drivers of change that might have even more significant and longer lasting influences on the world of work.

More concretely, technology, climate change, globalisation, and demography are seen as key megatrends within the context of the world of work and are projected to play a defining role in the upcoming years. As highlighted in the ILO Inception Report (2017c), understanding how these megatrends might influence work and society is crucial to prepare for the changes to come.

We define the future of work along five dimensions in which current changes will impact the world of work (see Figure 1): the future of jobs; their quality; wage and income inequality; social protection systems; and social dialogue and industrial relations. The future of jobs refers to job creation, job destruction or the future composition of the labour force. In contrast, the future of job quality touches on issues like future working conditions or the sustainability of social protection systems. Discussions on wage and income inequality are concerned about both the average growth of wages and earnings - as well as their distribution across households in the future. Finally, the future of social dialogue and industrial relations refers to how organised workers institutions might evolve in the upcoming years with such drivers of change.

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<sup>1</sup> The Fourth Industrial Revolution (4IR) – a term coined by the World Economic Forum after the German high-tech strategy project “Industrie 4.0” – is considered to describe the current fourth major industrial era since the first industrial revolution of the 18<sup>th</sup> century. 4IR contains the creation and deployment of new technologies that are merging the physical, digital and biological worlds, impacting all disciplines, economies and industries.

**Figure 1: Outcomes of the future of work**

With these five dimensions in mind, this literature review highlights the most important trends currently discussed, stressing their multifaceted nature. The next part identifies key drivers of coming changes, highlighting the intricate linkages that exist between them. The review concludes with a section on the main findings in the literature as well as gaps identified regarding both geographical and topical coverage of existing studies.

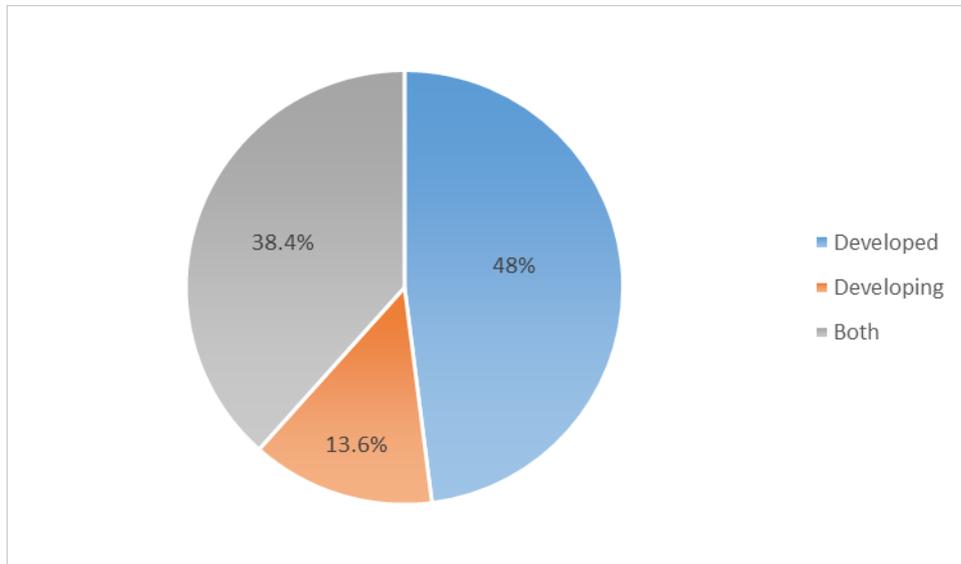
## 2. Literature review

The literature review is structured around the five dimensions presented in the introduction and organised as follows. Section 2.1 presents the reader with scenarios for *the future of jobs* along two subsections: Firstly, it discusses *labour force developments* and how global labour force participation might evolve in the future. Secondly, *jobs and unemployment* summarises debates on job destruction and job creation focusing on shifts in technology and structural change resulting from greening the economy. Section 2.2 introduces *the quality of jobs* – touching on, but not limited to, discussions on new forms of employment and how they might affect working condition in the future. Section 2.3 incorporates *the future of social protection*, covering sustainability issues stemming from several factors such as ageing populations and new forms of employment. Section 2.4, in turn, highlights how future wage and income distributions across households might develop taking into account a range of determinants. Finally, section 2.5 discusses current trends in *industrial relations and social dialogue* and how such entities can be expected to respond to the dynamic changes contained within the future of work.

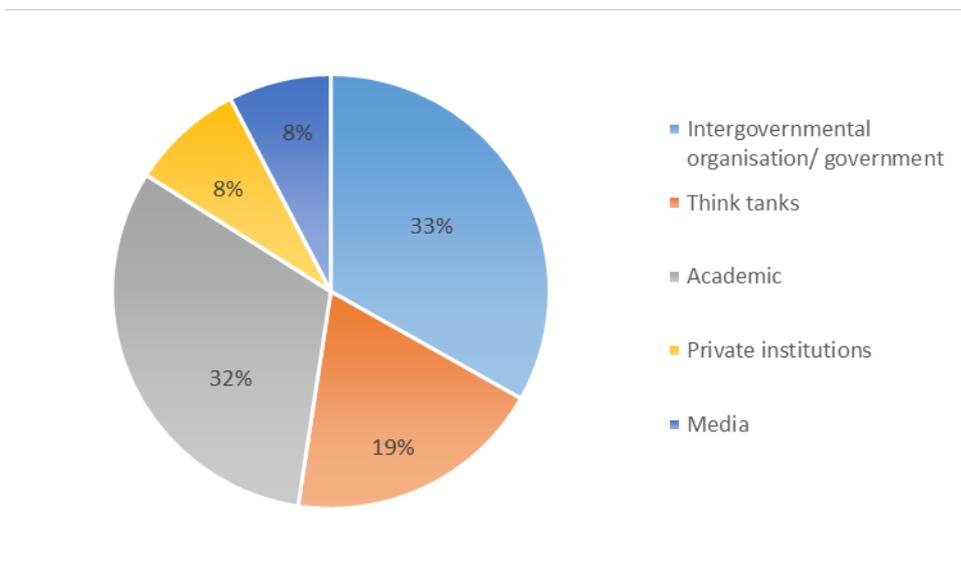
In terms of methods, the majority of published studies were identified through searches of EconLit, RePEc, SpringerLink, and EBSCO databases for the period 2005 to 2017. We made use of keywords, titles, and abstract information. The main search terms included, but were not limited to, “future of work”, “fourth industrial revolution”, “industry 4.0”, “demographic shift”, and “shared (gig, platform) economy”. We also used broad terms that are associated with work, such as “social security”, “working conditions”, and “wage inequality”. Additionally, lists of references obtained from reviewed papers, book chapters, and reports were included in this study and other relevant pieces of literature were systematically reviewed and experts were consulted to identify further additions. While most of literature used were English studies, the review also includes several Spanish, French, and German sources.

From the 255 studies included in this literature review, 121 (47.5 per cent) focused solely on developed countries (mostly U.S., U.K. and Germany), 34 (13.3 per cent) on developing countries only and another 100 (39.2 per cent) on both developed and developing countries (see Figure 2). Figure 3 provides an overview of the type of studies reviewed. The majority of studies were written by governmental or intergovernmental organisation – such as the ILO, World Bank and German Federal Ministry of Labour and Social Affairs (33.5 per cent). This is followed by academic papers (31.4 per cent); think-tanks (19.1 per cent); the media (7.6 per cent) and lastly private institutions such McKinsey and Deloitte (8.4 per cent).

**Figure 2: Stage of development representation in the reviewed literature (255 studies)**



**Figure 3: Types of studies used in the reviewed literature (255 studies)**

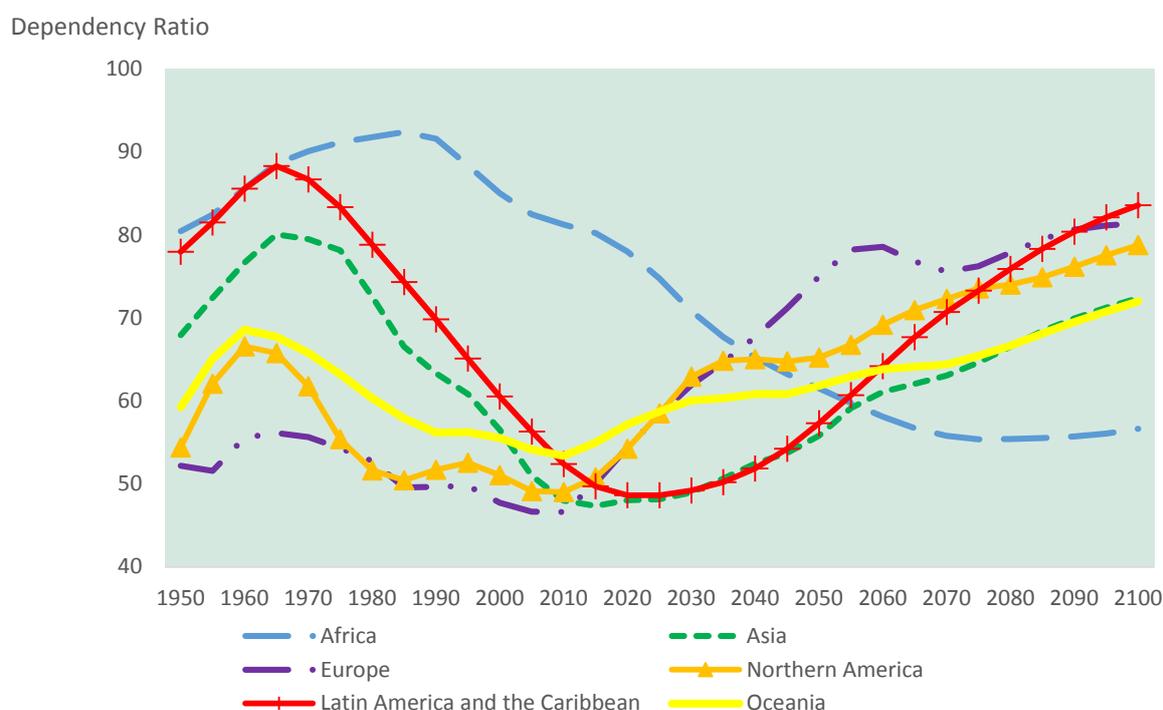


## 2.1 The future of jobs

### 2.1.1 Labour force developments

Demographic changes are a key determinant of prospects for the global labour force.<sup>2</sup> The world population is predicted to expand from 7.349 billion in 2015 to 9.725 billion in 2050 and up to 11.213 billion by 2100.<sup>3</sup> More than half of this global population growth will happen in Africa until 2050. Thereafter, Africa's dependency ratio is projected to stabilise as the continent sees its fertility rates converge to lower levels – similar to those observed in other world regions – and benefits from slowing growth of its younger population and a declining youth-dependency ratio.<sup>4</sup> Other regions which had experienced similar trends much earlier are now expected to have a continuous increase in their dependency ratio, led by an ageing population and an expansion of the silver economy (see Figure 4).<sup>5</sup>

**Figure 4: Projected dependency ratios in major world regions**



Note: The dependency ratio represents the ratio of population at age 0-14 and 65+ divided by population at age 15-64, multiplied by 100.

Source: Bloom et al. (2016); UN population projections (2017).

<sup>2</sup> Schwarz et al. (2014)

<sup>3</sup> United Nations (2015)

<sup>4</sup> Bloom, Kuhn, and Prettnner (2016)

<sup>5</sup> Bloom, Kuhn, and Prettnner (2016); UNICEF (2014); United Nations (2015)

The global increase in the share of older people will result in a decline of the growth rate of the potential labour force.<sup>6</sup> In addition, rising educational attainment and longer school careers will also continue to lower participation rates among young people, especially in emerging and developing countries where youth participation rates are currently still very high.<sup>7</sup> The fall in the working-age population is expected to be most pronounced among OECD countries, where it might fall by 7 per cent by 2060.<sup>8</sup> This demographic shift is also present in developing economies: In Latin America, for example, 30 per cent of its population will be older adults by 2100.<sup>9</sup> Labour market and pension reforms in the OECD countries are expected to partly compensate for a declining working-age population, pushing up labour force participation by 2.4 percentage points over the same period.<sup>10</sup> Nevertheless, labour's contribution to GDP per capita is expected to be nil or even negative, dragging down prospects for global growth.<sup>11</sup> Also, delaying the retirement age is likely to increase the share of workers with disabilities, which will have to be tackled by future employers in order to help keep this group in the labour force.<sup>12</sup> However, beyond the potential educational and digital inclusion of people with disabilities, the existing literature scarcely approaches the inclusion of this section of society in the future of work.<sup>13</sup>

International labour migration is expected to mitigate global differences in demographic transitions.<sup>14</sup> Provided a supportive policy framework, increased migration might help limit the deceleration of global labour force growth.<sup>15</sup> In particular, many developed countries are launching new policies to attract high-skilled migrants: Examples include the United Kingdom's introduction of a points-based immigration system in 2015 and its recent programmes to attract the 'brightest and best' innovators and entrepreneurs.<sup>16</sup> However, some studies suggest there will be more young migrants than high-income countries can absorb.<sup>17</sup> Furthermore, brain drain will affect sending countries by increasing their dependency ratio and depleting their human capital stock.<sup>18</sup>

Cross-country convergence is likely to reduce the pressure for international labour migration. Lutz et al. (2014) design three scenarios for how international migration might evolve until 2055-2060 (Figure 5). For two of these scenarios – one based on a pool of expert opinions, and the other on population projections – their estimates of the global number of migrants show a decline starting in approximately 30 years. Moreover, in the long-run, net migratory flows will diminish continuously until they reach half the 2050 levels by 2100.<sup>19</sup> Nevertheless, temporary labour migration may increasingly compensate for skills shortages in developed countries and thus replace permanent migration.<sup>20</sup> Notwithstanding, environmental degradation, climate change, and water shortages are expected to provoke increased

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<sup>6</sup> Hagen and Walz (1995); Bengtsson (2010); Bosanquet, Fraser, and Nolan (2013)

<sup>7</sup> ILO (2015a)

<sup>8</sup> Braconier, Nicoletti, and Westmore (2014)

<sup>9</sup> Estevadeordal et al. (2017)

<sup>10</sup> Estevadeordal et al. (2017)

<sup>11</sup> Braconier, Nicoletti, and Westmore (2014); UNDP (2016); World Economic Forum (2017)

<sup>12</sup> United Nations (2015)

<sup>13</sup> ILO (2015a); Santos and Sousa (2011); Wolbring (2016)

<sup>14</sup> Kerr et al. (2016); OECD (2016c); World Bank Group and International Monetary Fund (2016)

<sup>15</sup> World Bank Group and International Monetary Fund (2016)

<sup>16</sup> Kerr et al. (2016)

<sup>17</sup> Kerr et al. (2016)

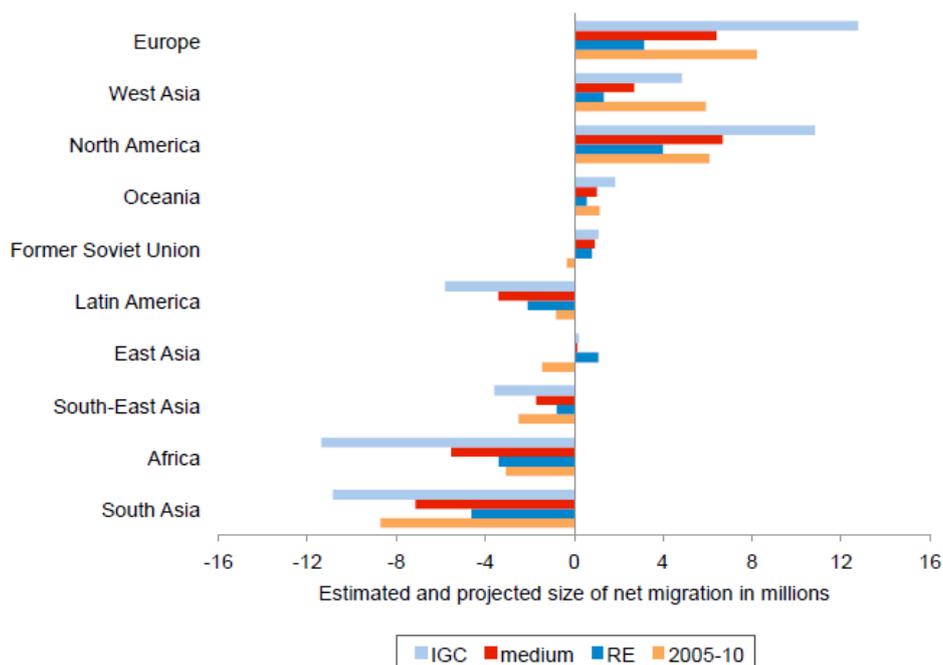
<sup>18</sup> OECD (2009)

<sup>19</sup> Buettner and Muenz (2016)

<sup>20</sup> Lutz, Butz, and KC (2014); Collinson, Tollman, and Kahn (2007)

migration – especially in geopolitically unstable regions.<sup>21</sup> Indeed, in the absence of a significant adjustment to how billions of individuals conduct their lives, certain areas of the earth are estimated to be uninhabitable by as early as the end of this century.<sup>22</sup> Since 2008, an annual average of 21.5 million individuals have been displaced by climatic forces or weather-induced disasters.<sup>23</sup> In addition, a sizeable section of the literature discusses the increasing incidence of conflict within countries receiving migrants – mostly in response to increased competition, ethnic tension and distrust.<sup>24</sup>

**Figure 5: Scenarios for international migration (2055-2060)**



Note: IGC is an abbreviation for “intensifying global competition” scenario; medium (business as usual): projection for 2055 to 2060; RE: “rise of the east” scenario. RE assumes restrictive migration policies in Europe and North America due to economic stagnation while South and Southeast Asia become increasingly attractive destinations. IGC assumes dynamic growth and social development at the global level paralleled with liberal immigration policies, resulting in growing competition among governments and the private sector for skilled labour and natural resources.

Source: Lutz et al. (2014)

Even with falling global labour force participation rates, however, the challenge to create enough jobs remains substantial (see Figure 6). According to the World Economic Forum (2016b), as much as 500 million new jobs will need to be created by 2020 to enable opportunities for both current job seekers and those young people projected to join the workforce in the upcoming years. Moreover, unemployment affects young people – particularly young women – disproportionately across all

<sup>21</sup> UNHCR (2015)

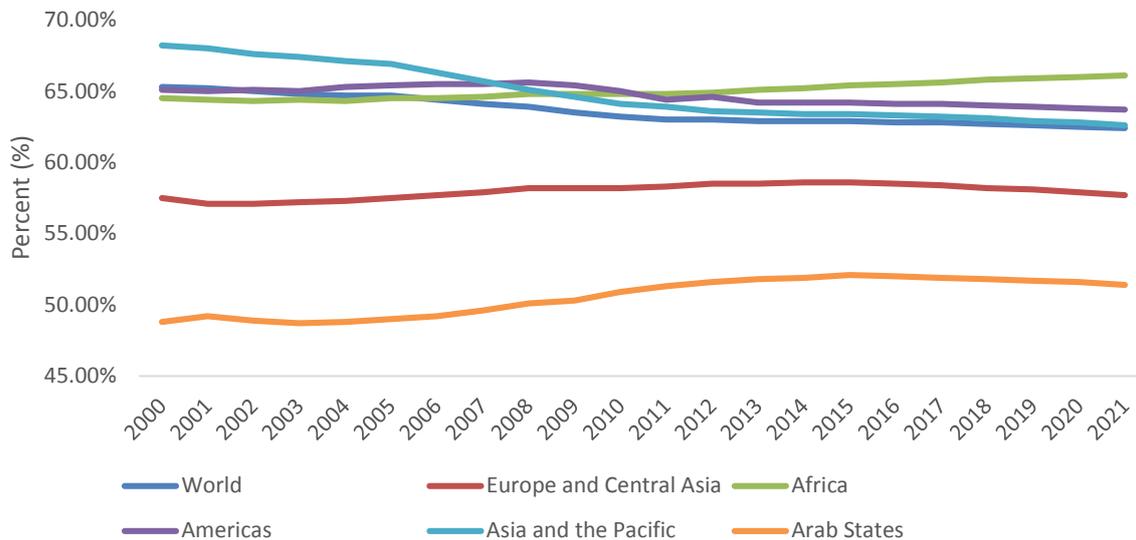
<sup>22</sup> Wallace-Wells (2017)

<sup>23</sup> Wallace-Wells (2017)

<sup>24</sup> Reuveny 2007; Raleigh, Jordan, and Salehyan (2008)

regions, resulting in a youth unemployment rate three times greater than the rest of the population.<sup>25</sup> This is likely to bring adverse long-term consequences for labour market opportunities of the young.<sup>26</sup> In addition, as much as 90 per cent of job creation must take place in the developing world, mostly in Africa and Asia, since this is where the projected needs will be most pronounced.<sup>27</sup>

**Figure 6: Labour force participation rate by regions, age 15+ (%)**



Source: ILO modelled estimates

Rising female labour force participation is also expected to help mitigate the fall in the labour force. Currently, women are underrepresented in the labour market, especially in the Arab States (21 per cent), Northern Africa (23 per cent) and South Asia (28 per cent).<sup>28</sup> Yet, few studies estimate if women employment will increase or decrease in the future world of work. A scenario analysis with six EU countries (Greece, Hungary, Ireland, Italy, Spain and Sweden) expects female labour force participation to increase and reach an average of 75.1 per cent, with Sweden having the highest rate (89.7 per cent) and Italy the lowest (68.8 per cent), as shown in table 1.<sup>29</sup> In fact, in France, female participation rates are not only expected to increase over the horizon 2012-2022, but women will also experience increased participation in more highly qualified jobs.<sup>30</sup> Conversely, following current trends, there seem to be few improvements in store for gender gaps in participation rates for developing regions. According to the ILO (2016b), for instance, while some regions, such as the Arab States, are on track for modest improvements, others are expected to experience widening gaps, particularly Eastern Asia. Nevertheless, globally, the increase in female participation rates is supported by declining fertility rates, a further development of the care sector and further automation of housework, thus freeing women to

<sup>25</sup> World Economic Forum (2016b)

<sup>26</sup> World Economic Forum (2016a)

<sup>27</sup> World Economic Forum (2016a)

<sup>28</sup> Gallup and ILO (2017)

<sup>29</sup> Mascherini et al. (2016)

<sup>30</sup> France Strategie (2015)

join the labour market.<sup>31</sup>

**Table 1: Women's labour force participation for selected countries, age 20–64 (%)**

Country	2013	2020	2030	2040	2050
Greece	62.4	64.1	67.1	70.0	73.0
Hungary	65.1	66.8	70.2	71.3	71.3
Ireland	62.8	69.5	69.6	69.6	72.0
Italy	59.0	63.3	64.7	67.0	68.8
Spain	70.9	72.3	71.8	73.3	75.5
Sweden	86.4	88.3	89.6	89.4	89.7

Source: Mascherini et al. (2016)

### 2.1.2 Jobs and unemployment

A key aspect of the future of work debate has centred on whether enough jobs will be created in coming years for all those seeking to work. In particular, an impassioned debate has flourished around the question: How will rapid technological change affect the number of jobs? Some engineers and technologists expect a technological transformation at proportions with the Industrial Revolution of the 19<sup>th</sup> century.<sup>32</sup> Others are less convinced and believe innovation has, in fact, peaked.<sup>33</sup> At the same time, though, there are additional drivers of change such as climate change and demographic shifts that are also set to influence the number of jobs in the future.

Most observers seem to agree that job destruction is likely to accelerate under the impression of current technological changes.<sup>34</sup> In contrast, little is known about the potential for the creation of new jobs. For such new jobs to appear, many comment on the need for new markets to be developed and regulated, in particular in the green economy, care and personal services sectors, or an augmented public sector in areas where currently no profitable activities exist.<sup>35</sup> The fear is that this process might not happen fast enough. Therefore, the number of jobs might fall faster than the global labour force when existing jobs are substituted by automation and other systems operated by artificial intelligence. In other words, machines, robots and computers will increasingly have an absolute advantage over labour and not only a comparative one. In the following, the most prominent debates are being reviewed on how the number of jobs might evolve in the future.

A growing body of researchers argue that technological progress in robotics and automation will lead to net job losses or lower wages as these advancements increasingly substitute for labour.<sup>36</sup> So far, job losses are concentrated among low- and middle-skilled (white-collar) administrative and routine jobs, such as bookkeeping, product testing and machine operators, leading to a rise in job polarisation in

<sup>31</sup> Bloom, Kuhn, and Prettnner (2016); German Federal Ministry of Labour and Social Affairs (2016); Hardoon (2017); Maybud (2015); Runge (2017); Saxer (2017); World Economic Forum (2016a); Nübler (2016)

<sup>32</sup> Brynjolfsson and McAfee (2014)

<sup>33</sup> Gordon (2012, 2000)

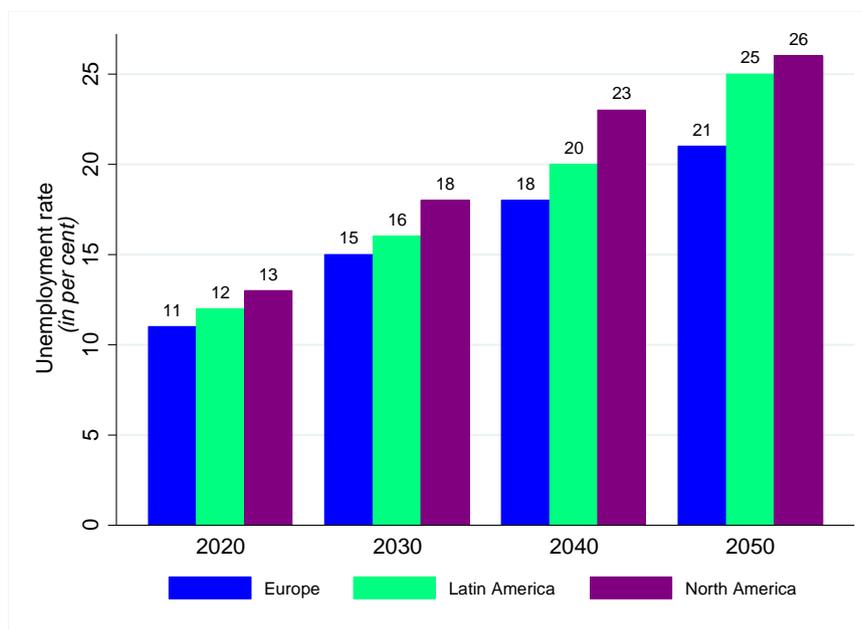
<sup>34</sup> Frey and Osborne (2013); Arntz, Gregory, and Zierahn (2016); Manyika et al. (2017)

<sup>35</sup> ILO (2017a); Pollin et al. (2014)

<sup>36</sup> Frey and Osborne (2013); Arntz, Gregory, and Zierahn (2016); McKinsey Global Institute (2016); Decanio (2016)

advanced countries and a large number of developing economies.<sup>37</sup> This trend is likely to continue: The World Economic Forum (2016a), for instance, estimates that out of 96,928,000 office and administration employees globally, 4,759,000 (4.9 per cent) will be made redundant by 2020. In a Delphi study conducted by the Bertelsmann Foundation, experts anticipate unemployment to continuously rise in both advanced and emerging economies, reaching more than 20 per cent in Europe, and over 25 per cent in Latin and North America by 2050 (see Figure 7). The potential productivity and producer welfare gains are believed to act as a catalyst for such changes in production processes. For example, one study estimates that companies with more automated activities are 6 times more likely to experience revenue growth of more than 15 per cent compared to companies with low automation.<sup>38</sup>

**Figure 7: Expected unemployment rates (Expert survey)**



Source: Daheim and Wintermann (2017)

Moreover, on the basis of detailed occupations data some observers estimate that 47 per cent of total U.S. employment is at high risk of being digitalised within 20 years (Figure 8).<sup>39</sup> Globally, automation is estimated to affect 1.1 billion workers (49 per cent of jobs) and US\$12.7 billion in wages.<sup>40</sup> Furthermore, the World Bank (2016) estimates as much as 66.6 per cent of jobs susceptible to be made redundant in the developing world due to technology disruption (Figure 9). In contrast, other studies produce much lower figures, such as Arntz et al. (2016) who find that only around 9 per cent of jobs are automatable in OECD countries. Nevertheless, this process of job destruction and substitution might be spread out over a long time period as a result of low wages and slow-paced implementation of

<sup>37</sup> OECD (2016c); Frey and Osborne (2015); German Federal Ministry of Labour and Social Affairs (2016); World Economic Forum (2016a); World Bank Group and International Monetary Fund (2016); Graetz and Michaels (2015); Brookings (2016)

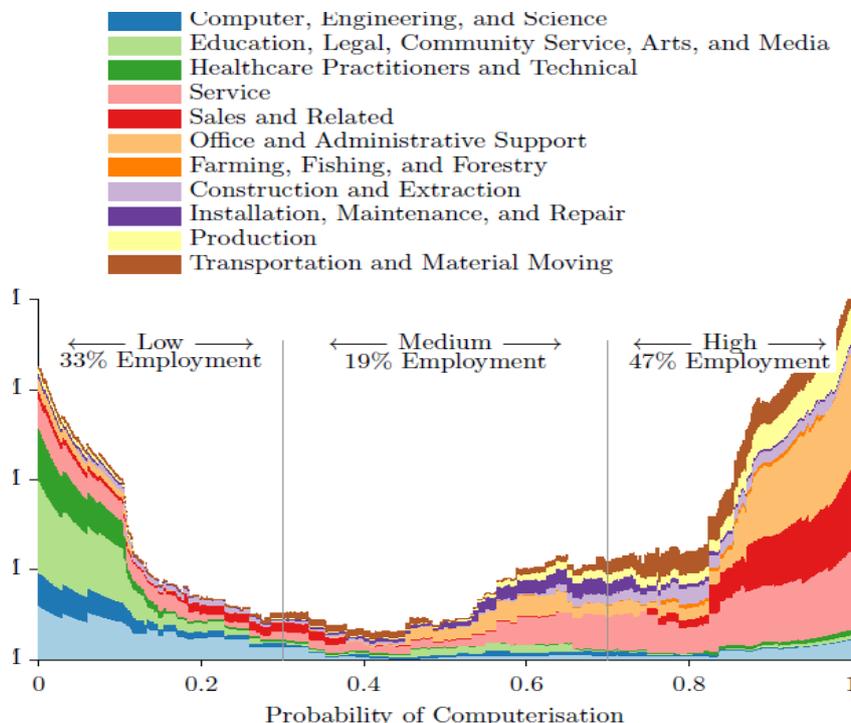
<sup>38</sup> ServiceNow (2017)

<sup>39</sup> Frey and Osborne (2013)

<sup>40</sup> Chui, Manyika, and Miremadi (2017)

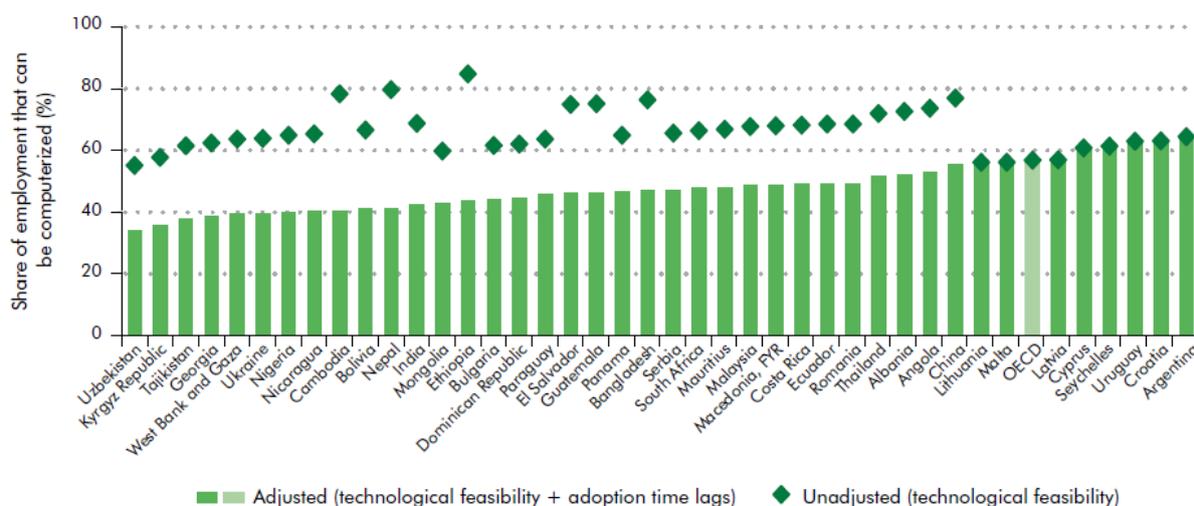
technology.<sup>41</sup>

**Figure 8: Distribution of the U.S. Bureau of Labour Statistics 2010 occupational employment and the probability of computerisation**



Source: Frey and Osborne (2013), p.37

**Figure 9: Estimation on the share of employment that is susceptible to automation in selected developing countries, latest year available**



Source: World Bank (2016, p.23)

<sup>41</sup> Chui, Manyika, and Miremadi (2015)

For the U.K., Deloitte (2014) finds that about 35 per cent of jobs might disappear due to new technologies in the next two decades. At the same time, 40 per cent of the country's employment has a low or inexistent risk of automation.<sup>42</sup> Other studies do not expect that entire occupations will disappear; rather, they argue that only some tasks are bound to be replaced by technology. In fact, McKinsey (2015) estimates that automation could replace 45 per cent of activities currently undertaken by humans, but only 5 per cent of full jobs could be totally substituted by technology.<sup>43</sup> Table 2 provides an overview of technological unemployment estimates from various institutions and researchers.

**Table 2: Estimates of technological unemployment**

Organization	Estimates
<b>University of Oxford</b>	47% of workers in America at high risk of jobs replaced by automation
<b>PricewaterhouseCoopers</b>	38% of jobs in America, 30% of jobs in UK, 21% in Japan and 35% in Germany at risk to automation
<b>ILO</b>	ASEAN-5: 56% of jobs at risk to automation in next 20 years
<b>McKinsey</b>	60% of all occupations have at least 30% technically automatable activities
<b>OECD</b>	OECD average: 9% of jobs at high risk. Low risk of complete automation but an important share (between 50% - 70%) of automatable tasks at risk
<b>Roland Berger</b>	Western Europe: 8.3m jobs lost in industry against 10m new jobs created in services by 2035.
<b>World Bank</b>	2/3 of all jobs in developing countries are susceptible to automation.
<b>Bruegel</b>	EU countries: between 47% and 54% of jobs are risk of automation

Source: Frey and Osborne (2015); Roland Berger (2016); McKinsey Global Institute (2016); PwC (2017); World Bank (2016); Chang and Huynh (2016); Bowles (2014) and Bruegel Blog (2014)

Automation might also cause jobs to be re-shored from developing countries to advanced economies.<sup>44</sup> The increasing use of robots in developed countries together with new production techniques that demand a sophisticated level of skills will reduce labour-cost advantages of producing in developing countries.<sup>45</sup> This may lead to a displacement of employment from developing to developed countries.<sup>46</sup> According to De Backer et al. (2016), the willingness to re-shore arises from the proximity to innovation centres and consumer markets. For the same reason, though, emerging economies with high educational levels and increasing middle-classes are also targeted by international firms as a hubs for production.<sup>47</sup> As a consequence, the likelihood that re-shoring will bring back middle-class jobs to developed economies is seen as very low, since the functions will be overtaken by automation.<sup>48</sup>

Job creation in the services sector is mostly under threat from automation according to Frey and Osborne

<sup>42</sup> Deloitte (2014); ILO (2016a); UKCES (2014)

<sup>43</sup> Arntz, Gregory, and Zierahn (2016); Chui, Manyika, and Miremadi (2016); ManpowerGroup (2017); Manyika et al. (2017)

<sup>44</sup> Cohen et al. (2016); De Backer et al. (2016)

<sup>45</sup> Cohen et al. (2016); De Backer et al. (2016); UNCTAD (2016)

<sup>46</sup> De Backer et al. (2016)

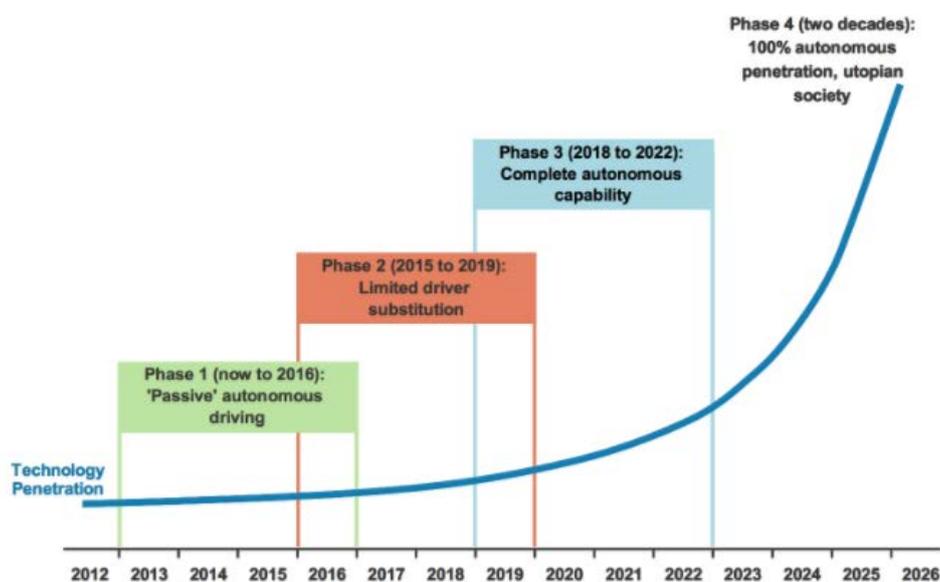
<sup>47</sup> De Backer et al. (2016)

<sup>48</sup> ILO (2016d); UNCTAD (2016); Cohen et al. (2016); De Backer et al. (2016)

(2013), despite the earlier expectation of this sector becoming a substantial job engine.<sup>49</sup> Office and administration jobs, in particular, followed by service and sales occupations, are those with the highest probability of computerisation.<sup>50</sup> However, methodological concerns have manifested around their approach, questioning the validity of the results.<sup>51</sup> For one, Frey and Osborne (2013) over-estimated the risk of automation in their sample of occupations, pushing the overall proportion of jobs at risk upwards. To name a few key arguments, firstly, the authors assumed that if an occupation can be computerised then all jobs in that occupation would be destroyed. This is a rather reductionist view since in most cases if technology were to substitute for labour, it is unlikely that all jobs in that respective job family would be lost. Secondly, as highlighted by Acemoglu and Restrepo (2016), technical feasibility does not always imply economic feasibility. That is, for human jobs to be substituted for machines, the change in the production mix must be comparably more profitable for firms than previous labour-intensive production processes. Finally, preferences for human interaction in certain industries, such as elderly care and education, might prevent certain occupations from being automated.<sup>52</sup>

Transportation is another services sector where many jobs run the risk of being automatised. Self-driving cars and trucks are being developed rapidly, and are expected to fully penetrate society by 2026 (see Figure 10). Many of the associated jobs reside in the public-sector and tend to be well-paid while offering easy labour market access even with low skills. The automation of these jobs can therefore bring sizeable consequences for both, the number of jobs and income inequality. For example, according to Estevadeordal et al. (2017), the automation of transportation means that 13 per cent of the economically active global population could lose their job, adding, on average, 13 percentage points to any country's unemployment rate.

**Figure 10: Estimated penetration time for autonomous cars**



Source: Estevadeordal et al. (2017)

<sup>49</sup> Orr and Rosen (2000); Bennington and Chamberlain (1989)

<sup>50</sup> Frey and Osborne (2013)

<sup>51</sup> Borland and Coelli (2017)

<sup>52</sup> Finkel (2017)

At the same time, manufacturing sectors remain highly susceptible to automation, including in emerging economies. ILO (2016a) finds that in ASEAN countries, sectors such as electrical appliances and electronics might make redundant over 60 per cent of workers in Indonesia, Philippines, Thailand and Viet Nam. Moreover, over 80 per cent of workers in the Textile, Clothing and Footwear industry can be substituted by automation in Cambodia and Viet Nam.<sup>53</sup>

The agricultural sector is also likely to be affected by Industry 4.0 in the near future, particularly in developed countries. In the United States, for instance, agriculture, forestry, fishing and hunting is expected to eliminate 223,000 jobs by 2022.<sup>54</sup> Many commentators already are looking forward to the Internet of Things, and scientists have started applying this concept to agricultural processes and developing an Internet of Living Things.<sup>55</sup> This contains sophisticated sensors embedded in fields, waterway, and irrigation systems that connect with machine-learning systems which are set to maximise production in an environmentally friendly manner.<sup>56</sup> Many of these future agricultural technologies require little labour: The Japanese company Spread, for instance, has recently announced that modern technologies will carry out all but one activity required to grow tens of thousands of lettuce each day in its indoor automated farm.<sup>57</sup>

Finally, the Blockchain (BC) technology that undergirds crypto-currencies is also discussed in the Future of Work literature. A BC is a distributed register to store static records and dynamic transaction data without central coordination by using a consensus-based mechanism to monitor the validity of transactions.<sup>58</sup> This technology might have a far-reaching impact on the world of work since it is cheap, secure, and data-based.<sup>59</sup> Some commentators argue that BC algorithms will markedly restructure the financial sector and replace traditional jobs in areas such as accountancy, banking, translation, and legal assistance.<sup>60</sup> At the same time, others argue that BC holds the capacity for job creation: for instance, the digital revolution may generate new jobs such as BC developers, internet of things architects and cognitive computer engineers.<sup>61</sup>

While most studies concentrate on the question of potential job losses, few acknowledge the potential of new technologies in creating new jobs. Partly, this might stem from the fact that it is simpler to predict the future of job profiles that currently exist than to envision which new jobs might exist in the future. In that regard, Luksha et al. (2015) is one study that attempts to speculate about future industries and occupations that might emerge given current technologies. More concretely, the authors' conduct an industry level scenario analysis investigating the effects of technology on Russian jobs until 2030. While they find that several blue- and white-collar jobs - such as ticket inspectors, postmen, and legal advisors - will become obsolete in the near future, the potential for job creation outweighs these redundancies. Specially, due to changing technologies, new work practices and consumer needs, new jobs will be created and current ones will be adjusted. Above all, the authors' emphasise the need for future employees to develop cross-professional skills in order to remain competitive. This will allow

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<sup>53</sup> ILO (2016a)

<sup>54</sup> West (2015)

<sup>55</sup> Clark (2017); Fraser and Charlebois (2016)

<sup>56</sup> Fraser and Charlebois (2016)

<sup>57</sup> EcoWatch (2015); Fraser and Charlebois (2016)

<sup>58</sup> McKinsey & Company (2017)

<sup>59</sup> Finextra (2016); McKinsey & Company (2017); Deloitte (2016)

<sup>60</sup> European Parliament 2016; McKinsey & Company (2017)

<sup>61</sup> Finextra (2016); McKinsey & Company (2017)

individuals to not only improve efficiency in their respective industries, but also stay in demand while changing industries.

Also, so far, while the use of several disruptive technologies surrounding Industry 4.0 have increased, their deployment appears to be concentrated in a small number of countries. Industrial robots, for instance, have experienced an annual growth rate of 17 per cent since 2010, but 75 per cent of these robots are being utilised in only 5 countries.<sup>62</sup> In fact, a ManpowerGroup (2017) survey among 18,000 employers from 43 countries argues that 64 per cent of them believe that technology will have no effect on their headcount in the next two years. In the contrary, 19 per cent affirm that automation might increase their firm's hiring positions, and only 12 per cent estimate a decline. More specifically, Southern Europe and Latin American countries, along with the United States., the U.K., New Zealand, Taiwan and South Africa, are prone to increase their employment rates, while India, Central and Eastern European countries' employers intend to make workers redundant through automation.<sup>63</sup> Furthermore, as much as 79 per cent of executives also believe automation could lead to job creation.<sup>64</sup> Moreover, half of the surveyed executives also suspect that automation spurs creativity since it frees up employees to do the work they want to do. Indeed, 91 per cent of respondents confirmed that their skilled employees spend too much time on administrative tasks.<sup>65</sup>

Other studies also estimate that technology could increase job opportunities in new occupations, especially in Architecture, Engineering, Computer and Mathematics.<sup>66</sup> Indeed, historically, technological advancements have resulted with positive net effects on employment, as adjustments mobilise and processes transform.<sup>67</sup> David Autor argues that "tasks that cannot be substituted by computerisation are generally complemented by it".<sup>68</sup> According to the World Economic Forum (2017b) even if robotics started to displace large numbers of workers, jobs dependent on human traits – such creativity and emotional intelligence – may become more numerous. In France, for instance, the internet destroyed 0.5 million jobs in the last 15 years but, at the same time, created 1.2 million new ones – a net effect of 2.4 jobs created for every job destroyed.<sup>69</sup> Some observers fear, however, that current technological changes have a lower potential for job creation: Oxford Martin School (2015) demonstrates that the U.S. economy created only 0.5 per cent of current jobs since 2000 compared to 8 per cent during the 1980s. Even though, the Forth Industrial Revolution may defy historical trends due to the pace of technological progress and since the associated technologies are capable of executing both physical and cognitive tasks.<sup>70</sup>

Nonetheless, some commentators argue that the technological revolution may actually stimulate human employment in the service and manufacturing sectors.<sup>71</sup> As shown by Moretti (2010) in a U.S. context, every new technology job will create around 4.9 additional local service jobs. This was also confirmed by the work of Goos et al. (2015) who present similar findings using a European dataset. In other words,

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<sup>62</sup> Estevadeordal et al. (2017)

<sup>63</sup> ManpowerGroup (2017)

<sup>64</sup> ServiceNow (2017)

<sup>65</sup> ServiceNow (2017)

<sup>66</sup> World Economic Forum (2016a); German Federal Ministry of Labour and Social Affairs (2016); Smith and Anderson (2014)

<sup>67</sup> Atkinson and Wu (2017)

<sup>68</sup> Davenport and Kirby (2015)

<sup>69</sup> McKinsey Global Institute (2016)

<sup>70</sup> Schwab (2016); World Economic Forum (2017)

<sup>71</sup> Kucera (2017); Mann and Puttmann (2017)

technology jobs play a critical role in creating demand for local service occupations. In fact, these effects are also expected to be pronounced in the manufacturing sector situated in the developing world: A recent study conducted by Berger, Chen, and Frey (2016) has shown that the multiplier effects associated with skilled manufacturing jobs is 6 to 9 times greater in the developing world than in the United States. This is partially aligned with Mann and Puttmann (2017) who find using U.S. patents data that further development in national automation technologies has a net gain on employment in local labour markets. More concretely, while manufacturing employment tends to decline in response to automation, these effects are far outweighed by service sector job growth.

Similarly, additive manufacturing (AM) is a technology that may substantially influence manufacturing in the future of work. 3D printing refers to the process by which three-dimensional products are built from the bottom to the top, constructing materials layer-by-layer on the basis of a digital file.<sup>72</sup> However, the extent to which the deployment of AM technologies will lead to unemployment is uncertain in the literature.<sup>73</sup> According to the World Economic Forum (2015), advances in 3D printing might reduce the amount of labour needed in production, but these negative employment effects are likely to be outweighed by the birth of a new industry supplying printing materials.<sup>74</sup> As put forward by the European Parliamentary Research Service (2016), AM holds the potential to be used as a way to increase productivity within Europe in tandem with a decreasing workforce. Notwithstanding, a fall in the demand for labour in industrial production might have a de-stabilising effect in some European countries and disproportionately affect workers in the lower end of the skills distribution.<sup>75</sup>

A third strand of the literature is not convinced by the potential impact of digitalisation altogether. Gordon (2012) provides a pessimistic account of economic growth in recent years and points out that previous technological advancements have been more transformative than the current digital revolution, which has merely contributed to a momentary revival of productivity growth. More broadly, proponents oppose the claims of accelerating technological progress and the associated employment effects that come with digital technology.<sup>76</sup> In fact, Gordon (2014) argues that the “post-1972 pace of technological change peaked in 1996-2000”.

Concurrent with these technological advancements are other drivers of change that may affect jobs, such as climate change and demography. The transformation to a greener economy, for instance, is a major factor that might impact the total number of jobs in the future.<sup>77</sup> According to France Strategie (2015), high-energy intensive sectors – such as those involved in producing and using cars – will be penalised by the adoption of green policies which are likely to obliterate jobs. Even though traditional non-renewable energy sectors will face job cuts, net employment change is still expected to be positive.<sup>78</sup> Moreover, as consumption patterns change, job growth in eco-friendly retail and other green occupations is expected to grow: For instance, in the United States, greening the economy is expected to create jobs in occupations such as energy auditors (+202,000), climate change analysts (+39,700)

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<sup>72</sup> Recharad et al. (2016); 3d Hubs (2017)

<sup>73</sup> Recharad et al. (2016)

<sup>74</sup> World Economic Forum (2015a)

<sup>75</sup> Robertshaw et al. (2015)

<sup>76</sup> Gordon (2012, 2000)

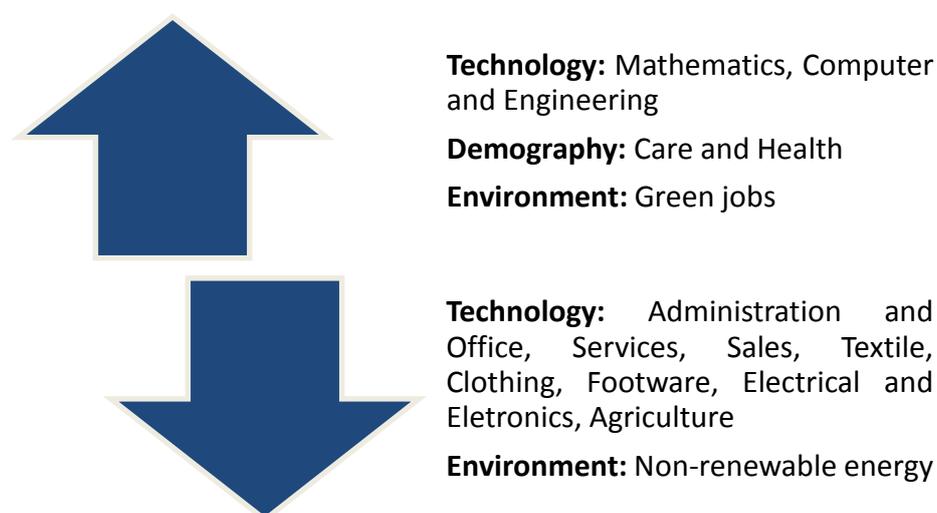
<sup>77</sup> ILO (2015c, 2017a); Esposito et al. (2017)

<sup>78</sup> France Strategie (2015); Pestel (2014); ILO (2013d)

and fuel cell technicians (+99,700) by 2022.<sup>79</sup> Notwithstanding, if the pursuits in the abatement of environmental degradation are insufficient, the economic costs might be significant: Every degree Celsius of global warming, on average, costs around 1.2 per cent of GDP, and is likely to push employment prospects downwards.<sup>80</sup>

New job opportunities are also expected to arise in the care sectors in line with population ageing.<sup>81</sup> Even though technology is likely to change the profile of many jobs in the care sector, care professions are among those occupations where humans continue to hold a comparative advantage to machines.<sup>82</sup> Scheil-Adlung (2016) estimates that in order to achieve universal health coverage by 2030, the global health protection supply chain will need to add 27 million more workers in health occupations (HO) and 45.5 million in non-health occupations (NHO), such as unskilled workers in maintenance and cleaning. The need for unpaid care workers is expected to increase by 11.5 million globally.<sup>83</sup> Most of these job opportunities will be in Asia and Pacific (14,136,000 HO and 24,658,000 NHO workers), closely followed by Africa (10,102,000 and 16,586,000, respectively).<sup>84</sup> In contrast, the Americas, Arab States, Europe and Central Asia are estimated to create fewer employment positions in these occupations by 2030.<sup>85</sup> In a forthcoming report, the ILO estimates that even more jobs need to be created – 153 million globally – just to keep the current status quo in terms of health care coverage. Achieving the sustainable development goals would add another 20 million or 13.1 per cent of health care jobs. Figure 11 illustrates occupations that are most likely to be affected by drivers of change and in which direction.

**Figure 11: Expected increase or decrease in occupations and their drivers**



Source: Authors' own elaboration

<sup>79</sup> UKCES (2014); IOE (2017); Pollin et al. (2014)

<sup>80</sup> Wallace-Wells (2017)

<sup>81</sup> World Economic Forum (2016a); World Health Organisation (2011, 2015, 2016); ILO (forthcoming).

<sup>82</sup> World Bank Group and International Monetary Fund (2016); United Nations (2015); IOE (2017); Runge (2017); UKCES (2014); Devlin (2017); ILO (2016b)

<sup>83</sup> Scheil-Adlung (2016)

<sup>84</sup> Scheil-Adlung (2016)

<sup>85</sup> Scheil-Adlung (2016)

Job churn implied by these changes is expected to worsen ethnic and gender imbalances. In the United States, for instance, automation in the transportation industry could strongly impact Blacks, Hispanics and Native American workers, since they are overrepresented and earn better wages than their peers in non-driving occupations.<sup>86</sup> With respect to gender, Acemoglu and Restrepo (2017) highlight that men are facing greater job losses compared to women in industries exposed to automation. However, men are expected to recover more of these job losses compared to women: While men will lose about 4 million jobs by 2020, they are expected to gain another 1.4 million, which means that there will be roughly 1 job gained for every 2.9 jobs lost. Women, on the other hand, will face 3 million lost jobs but only 550,000 job gains, meaning that they will recover only 1 in 5.5 jobs lost.<sup>87</sup> However, in some Latin American countries the opposite is true: In Argentina, for instance, female jobholders face an automation probability of 61.3 per cent while for men it stands at 66.1 per cent.<sup>88</sup> In ASEAN countries, women represent the majority in occupations that are likely to be automated, thus being more vulnerable to unemployment than men.<sup>89</sup> Nonetheless, the expansion of the care economy – in which women are overrepresented – could potentially help mitigate these imbalances. So far, however, job churn and labour market disruptions have declined in advanced economies, questioning the hypothesis of an ever more turbulent labour market.<sup>90</sup>

Disregarding the evolution of job churn, managing transitions to new qualifications and locations remain important for workers.<sup>91</sup> In this respect, a particular challenge is the apparent lack of skills among young people to take up existing jobs.<sup>92</sup> Partly, this stems from a disconnection between education systems and the dynamic needs of employers, opening up a skills-gap.<sup>93</sup> For instance, 69 per cent of UK businesses believe secondary schools are not effective at preparing young people for work.<sup>94</sup> Moreover, these gaps are most pronounced in technical skills, such as STEM (i.e. science, technology, engineering, and mathematics) subject degrees, but also in communication, teamwork and other soft skills.<sup>95</sup> According to the UKCES (2013), out of all professional vacancies in the fields of science, research, engineering and technology, 43 per cent were challenging to fill due to skills shortages.<sup>96</sup> These trends are expected to persist into the future for both developed and developing countries.<sup>97</sup>

Job churn is expected to lead to further rising skills and geographical mismatches.<sup>98</sup> This will make unemployment becoming more entrenched, long-lasting and hurt job creation prospects.<sup>99</sup> Such mismatches arise as new sectors or locations of thriving labour demand have difficulties to attract those who have lost their jobs, partly because of lack of skills or other barriers that prevent mobility.<sup>100</sup> Countries differ, however, with respect to the degree and persistence of labour market mismatches,

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<sup>86</sup> CGPS (2017)

<sup>87</sup> World Economic Forum (2016a)

<sup>88</sup> Estevadeordal et al. (2017)

<sup>89</sup> ILO (2016a)

<sup>90</sup> Atkinson and Wu (2017); Mishel and Shierholz (2017)

<sup>91</sup> ILO (2017b); Nadler (2010)

<sup>92</sup> ILO (2017b); UKCES (2014, 2013)

<sup>93</sup> ILO (2017b); World Economic Forum (2016a); Manyika et al. (2017)

<sup>94</sup> British Chambers (2015)

<sup>95</sup> ILO (2017b); UKCES (2013); Russell Group (2017)

<sup>96</sup> ILO (2017b); UKCES (2013)

<sup>97</sup> ILO (2015a)

<sup>98</sup> Restrepo (2013); Solomon W. Polachek et al. (2017)

<sup>99</sup> ILO (2013)

<sup>100</sup> McKinsey Global Institute (2016); Nadler (2010)

suggesting effective policy responses can help to address or at least mitigate these issues.<sup>101</sup>

Some observers comment on the role of artificial intelligence and other technologies in improving recruitment processes and thereby helping correct skills mismatches.<sup>102</sup> Time saved by automating parts of the hiring process – particularly repetitive high-volume tasks – and improved hiring quality from standardised job matching can help improve labour market efficiency, particularly for high-skilled labour.<sup>103</sup> However, the vast data requirements for intelligent screening software combined with its potential to learn human biases have been expressed in the literature.<sup>104</sup> Notwithstanding, digital platforms, such as LinkedIn and Monster.com, are already connecting individuals with work opportunities in both traditional and digital workplaces, thereby taking over tasks traditionally carried out by head-hunters.<sup>105</sup> These platforms can bring significant gains at both the micro and macro levels: According to Manyika et al. (2015), for instance, online platforms could match workers and employers, yielding 72 million jobs and spurring global GDP by 2 per cent within the next decade.

Nevertheless, the roots of these labour market inefficiencies may run deeper. Some commentators in the literature highlight that public policy must respond more dynamically to changes in the labour market.<sup>106</sup> More specifically, policymaker should track and anticipate these changes in the world of work, taking advantage of the information collection and processing capabilities of digital technologies, in order to provide targeted support to individuals through the conduits of educational reform, vocational training and promoting lifetime learning.<sup>107</sup>

## 2.2 The future of job quality

Over the past few decades, there has been a distinct rise in non-standard forms of employment (NSE)<sup>108</sup> in both developed and developing economies.<sup>109</sup> NSE are comprised mostly of temporary employment, part-time work, short-term agency work and dependent self-employment.<sup>110</sup> The expansion of NSE raises concerns for both workers and employers alike. For workers these forms of employment are associated with substantially less work security and poorer working conditions. Employers, on the other hand, might benefit in the short-term from greater worker flexibility and cost savings (especially if NSE workers employment arrangements are exempt from social security contributions and other employee benefits). However, as indicated in the management literature (see Aleksynaka and Berg, 2016), these short-term financial gains are likely to be outweighed by longer-term productivity losses through the erosion firm-specific skills in the organisation, limiting the ability of firms to respond to changing market demand.<sup>111</sup> Also, employers may underestimate the magnitude of the managerial demands that comes with NSE, especially if a considerable proportion of their workforce falls under these types of

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<sup>101</sup> OECD (2015)

<sup>102</sup> Ideal (2016); Manyika et al. (2015)

<sup>103</sup> Ideal (2016); Manyika et al. (2015)

<sup>104</sup> Ideal (2016); Manyika et al. (2015); Science (2017)

<sup>105</sup> Manyika et al. (2015)

<sup>106</sup> European Commission (2016)

<sup>107</sup> European Commission (2016); ILO (2015d)

<sup>108</sup> ILO (2016g)

<sup>109</sup> ILO (2016g)

<sup>110</sup> ILO (2016g)

<sup>111</sup> ILO (2017e)

employment.<sup>112</sup>

Currently, flexible work is rising in developed economies and making inroads among middle-class occupations in emerging economies.<sup>113</sup> Evidence suggests that routine tasks requiring middle skills are among the most demanded tasks in the platform economy.<sup>114</sup> This may lead to formerly full-time dependent workers made redundant are now being hired as self-employed workers through digital work arrangements.<sup>115</sup>

The rise of the platform (or gig or sharing) economy is expected to contribute to the continuous growth in self-employment and contingent work.<sup>116</sup> At present, as much as 25 per cent of work in the United States is performed by freelancers, and this is expected to rise to 40 per cent by 2020.<sup>117</sup> In Latin America, 56 per cent of workers are either self-employed or work in microenterprises.<sup>118</sup> In the future, more and more free-lance or temporary assignments are expected be channeled through online applications or websites.<sup>119</sup> However, workers offering their services on these platforms are not considered to be an employee of the firm who assigns the tasks.<sup>120</sup> The IOE (2017) considers that the concept of employment itself might be at risk with the expansion of the gig economy. More specifically, the definition of what constitutes employment could become blurred, leading to legal uncertainty in the labour market.<sup>121</sup>

Although, other commentators in the literature are less convinced by the future developments of the gig economy. Farrel and Greig (2016), for instance, argue that employment growth in online platforms peaked in 2014 and has slowed thereafter. Based on one of the largest samples of platform participants available, the authors find that monthly earnings have fallen by at least 6 per cent since 2014; labour turnover is very high, with over 50 per cent existing within a year; and that the pool of potential platform participants has narrowed in response to the strengthening of traditional labour markets.

The literature also highlights that the gig economy weakens workers' bargaining positions.<sup>122</sup> First, workers are likely to lose their capacity to get organised due to a lack of relations with colleagues and disappearance of a fixed, physical workplace.<sup>123</sup> In addition, their privacy is not protected and gender as well as ethnicity-based discrimination are evident.<sup>124</sup> On top of this, unpaid wages and a lack of rules for conflict resolution are another concern.<sup>125</sup> Over the longer term, this type of employment arrangement threatens income stability, reducing the capacity of workers to make investment in housing or pensions.<sup>126</sup> This may prove to be a particular challenge for younger generations who enter the labour

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<sup>112</sup> ILO (2016g)

<sup>113</sup> World Economic Forum (2016a)

<sup>114</sup> Codagnone, Abadie, and Biagi (2016)

<sup>115</sup> Devlin (2017); OECD (2016a); Codagnone, Abadie, and Biagi (2016); Schmidt (2017)

<sup>116</sup> Codagnone, Abadie, and Biagi (2016); Schmidt (2017)

<sup>117</sup> Estevadeordal et al. (2017)

<sup>118</sup> Estevadeordal et al. (2017)

<sup>119</sup> World Economic Forum (2017)

<sup>120</sup> Stefano and Valerio (2015); ILO (2017e)

<sup>121</sup> IOE (2017)

<sup>122</sup> OEM (2017); Codagnone, Abadie, and Biagi (2016); IOE (2017)

<sup>123</sup> Sokas (2017)

<sup>124</sup> Codagnone, Abadie, and Biagi (2016)

<sup>125</sup> Codagnone, Abadie, and Biagi (2016)

<sup>126</sup> World Economic Forum (2015b)

market: Indeed, currently around 40 per cent of independent workers are Millennials, limiting their future earnings capacity.<sup>127</sup>

Moreover, as ILO (2017e) points out, workers operating in these forms of NSE have little control over their working hours, leading to work-life balance implications; incur significant occupational safety and health risks due to a combination of poor induction, training and supervision; and are less likely to receive on-the-job training which can have a negative effect on career developments, especially for younger workers.

So far, however, the platform economy mostly seems to constitute a means for workers to complement income from other, temporary or part-time work rather than a full time activity.<sup>128</sup> In fact, currently the importance of this type of employment seems negligible: In the United States and United Kingdom, for instance, the gig economy accounts for only around 0.4-0.7 per cent and 4 per cent of total employment, respectively.<sup>129</sup> In addition, if the platform economy expands substantially in the future, some observers expect new forms of workers' associations to emerge – such as a digital freelancers' union – that help outweigh the presumed reduction of workers' bargaining power in the gig economy.<sup>130</sup>

These non-standard forms of employment also threaten progress made in occupational safety and health (OSH) regulation. Problems arise not only related to physical issues, such as injuries from poor ergonomic conditions, but also psychosocial ones – in particular, social isolation and unclear tasks.<sup>131</sup> In addition, workers are also less likely to receive on-the-job training which can have a negative effect on career developments, especially for younger workers. Moreover, these new work models are characterised by flexible and undefinable working hours.<sup>132</sup> Indeed, studies have shown that, on average, teleworking employees are more likely to work longer hours than those working at an employer facility.<sup>133</sup> In Spain, for instance, only 19 per cent of employees working on their employer's premises work more than 40 hours per week compared to 24 per cent and 33 per cent for employees that work from home and from a third location, respectively.<sup>134</sup>

On the positive side, some observers expect the increased labour market flexibility that comes with NSE to bring benefits to the world of work.<sup>135</sup> They stress the importance of the new work models for improved labour market efficiency, a better work-life balance for workers with family responsibilities and the inclusion of some marginalised groups (e.g. students or seniors).<sup>136</sup> Nonetheless, with respect to marginalised groups, specifically young people, evidence suggests that few are eager to engage in this type of work. For example, in the EU, 29 per cent and 37 per cent of young workers in part-time and temporary positions, respectively, claim that they do so involuntarily.<sup>137</sup> Moreover, women represent the majority of the world's low-paid workers and are concentrated in the most precarious jobs

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<sup>127</sup> IMF (2017)

<sup>128</sup> Farrel and Greig (2016)

<sup>129</sup> Polaski (2017); ILO (2017e)

<sup>130</sup> World Economic Forum (2016a)

<sup>131</sup> Boden, Spieler, and Wagner (2016); EU-OSHA (2015); Quinlan (2016); Reinert (2016); ILO (2017e)

<sup>132</sup> World Economic Forum (2015b); ILO (2017e)

<sup>133</sup> Buhr et al. (2016); Eurofound and ILO (2017)

<sup>134</sup> Buhr et al. (2016); Eurofound and ILO (2017)

<sup>135</sup> Brookings (2016)

<sup>136</sup> Brookings (2016); Mandl et al. (2015); IOE (2017); Manyika et al. (2016); OECD (2016a)

<sup>137</sup> ILO (2016e)

- the same is true for African-American and Hispanic workers in the United States.<sup>138</sup>

Informal employment is likely to be affected by these shifts in working conditions. Currently, informality is widespread in the majority of developing economies but also growing in developed countries.<sup>139</sup> In a typical developing country, the informal economy contributes around 35 per cent to GDP and employs 70 per cent of the workforce.<sup>140</sup> So far, however, few studies project trends for informal working conditions.<sup>141</sup> One of them by the Rockefeller Foundation (2013) sets up four different scenarios for each of the following cities: Accra, Bangkok, Chennai, Lima, Manila and Nairobi. One scenario for Chennai depicts the city containing predominantly rich people and, consequently, eliminating the informal sector by 2040; another scenario expects that the informal sector will account for half of the workforce over the same time period. In a scenario analysis conducted by the World Bank (2016), results are less ambivalent. Moreover, taking into account an array of factors such as mandated labour costs, the author finds support for the informal sector diminishing rapidly in both developed and developing countries over the next 20 years, primarily due to total factor productivity and capital growth.

The rise in NSE and informality are not the only causes for declining job quality. Other drivers also deteriorate working conditions and OSH, most prominently climate change and rising temperatures.<sup>142</sup> These effects are expected to be more pronounced in developing countries situated in geographically vulnerable regions and with low adaptive capacities.<sup>143</sup> In West Africa, for instance, the incidence of very hot days per year has doubled since the 1960s.<sup>144</sup> Extreme temperatures creates risks for both individuals and firms: Workers face the associated health risks such as clinical heat effects, and increased likelihood of accidental injuries; firms incur reduced work capacity and labour productivity.<sup>145</sup> Studies consistently highlight the negative relationship between high temperatures in the workplace and labour output – for both manual and cognitive activities.<sup>146</sup>

The literature also touches on the potential for improving the quality of existing jobs while transitioning towards a greener economy.<sup>147</sup> In that regard, according to the ILO (2013d), there is a range of economic sectors that exhibit substantial opportunity for increasing the quality of work through improving working conditions. In the waste management and recycling sector, for instance, the majority of workers are currently informally employed, particular in developing countries. However, in order for recycling to become a green activity, jobs must be formalised.<sup>148</sup> In fact, in Brazil, Colombia and Sri Lanka, waste-pickers have been organised into cooperatives and established enterprises, demonstrating how formalisation can yield opportunities for improved working conditions.<sup>149</sup> If this trend persists into the future then it may present downward pressure on informality rates.

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<sup>138</sup> Hardoon (2017); Hardoon, Fuentes-Nieva, and Ayele (2016); ILO (2016c); Thiess (2012)

<sup>139</sup> ILO (2016g)

<sup>140</sup> Loayza (2016)

<sup>141</sup> Cardona (2016)

<sup>142</sup> Lundgren et al. (2013)

<sup>143</sup> Lundgren et al. (2013); Harrold et al. (2002)

<sup>144</sup> ILO and UNDP (2016)

<sup>145</sup> Parsons (2014); ILO and UNDP (2016)

<sup>146</sup> Parsons (2014); ILO and UNDP (2016); ILO and UNDP (2016); Sudarshan et al. (2015)

<sup>147</sup> ILO (2013d); Bonner (2008); Dias (2011); ILO (2011)

<sup>148</sup> Bonner (2008)

<sup>149</sup> ILO (2011)

Overall, flexible work together with temporary contracts are likely to make further inroads in the future. These forms of employment are often linked to lower wages, less training and reduced career development. Also, outsourcing of previously secure jobs to self-employed individuals who perform small and precarious tasks is expected to lower labour standards on a broad base. Moreover, work is also likely to be project-based with high turn-over rates, providing those workers with less access to social protection and work security.<sup>150</sup> A summary of the main points are displayed below in Figure 12.

**Figure 12: Potential risks to working conditions in the future of work**



Source: Authors' own elaboration

### 2.3 The future of social protection

The sustainability of social protection systems are being challenged under the impression of current and expected labour market changes.<sup>151</sup> Changes in employment, working conditions, and wage polarisation directly impact the financing of social protection schemes and public services, such as health care and education.<sup>152</sup> Currently, social protection schemes are predominantly related to formal labour contracts. However, given the rise of new forms of employment and technological unemployment, countries fiscal positions and the capacity to pay for social protection schemes are weakening.<sup>153</sup> Moreover, digital workers in the gig economy, who are considered self-employed, are required to provide the full amount of social security contributions, increasing their fiscal burden and making them relatively worse-off

<sup>150</sup> Buhr et al. (2016); Eurofound and ILO (2017); ILO (2016c); OECD (2016a); Schmidt (2017); UKCES (2014); Gorbis, Goldman, and Thigpen (2014)

<sup>151</sup> Codagnone, Abadie, and Biagi (2016)

<sup>152</sup> ILO 2007; OECD (2007b); European Commission (2014)

<sup>153</sup> OECD 2016b; World Economic Forum (2017)

compared to formal employees.<sup>154</sup> Similarly, existing policies such as minimum wages, are attached to dependent employment thus unavailable for non-standard employees.<sup>155</sup>

Population ageing adds another burden to the sustainability of existing social protection systems. The tax base may erode as the labour force decreases and expenditures for pensions and care services increase.<sup>156</sup> In particular, health-care costs tend to increase when populations grow older since the elderly use more services and require more expensive treatment.<sup>157</sup> For example, in the United States, increasing life expectancy is projected to lead to an increase from 15 to 29 per cent of GDP in health expenditures by 2040.<sup>158</sup> Moreover, provisions for the elderly are expected to increase and be used for longer periods of time, which may overwhelm the pension system in the absence of later retirement ages or increased taxation.<sup>159</sup> These trends affect all countries, including in the emerging world. Chileans, for instance, are expected to face increasing pension contributions that will reach 18 per cent (14 per cent) of their salary for males (females).<sup>160</sup> In addition, following current trends, increased life expectancies could reduce future generations' pensions by half.<sup>161</sup>

On top of this, the emergence of tax competition caused by globalisation might further stifle social security systems. Findings from the tax competition literature indicate that countries compete by reducing tax rates to attract, or retain, mobile factors of production.<sup>162</sup> For example, Bretschger and Hettich (2002) find that over the period 1967-1996, globalisation has had a negative and significant impact on corporate taxes, reducing tax revenue prospects.

If these trends continue into the future, it may also constrain countries' tax base capabilities. Taken together, these trends contribute to a widening funding gap of pension systems, including in emerging economies such as China and India despite their less developed social security systems.<sup>163</sup> Alarmingly, one study even predicts that by 2050, the gap may reach a total of \$400 trillion – approximately five times the size of the current global economy.<sup>164</sup>

A weakening of the macroeconomic environment has undermined the sustainability of existing social protection systems even further. The current environment with low interest rates puts an additional burden on the sustainability of capitalized pension schemes. Low interest rates are a global trend driven almost entirely by a fall in the world term premium, and have been further depressed by the monetary policy rates next to zero in major advanced economies.<sup>165</sup> In addition, the World Economic Forum (2017) considers that financial regulation and complexity combined with worsening tax concessions are undermining the value of pensions as well. Should this trend continue, benefit pay-outs from current

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<sup>154</sup> Schmidt (2017)

<sup>155</sup> Schmidt (2017); World Economic Forum (2017)

<sup>156</sup> World Economic Forum (2017)

<sup>157</sup> Bengtsson (2010)

<sup>158</sup> Fogel (2008); UNDP (2016)

<sup>159</sup> World Economic Forum (2017)

<sup>160</sup> World Economic Forum (2017)

<sup>161</sup> FIAP (2011)

<sup>162</sup> Bengtsson (2010)

<sup>163</sup> Braconier, Nicoletti, and Westmore (2014); German Federal Ministry of Labour and Social Affairs (2016); Schwarz et al. (2014); World Bank Group and International Monetary Fund (2016)

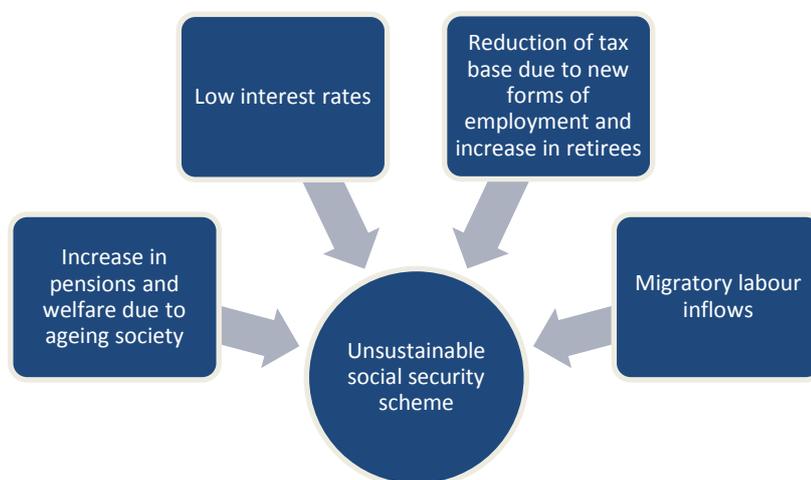
<sup>164</sup> The World Economic Forum (2017)

<sup>165</sup> Hördahl, Sobrun, and Turner (2016); World Economic Forum (2017)

pension systems will decrease significantly in the absence of increased contributions.

Finally, mass migratory labour flows presents further challenges for social protection.<sup>166</sup> Generally, the net effects of migration are viewed as positive. In OECD countries, for instance, immigration between 2007 and 2009 is estimated to have contributed an average of 0.4 per cent to GDP (0.5 per cent for the United Kingdom).<sup>167</sup> Nevertheless, substantial and sudden inflows of individuals can place pressure on social security systems as well as available infrastructure.<sup>168</sup> Europe, for example, has seen a significant inflow over the past few years with 2015 bringing more than four times the level of migrants than the previous year.<sup>169</sup> Furthermore, some observers perceived the United Kingdom's recent withdrawal from the European Union as a product of uncontrolled movements of labour.<sup>170</sup> An overview of the key factors affecting the sustainability of global social security systems is present in Figure 13.

**Figure 13: Negative effects on social security scheme financing worldwide**



Source: Authors' own elaboration

Several suggestions have emerged discussing how to address these challenges. The World Economic Forum (2017), for instance, puts forward the possibility to create portable health and pension plans, where the risk and responsibility for social protection will continue to be shared by employees, employers and the state, in order to include workers in non-standard employment and unemployed.

Taxing of capital, robots and other technologies has been suggested to provide an additional, if not alternative, revenue stream for social security systems.<sup>171</sup> The deployment of robots and other technologies is likely to have an important impact on the future composition of the economy.<sup>172</sup> Since wages compared to national income have already fallen in several countries, shifting taxation from labour to other incomes needs to be considered, replacing social security contributions based on wages

<sup>166</sup> OECD (2014b)

<sup>167</sup> OECD (2014b)

<sup>168</sup> Hagen and Walz (1995)

<sup>169</sup> Clayton and Holland (2015)

<sup>170</sup> World Economic Forum (2017)

<sup>171</sup> Guerreiro et al. (2018) ; West (2015) ; French (2017)

<sup>172</sup> Piketty, Saez, and Stantcheva (2014); Bozio, Breda, and Guillot (2016); Piketty (2015a)

with a levy on the entire added value of national income.<sup>173</sup> This would also considerably reduce the cost of labour.<sup>174</sup> In Italy, for instance, if the current levy were collected on the total added value rather than wages, workers contributions would fall from 33 to 16 per cent.<sup>175</sup> Nevertheless, the potential taxation for robots or capital is still controversial and may not to be accepted by society. The European Parliament, for instance, recently rejected the proposal to tax robot owners in order to finance social protection.<sup>176</sup>

More radical proposals include the introduction of a Universal Basic Income (UBI). Irrespective of circumstances and outcomes such as income, age, and socioeconomic status, UBI would provide each citizen with an unconditional amount of income that would reduce or eliminate the need for paid work. UBI was first proposed by Thomas Paine (1795), and reinstated by economist James Meade (1935) who viewed it as social dividend. In fact, according to Friedman (1962), the establishment of a UBI programme is necessary to correct for some inequalities generated by the free market. More recently, however, the motivation for UBI stems from the increase in robotisation and the fear that there may not be enough work for everyone. In that regard, UBI policy might provide a channel to reap the benefits of robots and other technologies while compensating the resulting unemployment.<sup>177</sup> Other proponents of UBI argue that it might contribute to alleviating poverty while also reducing the administrative complexity and cost of existing social protection systems.<sup>178</sup> On the other hand, critics of the UBI sustain that work adds value to human worth and the basic income will act as a disincentive for work, thus exacerbating the poverty trap.<sup>179</sup> Furthermore, some argue that it is both a politically and financially infeasible project. Tanner (2015) argues, for instance, that if UBI was to be introduced in the United States, administration costs would be reduced but the total cost for an UBI to all citizens (deducting the costs of the current anti-poverty programmes) would be of US\$3.4 trillion – almost twice as much the federal budget. That being said, the lack of large-scale experiments make it difficult to assess how UBI would work out.<sup>180</sup> A simulation performed by Fabre et al. (2014) evaluated how UBI might perform compared to traditional unemployment insurance (UI) programmes in the U.S. labour market. The authors' find that even though UI programmes possess potential moral hazard implications and fraudulent claims, they still provide superior protection to workers and are more socially desirable, largely because the funds are better targeted.

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<sup>173</sup> Visco (2017)

<sup>174</sup> González-Páramo and Melguizo (2013); OECD (1990)

<sup>175</sup> Visco (2017)

<sup>176</sup> Prodhon (2017)

<sup>177</sup> Rycroft (2017)

<sup>178</sup> ILO (2017d)

<sup>179</sup> Tanner (2015); Standing (2014, 2013)

<sup>180</sup> Rycroft (2017)

## 2.4 How will wage and income inequality evolve?

Wealth and income inequality can profoundly influence economic prosperity, social justice and political decision-making. According to the Global Risks Perception Survey conducted by The World Economic Forum (2017), growing income and wealth disparities are seen as the most probable trend to determine global developments in the next decade. The fear is that households situated at the bottom of the income distribution may be the least prepared to adjust to the new world of work, producing a vicious cycle of widening inequalities.<sup>181</sup>

Even though the fall in global income inequality between countries has accelerated over the past three decades, within-country inequality has not followed the same trend.<sup>182</sup> For industrialised countries, despite having a mostly positive track record in closing income gaps during the twentieth-century, a new trend of increasing income shares to the top 1 per cent emerged after 1980 in countries such as the United Kingdom, United States and Australia.<sup>183</sup>

Many economists assert that the diffusion of information and communication technologies (ICT) are the main culprit for these developments. Traditionally, technological change was viewed as factor-neutral; with the large-scale introduction of ICT, however, technological change became skill-biased and hollowed out the jobs market. Others comment on the rising dominance of a small group of corporate giants that have taken hold of the global economy, enjoying substantial profits and a low share of labour in firm value-added and sales. Rent-seeking, mostly related to protectionist behaviour of high income professionals and market power of large firms also plays a role. These factors stemming from technological, economic and political developments are shrinking labour's contribution to national income and concentrating incomes at the top of the distribution.

The existing literature has little to offer regarding future wage growth in the world. Most observers seem to expect stagnating wages in general with the exception of some emerging economies, especially China, which will continue to experience rising wages.<sup>184</sup> Nonetheless, the National Intelligence Council (2017) predicts one scenario for 2028 in which China and India could also follow the path of stagnant wages due to the so-called middle-income trap. With respect to developed economies, The Conference Board (2017) argues that skills shortages in mature economies originating from the retirement of baby boomers may put upward pressure on wages and lower profits for the next 15 years, although to what extent will depend on a range of factors such as occupations and locations.<sup>185</sup> Meanwhile, the OECD (2016b) believes that the increasing importance of online platform work can cause a "race to the bottom" for OECD workers – disputing jobs with workers from low-wage countries thus pushing real wages down. Similarly, Codagnone et al. (2016) argue that the rise in the gig economy puts digital workers under pressure, leaving them with only very low to modest incomes.

On top of this, the erosion of labour market institutions in recent decades is believed to be a driver of inequality, and has pushed the labour share of income downwards – particularly for developed

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<sup>181</sup> Coyle (2016)

<sup>182</sup> The Economist (2006); OECD (2011); World Economic Forum (2017)

<sup>183</sup> Cribb, n.d.; Treasury (2013); OECD (2014a)

<sup>184</sup> Hardoon (2017); Saxer (2017); ILO (2016a)

<sup>185</sup> The Conference Board (2017)

countries.<sup>186</sup> Furthermore, lower union density has reduced workers' influence on corporate decisions, including those related to top executive compensation, and perhaps influencing the concentration of wealth taking place in many developed economies.<sup>187</sup> In fact, some contributors attribute the rise and fall in bargaining power for employers and workers, respectively as the main driver of wage inequality in recent decades.<sup>188</sup> In a panel study of 20 advanced economies, for instance, IMF (2015) finds empirical support for the notion that declining unionisation is related to rising top income shares and less redistribution – this has also been confirmed by other contributors.<sup>189</sup> In addition, the erosion of minimum wages are correlated with considerable increases in overall inequality.<sup>190</sup> For example, in the Netherlands over the period 1980-2010, a 16.5 per cent decrease in the minimum wage contributed to a 2.4 per cent increase in the Gini coefficient.<sup>191</sup>

The current technological trends are expected to further erode middle-class jobs, leading to a deepening of job polarisation.<sup>192</sup> As the number of middle class jobs decline, both precarious jobs and high-skilled jobs are set to increase. Historically, skill-biased technological change has benefited workers with higher skills, causing wage inequality to worsen.<sup>193</sup> With job polarisation, the absolute number of jobs for middle-income workers is declining.<sup>194</sup> As a result, these workers face slow or no wage growth and a deterioration in job quality, further increasing inequality.<sup>195</sup> For example, in the UK approximately 80 per cent of the employment shares lost by medium-skilled occupations have been gained by top occupations.<sup>196</sup> Furthermore, three different projections claim that top-earners will receive between 200 to 300 times more than the average wage by 2030. However, Autor (2015) sustains that job polarisation in the U.S. is unlikely to continue in the future since middle-skill jobs will continue to demand a mixture of skilled tasks. In addition, job polarisation is also present in developing countries, with the exceptions of Latin America and Central Asian countries.<sup>197</sup>

Technological advancements are shifting the composition of national income from labour to capital, increasing returns to capital owners.<sup>198</sup> In advanced economies and developing countries, the decline in labour income share started in the 1980s and 1990s, respectively, and reached their lowest level in the past 100 years just prior to the global financial crisis (see Figure 14).<sup>199</sup> As highlighted by the OECD (2012b), four-fifths of the labour share decline between 1990 and 2007 can be explained by technology. In particular, the rise of superstar firms, such as Google, Facebook, Amazon and Apple, have aggravated income inequality. In the past four decades, an increasing number of industries have become 'winners take most', leaving little to share with their rivals.<sup>200</sup> Indeed, sales within industries are becoming

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<sup>186</sup> Hyman (2015); Jaumotte and Buitron (2015); Carbonero, Offermanns, and Weber (2016)

<sup>187</sup> Hyman (2015); Jaumotte and Buitron (2015); Carbonero, Offermanns, and Weber (2016)

<sup>188</sup> Summers (2017)

<sup>189</sup> Jappelli and Pistaferri (2010)

<sup>190</sup> Adam and Moutos (2006); Beramendi and Rueda (2014); Jaumotte and Buitron (2015); Checchi and Garcia-Penalosa (2008)

<sup>191</sup> Jaumotte and Buitron (2015)

<sup>192</sup> Acemoglu and Autor (2010)

<sup>193</sup> OECD (2016c); Acemoglu and Autor (2010); Ales, Kurnaz, and Sleet (2015)

<sup>194</sup> Goos and Manning (2007); Salvatori (2015); France Strategie (2015)

<sup>195</sup> Goos and Manning (2007); Piketty, Saez, and Stantcheva (2014); ILO (2016f)

<sup>196</sup> Salvatori (2015)

<sup>197</sup> World Bank (2016)

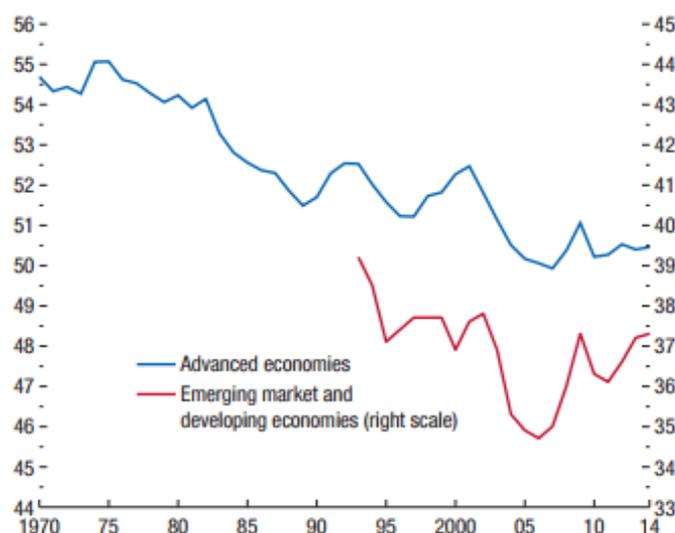
<sup>198</sup> Piketty (2015); ILO and OECD (2015); Acemoglu and Restrepo (2016, 2017)

<sup>199</sup> IMF (2017b)

<sup>200</sup> The Economist (2016); Autor et al. (2017)

increasingly concentrated among a small number of firms.<sup>201</sup> Moreover, as little as 10 per cent of the world's public corporations account for 80 per cent of all profits.<sup>202</sup> While large firms typically pay high wages, the return to labour represents a small fraction of their sales revenue. Therefore, these businesses continue to expand and increase their position in the economy, causing the labour income share to fall and widening income gaps.<sup>203</sup>

**Figure 14: Evolution of the labour share of income**



Source: IMF (2017b)

Sharing technological dividends also depends on how much and how fast productivity gains from new technologies spread throughout the economy. In this respect, digital technology can be transformational in many respects. These gains range from government digital identification systems that help promote the inclusion of disadvantaged groups, to platforms that reduce coordination costs and increase efficiency, such as Alibaba's business-to-business e-commerce website.<sup>204</sup> Nevertheless, the digital dividends of new technologies on global productivity, government accountability or equal opportunities have been rather low and less than expected.<sup>205</sup> Despite the growing importance of technology in economies across the world, more than 53 per cent of the population do not have access to the internet.<sup>206</sup> According to World Bank (2016) the digital dividend can be maximised by adopting the so-called "*analogue complements*", comprising regulations to support firms to leverage the internet and spur competition as well as innovation; investment in skills, enabling individuals to harness digital opportunities and accountable institutions ensuring government bodies adequately respond to the needs and demands of society.

<sup>201</sup> Autor et al. (2017)

<sup>202</sup> The Economist (2016)

<sup>203</sup> Autor et al. (2017)

<sup>204</sup> The World Bank (2016); Korteweg and McGonagle (2012)

<sup>205</sup> The Bank (2016); Korteweg and McGonagle (2012)

<sup>206</sup> IEA (2016); World Economic Forum (2017)

The hope that globalisation and international trade would help spreading technological dividends more widely also has not materialised. This is surprising as digital technologies themselves did spread globally and fast. Indeed, opening up global markets and freeing movement of economic resources have increased the ease of technological diffusion across and within countries for consumers and producers alike.<sup>207</sup> The invention of the telephone, for instance, took more than half a century to reach 50 per cent of U.S. households. In contrast, Facebook needed only 1 year to reach 6 million users (and this Figure grew annually by a factor of 100 over the subsequent 5 years).<sup>208</sup> In addition, industries in developing countries tend to benefit from the incidence of imported technologies and business techniques as a result of FDI originating from developed countries, be it transfers or spillovers.<sup>209</sup> The concomitant data revolution amplified these effects further by supplying an unprecedented amount of information to economic agents.

Notwithstanding, global competition is increasingly seen as a source of widening wage inequality in both developed and developing countries.<sup>210</sup> For the former, the scale effects that come with integrating societies and economies may have intensified competition for talent.<sup>211</sup> Some observers believe the productivity gains have been disproportionately allocated to high-skilled workers, leaving low-skilled labour straggling.<sup>212</sup> Furthermore, growing trade with developing economies may have exacerbated earnings inequality by depressing wages of low-skilled labour in developed economies.<sup>213</sup> With respect to the latter, multinationals from rich countries generally pay skilled-workers from poor countries relatively high wages, with some foreign multinationals paying, on average, 40 per cent more than local firms.<sup>214</sup> However, unskilled workers in these companies tend to have limited opportunities and face stagnant, low wages. As a result, globalisation seems to have pushed up wages for skilled-labour while crimping those on the lower end of the skills distribution, widening wage inequality.<sup>215</sup>

As a result, populist movements have been gaining momentum in recent years, rising fear of a period of de-globalisation.<sup>216</sup> Sceptics tend to hold globalisation accountable for job losses, arguing in favour of less openness across nations as a simple solution. Nevertheless, protectionism may not yield the expected outcomes: The same trade barriers intended to protect native workers could, for instance, obliterate jobs by raising production costs for high value-added business entities.<sup>217</sup>

Therefore, rather than reducing global trade flows, many observers call for trade liberalisation combined with labour market policies – such as income transfers – to workers displaced by international trade (known as ‘smart protectionism’).<sup>218</sup> In the *Washington Post* (2016), for example, Fareed Zakaria has argued for ‘open and armed’ economics. Moreover, this doctrine aims to keep economies open but it is also committed to protect, as well as invest, in the displaced and most vulnerable.

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<sup>207</sup> Manyika et al. (2015)

<sup>208</sup> Manyika et al. (2015)

<sup>209</sup> Zhao and Zhang (2006); Hines (1995); Acemoglu and Zilibotti (2001)

<sup>210</sup> Milanovic (2016); OECD (2007); The Economist (2014); OECD (2011); World Economic Forum (2017)

<sup>211</sup> World Economic Forum (2017)

<sup>212</sup> OECD (2011); Andrews et al., (2016)

<sup>213</sup> OECD (2011)

<sup>214</sup> The Economist (2014)

<sup>215</sup> Hallward-Driemeier and Nayyar (2017)

<sup>216</sup> Wagner (2017); SPERI (2017); World Economic Forum (2017); The Atlantic (2016)

<sup>217</sup> World Economic Forum (2017)

<sup>218</sup> Wagner (2017); SPERI (2017); The Atlantic (2016)

These trends are expected to impact the income distribution significantly. Middle classes are benefiting from fast-paced growth in emerging economies. In advanced economies, on the other hand, incomes are growing slowly or even shrinking. This has created income polarisation in many developed regions. The IMF (2016) notes that in the United States, since 2000 only 0.3 per cent of middle class households have moved up to higher income ranks, compared to 3.3 per cent of households who moved down the income ladder. Moreover, globally, wealth has shifted from West to East and will continue to do so.<sup>219</sup> Europe's middle-class global share is expected to diminish from 36 to 14 per cent in 2009 and 2030. In contrast, Asia Pacific's global share is expected to grow from 28 to 66 per cent.<sup>220</sup>

The current macroeconomic environment further exacerbated the worsening of wealth inequalities. The low-interest rate environment has eroded pension wealth, in particular for those pensioners that have no access to actively managed funds. The fall in demand for credit following the recession, accompanied with monetary policies in response to the global financial crisis, contributed to a sustained decline in both real and nominal interest rates at unprecedented levels.<sup>221</sup> For example, in the U.K. and the United States., zero-bound interest rates boosted corporate profits by 5 per cent in 2012; at the same time, households in these countries lost a total of \$630 billion in net interest income.<sup>222</sup>

In addition, political uncertainty has influenced the widening income gaps in both developed and developing countries. Anti-establishment sentiments are growing and this has largely been driven by socially unjust policies. According to Cramer (2016), the preferences of the wealthy have an overbearing influence on votes delegated by representatives, leaving voices from the bottom third of the income distribution unheard.<sup>223</sup>

Global competition has been met by rent-seeking activities and protectionism of the well-organised, in particular in developed countries. Rather than mitigating the fall-out from globalisation, this has contributed significantly to further rising income inequality. Such rent-seeking is often related to protectionist behaviour of high-income professionals.<sup>224</sup> For instance, lobbying by professional associations that defend and enforce licencing requirements in order to protect skilled groups of workers, such as lawyers, doctors, and other highly qualified professionals, is strongly linked to income inequality in the United States.<sup>225</sup> Rent-seeking can also be related to the market power of large firms: According to Loecker and Eeckhout (2017), for instance, U.S. firms have, on average, incurred a marked increase in market power stemming from 1980, and this is strongly associated with a range of macroeconomic trends realised in the last decade. More concretely, U.S. market power is negatively correlated with labour income share, low skill wages, labour force participation, and labour flows.<sup>226</sup> More generally, as put forward by Stiglitz (2015), rent-seeking behaviour combined with weak redistributive mechanisms are critical to the growth of income inequality in both developing and developed countries.<sup>227</sup> In the future, however, some observers believe that digital technologies will help curb patronage and rent-seeking behaviour from bureaucrats due to increased ease of monitoring

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<sup>219</sup> OECD (2010b)

<sup>220</sup> Kharas (2011)

<sup>221</sup> Dobbs et al. (2013); Hördahl, Sobrun, and Turner (2016)

<sup>222</sup> Dobbs et al. (2013); Hördahl, Sobrun, and Turner (2016)

<sup>223</sup> Keister and Aronson (2017); Domhoff (2005); Krauss (2015)

<sup>224</sup> Baker, (2015)

<sup>225</sup> Baker, (2015); Folbre, (2016)

<sup>226</sup> De Loecker and Eeckhout 2017

<sup>227</sup> Bobkov and Simonova (2016); Kind and Koethenbueger (2016); Stiglitz (2015)

government actions.<sup>228</sup>

Besides rent-seeking, the financialisation of the economy has also increased capital income substantially while wages have remained stagnant.<sup>229</sup> With the rising importance of the financial sector in the economy, dividends distributed to shareholders and their stock prices have increased (following the wide-spread adoption of shareholder value principles), which worsened income inequality and lowered the labour income share, especially in developed countries.<sup>230</sup> Many public corporations, often, have pursued short-term strategies to maximise the firm's shareholders' wealth ("shareholder value objective") implementing business decisions typically at the expense of workers, customers and product quality.<sup>231</sup> Currently, low rates of real sector growth have also contributed to further bloat the financial sector, with a view of generating excess profits through financial investment.<sup>232</sup> Moreover, increased international financial integration has not generated the expected benefits and led to a significant increase in volatility and inequality, which has mostly hit wage earners.<sup>233</sup>

Moreover, short-termism in public corporations can deteriorate firms' competitiveness, increase systematic risk, and reduce the long-run potential of the whole economy.<sup>234</sup> For one, excessive focus on short-term objectives might lead to neglected investment activity since the immediate financial implications might decrease their expected dividend and thereby the price of company shares.<sup>235</sup> Equivalently, executives may find the incentive to reduce expenditures at the expense of training their staff – or delaying the recruitment process – and withhold investments to human capital.<sup>236</sup> As markets provide rewards in the short-run for underinvestment, a firm's resilience to shocks is hurt over the long run through a lower adaptive capacity and reduced competitiveness. Subramanyam and Zhang (2007) find, for instance, that, in the United States, firms with too much concentration on short-term goals have a lower long-term earnings growth rate than those that balance short- and long-run objectives.

Finally, inter-generational inequality is also a concern. Indeed, the role of parental status in the process by which individuals come to occupy particular rungs in the socioeconomic ladder is persisting and, in some cases, increasing.<sup>237</sup> For example, in southern European countries, the U.K. and Finland, having a father with tertiary education raises a son's wage by at least 20 per cent or more compared with a son whose father had simply upper secondary education.<sup>238</sup> In this regard, Sachs et al. (2015) demonstrated that by taxing capital income at an average rate of 70 per cent, it will be possible to redistribute capital gains to younger generations and consequently close economic opportunity gaps across society.

Even though few studies dare give predictions on future wage growth, a general perception persists that wages will remain stagnant in developed countries while rising in emerging economies. For wage and income inequality, there are no concrete predictions for the future. In light of the extensive literature on the factors that are driving inequality, however, and in the absence of policy changes, these trends are

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<sup>228</sup> World Bank (2016)

<sup>229</sup> Dünhaupt (2017); Hardoon (2017); Hein and Schoder (2011); Stiglitz (2016)

<sup>230</sup> Dünhaupt (2017); Hardoon (2017); Hein and Schoder (2011); Stiglitz (2016)

<sup>231</sup> Magill, Quinzii, and Rochet (2013); Stiglitz (2016)

<sup>232</sup> Saxer, (2017)

<sup>233</sup> Furceri and Loungani (2015); Ernst (2011)

<sup>234</sup> Rappaport (2006); Magill, Quinzii, and Rochet (2013)

<sup>235</sup> Rappaport (2006); Magill, Quinzii, and Rochet (2013); Olesinski (2014)

<sup>236</sup> Hughes (2014); Olesinski (2014)

<sup>237</sup> Corak (2013)

<sup>238</sup> OECD (2010a)

likely to continue worsening the global income distribution. Table 3 categorises key drivers of the income and wage distribution into positive and negative effects by stage of development.

**Table 3: Possible effects on wage and income distribution in the future**

	Developed countries		Developing countries	
	Negative effect	Positive effect	Negative effect	Positive effect
<b>Wage distribution</b>	<ul style="list-style-type: none"> <li>Job polarisation</li> <li>Decline in unionisation</li> <li>Very high wages to top management</li> <li>Online platforms</li> <li>De-globalisation</li> </ul>	<ul style="list-style-type: none"> <li>Middle-skilled occupations</li> <li>Skills shortage (mature economies)</li> </ul>	<ul style="list-style-type: none"> <li>Job polarisation</li> <li>Decline in unionisation</li> <li>Globalisation</li> </ul>	<ul style="list-style-type: none"> <li>Middle-skilled occupations</li> </ul>
<b>Income distribution</b>	<ul style="list-style-type: none"> <li>Erosion of middle classes</li> <li>Shareholder value</li> <li>Short-termism</li> <li>Protectionism from highly qualified professionals and large firms</li> <li>Decline in unionisation</li> <li>Rise of superstar firms</li> <li>Politically unjust policies</li> <li>Weak redistributive mechanisms</li> <li>Inter-generational inequality</li> </ul>	<ul style="list-style-type: none"> <li>Progressive capital taxation</li> <li>Proper taxation of digital goods</li> </ul>	<ul style="list-style-type: none"> <li>Rent-seeking from elites</li> <li>Decline in unionisation</li> <li>The rise of superstar firms</li> <li>Politically unjust policies</li> <li>Weak redistributive mechanisms</li> <li>Inter-generational inequality</li> </ul>	<ul style="list-style-type: none"> <li>Rise of middle classes</li> <li>Progressive income taxation</li> </ul>

Source: Authors' own elaboration

## 2.5 The future of social dialogue and industrial relations

Social dialogue (SD) and industrial relations (IR) are playing an important role for the promotion of decent work as well as peace and social justice.<sup>239</sup> According to the ILO (2013b), SD and IR can be used as instruments to advocate good governance, and foster not only cooperation across social partners but also enhance economic performance. In that regard, SD and IR create a cohesive environment where social partners can meet and work towards mutually desirable objectives of decent work and growth at the national level.<sup>240</sup> While IR strictly refers to the relationship between management and workers of a particular industry, SD is considerably broader and has several elements. According to the ILO (2013b, p.5), SD is a term that “describes the involvement of workers, employers and governments in decision-making on employment and workplace issues”. More concretely, SD encompasses bipartite relations between workers and employers and tripartite relationships with the addition of the government. While bipartite SD typically takes the form of collective bargaining, tripartite SD includes government to discuss public policies and laws that affect the workplace.

Partly in response to such arrangements, workers nowadays enjoy in many countries the right to negotiate for wage increases, access healthcare, and improved working conditions.<sup>241</sup> In the years ahead, however, SD and IR are likely to face unprecedented challenges.<sup>242</sup> As the Fourth Industrial Revolution is about to bring new business models, the purpose and relevance of labour market institutions are being questioned: Can organised workers be as effective while work is being increasingly shifted to machines? But also: What rights do workers reserve when machine efficiency outweighs human labour? In the following section, we will first briefly discuss historical and future challenges faced by SD and IR, and then move onto current and potential responses of social partners.

### *Challenges*

The literature mostly addresses the challenges to SD in the context of workers’ organisations. Some observers argue that the future holds immense potential for trade unions. In the United Kingdom, for instance, as much as 80 per cent of the public thinks that trade unions are “essential” to protect the interest of workers and public concerns over low pay have soared to record levels in recent years.<sup>243</sup> Nevertheless, union memberships have been steadily declining in developed countries since at least the 1980s, and current memberships are highly skewed towards the public-sector, older workers and middle-to-high earners.<sup>244</sup> While union membership rates tend to move positively with workers’ age, inter-generationally there has been a declining trend that is expected to continue into the future. Moreover, this is also the case for employers’ organisations (Figure 15).<sup>245</sup> Comparing union participation rates of baby boomers to those of the first cohort of Millennials, we see a decline from 30 per cent to 20 per cent for young adults, respectively. As a consequence, by 2030, working age membership might fall to 20 per cent (compared to today’s figure of 25 per cent).<sup>246</sup>

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<sup>239</sup> ILO (2013b)

<sup>240</sup> ILO (2013c)

<sup>241</sup> Forbes (2016)

<sup>242</sup> Fine (2015); Nowak (2015); Forbes (2016)

<sup>243</sup> Tyrone (2016)

<sup>244</sup> Tyrone (2016); Collins (2015); The Economist (2015)

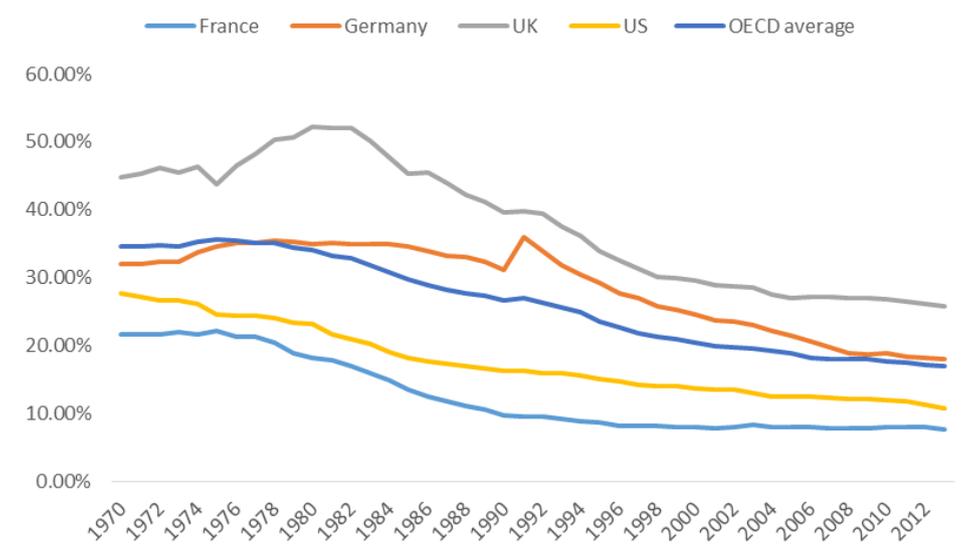
<sup>245</sup> Nowak (2015); Tyrone (2016); ILO (2013b)

<sup>246</sup> Tyrone (2016)

The historical decline in trade union participation rates that took place in developed countries can largely be explained by structural changes.<sup>247</sup> For one, the structural transformation away from industry and towards services has significantly reduced total manufacturing employment and with it opportunities for unskilled males, the largest cohort in manufacturing and precisely those most probable to join a union.<sup>248</sup> In the United States alone, manufacturing employment has fallen from 20 million in 1979 to 12 million in 2015.<sup>249</sup> As a consequence, the increasing use of industrial machines and globalisation has made it more difficult for unions to regulate work.<sup>250</sup>

Furthermore, international trade union organisations, employer organisation and academics fear that the future world of work might pose further pressure to undermine progress made in regards to collective labour relations and rights.<sup>251</sup> More concretely, the ongoing and pending challenges for SD and IR includes demographic shifts through migration and an ageing workforce; technological advancements via the gig economy and digitalisation; and the impact the transition to the green economy has on jobs.<sup>252</sup>

**Figure 15: Evolution of trade union density in OECD countries**



Source: OECD database

### *Responses*

Contributors in the literature present differing views on how SD and IR ought to respond to these challenges, but what is mutually consistent is the view that such labour market institutions will only

<sup>247</sup> The Economist (2015)

<sup>248</sup> Fontagné and Harrison (2017)

<sup>249</sup> The Economist (2015)

<sup>250</sup> The Economist (2015); Nowak (2015)

<sup>251</sup> IOE (2017)

<sup>252</sup> ILO (2017f)

remain relevant by acting responsively to the changing world of work.<sup>253</sup>

In the case of workers' organisations, for instance, the literature touches on the need for unions to anticipate and adjust their organising and collective bargaining approaches to the dynamic demands of the modern economy, labour market, work organisation, demography, and human resource management.<sup>254</sup> For example, in Italy, the Italian Federation of Metalworkers (FIM-CISL) has conducted studies on the potential impacts of automation on production systems and the corresponding role for unions.<sup>255</sup> Moreover, in response to the drastic shift in workers' activities from manual tasks to planning and control, FIM-CISL is offering professional training as a worker right, which is in the process of being taken a step further and added to the national collective agreement for individuals labouring in the metalworking sector.

Other contributors advocate for a shift towards more decentralised and/or innovative collective bargaining structures to include isolated groups of workers.<sup>256</sup> Indeed, workplaces are becoming increasingly fragmented as flexible work increases with the emergence of online platforms.<sup>257</sup> The consequences can raise problems with regard to respecting workers representation, freedom of association and collective bargaining.<sup>258</sup> Nonetheless, the rise of such non-standard employment creates substantial opportunities for membership since more and more individuals are in need of the services and support that workers' organisations offer.<sup>259</sup> Currently, the rate of unionisation among non-standard employees is markedly lower than their traditionally employed counterparts.<sup>260</sup> Notwithstanding, as put forward by Hayter (2015), through mending the benefits and services to be aligned with the needs of today's workers, it may be possible to attract a sizable proportion of this section of the workforce to sign up. In fact, some commentators highlight the inevitable emergence of modern labour institutions such as digital freelancers' unions, and, in turn, updated labour market regulations that will come with it.<sup>261</sup>

According to Kelly Ross (deputy director of American Federation of Labour and Congress of Industrial Organisations), there are three trade union approaches currently organising gig and platform workers<sup>262</sup>:

- 1) Legal approach – Unions contest worker misclassification and try to include gig and platform workers in existing employment statutes. An example of this approach includes the well-documented case of worker misclassification against Uber in the UK led by GMB. Moreover, rather than independent contractors, GMB contended that Uber drivers should be classified as workers of the United Kingdom and be eligible for the corresponding employment entitlements. As a result, over 30,000 drivers were granted access to basic employment provisions, including minimum wage and vocational pay.<sup>263</sup>

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<sup>253</sup> Collins (2015); Tyrone (2016); Nowak (2015); ILO (2017f); IOE (2017)

<sup>254</sup> Collins (2015); Tyrone (2016)

<sup>255</sup> Forbes (2016)

<sup>256</sup> ILO (2017f)

<sup>257</sup> De Stefano (2016)

<sup>258</sup> ILO (2017f)

<sup>259</sup> Kessler (2015); Parker (2016)

<sup>260</sup> Collins (2015); Nowak (2015)

<sup>261</sup> World Economic Forum (2016a)

<sup>262</sup> Johnston and Land-Kazlauskas (2018)

<sup>263</sup> GMB (2016)

- 2) Alliance formation – The development of associations and alliances committed to providing a service to isolated workers, often in the form of lobbying on behalf of gig workers. In New York, for instance, several trade unions, including The International Association of Machinists and Aerospace Workers (IAM), are associated with The Independent Drivers Guild (IDG). Representing over 60,000 drivers, IDG was established with the agenda of reforming the industry and creating opportunities for dialogue among drivers operating in the gig economy and the corporations.<sup>264</sup>
- 3) Regulatory reform – The creation of new opportunities for collective bargaining at the state and municipal levels with the aid of regulatory and legal reform. While there have been few successful attempts at introducing new legislation at the municipal level, the most effective cases have been executed by The Teamsters in Seattle. Indeed, such legislation aims at extending collective bargaining to include independent contractors in the transportation industry, most notably Uber and Lyft.<sup>265</sup>

The literature also highlights that the movement towards precarious employment, sub-standard conditions and marginalisation may lead to the emergence of unconventional, community-based initiatives to protect vulnerable workers using innovative strategies.<sup>266</sup> Moreover, worker centres play a critical role in that respect – and often combine forces with formal trade unions in pursuing their mutual objectives.<sup>267</sup> In the United States, for instance, an increasing number of worker centres are becoming established institutions for organising workers and collective bargaining.<sup>268</sup> This alternative form of labour protection has made significant gains for U.S. workers at all levels: Over the past two years as much as 13 states and 10 city and county governments have voted to increase minimum wages in part thanks to worker centres.<sup>269</sup> Such new, alternative forms of worker representation are likely to shape the future of organised labour into a mix of organisational forms, according to Fine (2015).

Unlike digitisation, automation has been a challenge faced by social partners tracking back to the second half of the 20<sup>th</sup> century.<sup>270</sup> At the moment, there appears to be no empirical-based research providing information on how workers' organisations, employers' organisations and governments, at a global level, are preparing for drastic shifts in the production process. However, the majority of the efforts taking place to adjust for automation are in developed countries, and each of these movements highlight the importance of research and re-training workers.<sup>271</sup>

While few studies solely discuss the role of employer' organisations in the future of work, those available emphasise the need for a more dynamic, continuous dialogue across various sectors of economic activity, and more targeted education for workers to harness the impending changes to the labour market.<sup>272</sup> With regard to the latter, employers' organisations can act effectively as

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<sup>264</sup> Independent Drivers Guild (2017)

<sup>265</sup> Teamsters (2017)

<sup>266</sup> Collins (2015)

<sup>267</sup> Fine (2015); Johnston and Land-Kazlauskas (2018)

<sup>268</sup> Fine (2015); Johnston and Land-Kazlauskas (2018)

<sup>269</sup> Fine (2015)

<sup>270</sup> Forbes (2016)

<sup>271</sup> Forbes (2016)

<sup>272</sup> IOE (2017); EFF (2012); ILO (2017f)

knowledgeable participants in innovation and improvement.<sup>273</sup> Specifically, such organisations should play a predominant role national and locally as brokers of knowledge through the conduits of organised training, consultancy, conferences and networking. For example, as demonstrated by the Engineering Employers Federation, employers' organisations can offer direct support for the evaluation and improvement of work organisation and highlight skill shortages to worker unions.<sup>274</sup> More broadly, according to The Malta Federation of Industry, economic policies should be tailored towards an integrated and forward-looking education system, particularly in the areas of science and research.<sup>275</sup> Other commentators assert that the role of employers will be affected as the concept of dependent employment comes under discussion and, in response, employers' organisations might need to become more service oriented, widening the scope of their membership to new kinds of businesses.<sup>276</sup> Finally, current changes in the world of work are also likely to challenge global governance institutions such as the ILO. In this regard, the IOE (2017) highlights several areas in which international agencies such as ILO need to react to changes in the employment relationships, the emergence of new skills and qualifications and in the evolution of SD and IR.

In the absence of such changes discussed above the negative trends facing SD and IR are likely to exacerbate further into the future. For instance, in a scenario analysis outlining three alternative realities on IR in Europe, the most likely outcome is the so-called *from bad to worse*. Moreover, this possible future depicts the continuation of current trends, and reveals the "cancer stage of capitalism".<sup>277</sup> As a result, national economies and labour markets are increasingly disembodied from effective social regulation; and the beneficiaries of financialised 'shareholder value' capitalism have little interest in maintaining historic compromises, leading to reduced workers bargaining power and increasing inequality.<sup>278</sup>

On the other hand, with a dynamic approach it may be possible for labour institutions to not only counteract current trends, but to also have a far-reaching effect on the future world of work. For instance, in an alternative scenario by Hyman (2015) coined as *elite reform*, he envisages a stark shift in public policy – at both the national and supranational levels. Indeed, this reality describes reversing current trends in industrial relations and collective bargaining by devising a new international financial and economic architecture. In fact, this framework is also believed to complement a so-called "Keynes-plus" policy reorientation by national governments, concurrent with a new green deal, creating a platform for growth which is rich in terms of employment, but environmentally friendly.

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<sup>273</sup> Totterdill (2013)

<sup>274</sup> EEF (2018)

<sup>275</sup> Camilleri and Debono (2008)

<sup>276</sup> IOE (2017)

<sup>277</sup> Hyman (2015)

<sup>278</sup> Hyman (2015)

### 3. Summary and identified gaps in the literature

This paper made use of 255 studies and has focused on different drivers that will impact the future of work. In particular, this review looks at five different labour market outcomes:

- i) The first subsection on *the future of jobs* contains two parts: *labour force developments* as well as *jobs and employment*. For the former, it starts with the future of global demography and discusses what effects a reduced labour force might bring to most advanced economies. Other countries, however, will deal with an expanding younger population concurrent to decreasing labour market participation rates. The potential inclusion of other groups, such as women and migrants', are seen as a solution to counteracting this trend, alongside labour market policy and pension reforms. For the latter, different studies estimate which occupations will be substituted by automation in both developed and developing countries. In addition, re-shoring of production from developing to developed countries to utilise innovation hubs and access markets is highlighted. At the same time, it presents opposing views that argue, although computerisation might eliminate tasks, it is unlikely that entire occupations will disappear. Furthermore, several researchers expect that new jobs will appear, in particular for Engineering, Computer and mathematics-related employments. Conversely, other commenters believe the overall effects from advancements in genetics, artificial intelligence and robotics will have a negligible impact on the labour market.

Demographic and climate change are also discussed in this section. Ageing populations are expected to create additional employment in the health and care sectors, while climate change is likely to foster employment in green jobs - particularly within the renewable energy sector. The effects of automation in gender and race are also introduced here.

- ii) Working conditions is the second sub-section and associates new business models to the future of work. Flexible and temporary work, among other forms of non-standard employment, is expected to become more prevalent in the near future. Many anticipate lower wages, reduced social protection and more work insecurity to follow. Some studies point out, however, that flexible and remote work will allow marginalised workers to join the work force, as well as workers with family responsibilities. The impact of the gig economy, entailing increased precarisation, decreased bargaining power and reduced legal protection, is also highlighted. Outcomes related to OSH and informality are also present.
- iii) Social protection and the welfare state are expected to be challenged in the future. New forms of employment, such as those borne with the gig economy, will eliminate the contributions towards social protection schemes. Likewise, a fall in labour supply will have a negative effect on the amount of social contributions and the sustainability of pay-as-you-go insurance systems. Meanwhile, ageing populations will require more funds to afford pensions and care services. The inward migratory pressure that many developed countries are expected to incur in the future may squeeze social protection systems further. For some emerging economies, high wages might stifle social security sustainability. A last negative effect arises from a low-interest environment which is predicted to continue into the future. Studies also highlight the importance of including workers under non-standard forms of employment into social security benefits. Others comment on more transformative remedies, such as the universal basic income.

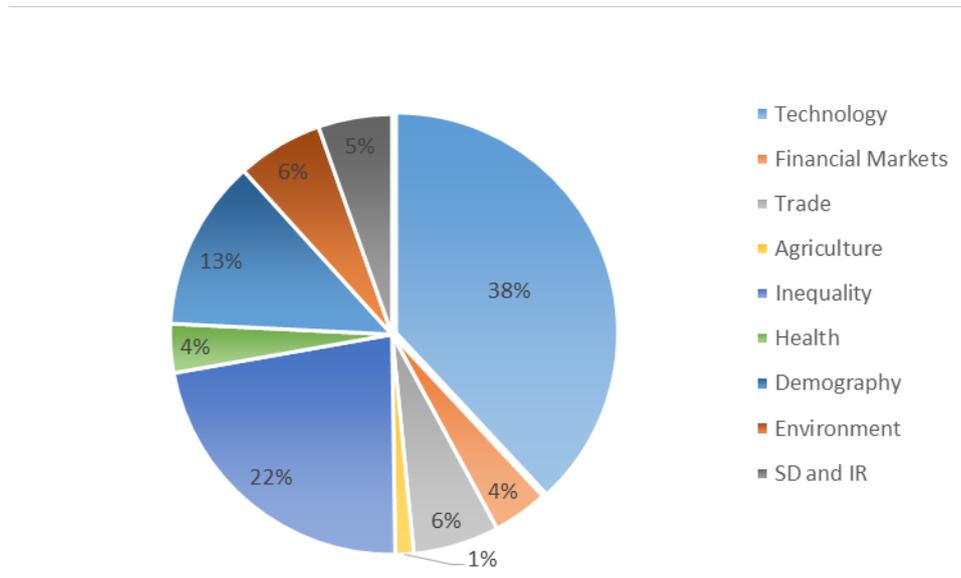
- iv) Wage growth is not largely discussed in the existing literature on the future of work, despite the wealth of studies on wage and income inequality. Job polarisation, in both developed and developing countries, is discussed along with the future of middle-classes. Many commenters highlight the importance of globalisation and the rise of superstar firms as an explanation for widening inequalities. Further, the literature also discusses the erosion of labour market institutions as another detriment to inequality. Additionally, the financialisation of the economy and short-termism may have benefited capital owners at the expense of workers. Studies have also debated about capital taxation, such as a robot tax, but so far this has not led to any policy initiatives. The last point of this sub-section on wages and income inequality is that rent-seeking has affected societies both in developed and developing countries, through either natural resources rents, protectionism from highly qualified workers or intellectual property rights.
- v) Finally, the review looks at the future of industrial relations. It notices that past trends have already weakened unionization rates in many countries, both for structural and demographic reasons. These forces are likely to continue, especially if trade unions do not seize opportunities to reach out to new groups on the labour markets and address their rising demand for representation and protection. Several studies highlight the potential for traditional forms of trade unions but also new models of representation to address the rising precariousness that comes with new forms of (self-)employment and restructuring due to the digital transformation.

The existing literature on the future of work covers a wide range of topics, most of which focused on technological innovations and inequality, with fewer studies looking into the impact of demographics and environmental changes<sup>279</sup> (see Figure 16). Nevertheless, despite this wealth of existing studies some important gaps remain that should be addressed in future research:

- For labour force participation, little is known about the impact of migration as there are no estimations on how much of the workforce will be constituted by migrants (from either agriculture to urban cities or international).
- In regard to the future of job creation and destruction, projections on the impact of automation on agriculture would be essential for the analysis, particularly for developing countries.
- With regard to future working conditions, the available literature is sizable. However, even though there are scenarios for specific cities and their informal sectors, no aggregate estimations exist for developing countries and how this will affect societies in the future.
- Finally, with reference to wage and income inequality, there has been no study on wage growth for the upcoming decades. This would be crucial for understanding wage trends, especially when taking into account different income groups.

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<sup>279</sup> ILO (2017c)

**Figure 16: Topics coverage in the reviewed literature (255 studies)**

## References

- Acemoglu, D.; Autor, D. 2010. *Skills, Tasks and Technologies: Implications for Employment and Earnings*, NBER Working Paper Series 16082 (Cambridge, National Bureau of Economic Research).
- Acemoglu, D.; Restrepo, P. 2016. *The Race Between Machine and Man: Implications of Technology for Growth, Factor Shares and Employment*, NBER Working Paper Series 22252. (Cambridge, National Bureau of Economic Research).
- . 2017. *Robots and Jobs: Evidence from US Labor Markets*, NBER Working Paper Series 23285 (Cambridge, National Bureau of Economic Research).
- Acemoglu, D.; Fabrizio, Z. 2001. "Productivity Differences", in *The Quarterly Journal of Economics*, Vol. 115, No. 116, pp. 563-606.
- Adam, A; Moutos, T. 2006. "Minimum Wages, Inequality and Unemployment", in *Economics Letters*, Vol. 92, No. 2, pp. 170–76.
- Ales, L. et al. 2015. "Technical Change, Wage Inequality, and Taxes", in *American Economic Review*, Vol. 105, No. 10, pp. 3061–3101.
- Andrews, D. et al. *The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy*, OECD Productivity Working Papers (Paris, OECD Publishing).
- Arntz, M. et al. 2016. *The Risk of Automation for Jobs in OECD Countries*, OECD Social, Employment and Migration Working Papers (Paris, OECD Publishing).
- Atkinson, R.; Wu, J. 2017. *False Alarmism: Technological Disruption and the U.S. Labor Market, 1850–2015*, (London, ITIF).
- Autor, D. et al. 2017. *Concentrating on the Fall of the Labor Share*, NBER Working Paper Series 23108 (Cambridge, National Bureau of Economic Research).
- Bengtsson, T. 2010. *Population Ageing - A Threat to the Welfare State? The Case of Sweden*, (Berlin, Springer).
- Bennington, J.; Chamberlain, J. 1989. *Beyond FTS2000: A Program for Change*, (Washington, DC, National Academies Press).
- Beramendi, P.; Rueda, D. 2014. "Inequality and Institutions: The Case of Economic Coordination", in *Annual Review of Political Science*, Vol. 17, No. 1, pp. 251–71.
- Bloom, D. et al. 2016. *Africa's Prospects for Enjoying a Demographic Dividend*, NBER Working Paper No. 22560 (Cambridge, National Bureau of Economic Research).
- Bobkov, N. et al. 2016. "Economic Factors of Russian Inequality", in *International Journal of Environmental and Science Education*, Vol. 11, No. 16, pp. 8900-8910.
- Boden, I. et al. 2016. *The Changing Structure of Work: Implications for Workplace Health and Safety in the US*, Prepared for the Future of Work Symposium (California, U.S. Department of Labor).

- Bonner, J. 2008. *Waste Pickers without Frontiers*, Report of Conference Proceedings (Cambridge, WEIGO).
- Borland, J.; Coelli, M. 2017. "Are Robots Taking Our Jobs?", in *The Australian Economic Review*, Vol. 50, No. 4, pp. 377-97.
- Bosanquet, N. et al. 2013. *Mind the (Fiscal) Gap: Direct Taxes, Public Debt and Population Ageing*, (England, Reform).
- Bozio, A. et al. 2016. *Taxes and Technological Determinants of Wage Inequalities: France 1976-2010*, PSE Working Papers 2015-05 (Paris, PSE).
- Braconier, H. et al. 2014a. *Policy Challenges for the Next 50 Years*, *OECD Economic Policy Papers* (Paris, OECD).
- British Chambers. 2015. *Business and Education Survey*. Available at: [http://www.britishchambers.org.uk/BusinessEducation\\_Infographic.jpg](http://www.britishchambers.org.uk/BusinessEducation_Infographic.jpg) [10 Jan. 2018].
- Brookings. 2016. *The Future of Work in the Developing World*, (Washington, DC, Brookings Institution).
- Brynjolfsson, E.; McAfee, A. 2014. *The Second Machine Age*, (Cambridge, MIT).
- Buettner, T.; Rainer M. 2016. *Comparative Analysis of International Migration in Population Projections*, KNOMAD Working Paper 10.
- Buhr, D. et al. 2016. *On the Way to Welfare 4.0? Digitalisation of the Welfare State in Labour Market, Health Care and Innovation Policy: A European Comparison*, Politik Für Europa (Berlin: Friedrich-Ebert-Stiftung).
- Carbonero, F. et al. 2016. *The Trend in Labour Income Share: The Role of Technological Change in Imperfect Labour Markets*, IAB Discussion paper (Nuremberg, IAB).
- Cardona, Í. 2016. *El futuro del trabajo en un mundo cambiante*, Libros Editorial (Lima, UNIMAR).
- CGPS. 2017. *Stick Shift: Autonomous Vehicles, Driving Jobs and the Future of Work*, (Washington, DC, Center for Global Policy Solutions).
- Chang, J.; Phu, H. 2016. *The Future of Jobs at Risk of Automation in ASEAN*, ILO Working Paper No. 9 (Geneva, ILO)
- Checchi, D.; Garcia-Penalosa, C. 2008. "Labour market institutions and income inequality", in *Economic Policy*, Vol. 23, No. 56, pp. 601-649.
- Chui, M. et al. 2015. *Four Fundamentals of Workplace Automation*, (New York, McKinsey & Company).
- . 2016. *Where Machines Could Replace Humans--and Where They Can't (yet)*, (New York, McKinsey & Company)
- . 2017. *The Countries Most (and Least) Likely to Be Affected by Automation*, Harvard Business Review (New York, McKinsey & Company)

- Clark, L. 2017. *Oxford Nanopore: We Want to Create the Internet of Living Things*. Available at: <http://www.wired.co.uk/article/clive-brown-oxford-nanopore-technologies-wired-health-2015> [10 Jan. 2018].
- Clayton, J.; Hereward, H. 2015. *Over One Million Sea Arrivals Reach Europe in 2015*, (Geneva, UNHCR).
- Camilleri, N; Debono, M. 2008. *Views of Employer Organisations on Future Skills Requirements*, (Dublin, Eurofound).
- Codagnone, C. et al. 2016. *The Future of Work in the 'Sharing Economy'. Market Efficiency and Equitable Opportunities or Unfair Precarisation?*, EU Science Hub (Brussels, European Commission).
- Cohen, A. et al. 2016. *Benchmarking Global Production Sourcing Decisions: Where and Why Firms Offshore and Reshore*, Stanford University Graduate School of Business Research Paper No. 16-28 (California, Stanford).
- Collins, P. 2015. *The Future of Trade Unions*. Available at: <https://www.prospectmagazine.co.uk/magazine/the-future-of-trade-unions> [8 Jan. 2018].
- Collinson, M. et al. 2007. "Migration, Settlement Change and Health in Post-Apartheid South Africa: Triangulating Health and Demographic Surveillance with National Census Data", in *Scandinavian Journal of Public Health. Supplement* Vol. 69, pp. 77–84.
- Corak, M. 2013. "Income Inequality, Equality of Opportunity, and Intergenerational Mobility", in *Journal of Economic Perspectives*, Vol. 27, No. 3, pp.79–102.
- Coyle, D. 2016. *Inequality and the Future of Work*, (London, The Economist)
- Cribb, J. 2013. *Income Inequality in the UK*, (London, IFS).
- Daheim, C.; Wintermann, O. 2017. *2050: Die Zukunft Der Arbeit*, (Gutersloh, Bertelsmann Foundation).
- Davenport, T.; Kirby, J. 2015. *Beyond Automation*, (Cambridge, Harvard Business Review).
- De Backer, K. et al. 2016. *Reshoring: Myth or Reality?*, OECD Science, Technology and Industry Policy Papers (Paris, OECD)
- Decanio, S. 2016. "Robots and humans - complements or substitutes?", in *Journal of Macroeconomics*, Vol. 49, pp. 280-291.
- De Loecker, J.; Eeckhout, J. 2017. *The Rise of Market Power and the Macroeconomic Implications*, NBER Working Paper 23687.
- Deloitte. 2014. *Agiletown: The Relentless March of Technology and London's Response*, (London, Futures).
- . 2016. *Blockchain Applications in the Public Sector*, (London, Deloitte).

- De Stefano, V. 2016. *The Rise of the 'Just-in-Time Workforce: On-Demand Work, Crowd Work and Labour Protection in the 'Gig-Economy*, Conditions of work and employment series No. 7 (Geneva, ILO).
- Dias, S. 2011. *Overview of the legal framework for inclusion of informal recyclers in solid waste management in Brazil*, WIEGO Urban Policies Briefing Note No. 8 (Cambridge, WIEGO).
- Devlin, S. 2017. *(In)equality in the Digital Society*, (Berlin: Friedrich-Ebert-Stiftung)
- Dobbs, R. et al. 2013. *QE and Ultra-Low Interest Rates: Distributional Effects and Risks*, (New York, McKinsey & Company).
- Domhoff, W. 2005. *The Class-Domination Theory of Power*. Available: [http://www2.ucsc.edu/whorulesamerica/power/class\\_domination.html](http://www2.ucsc.edu/whorulesamerica/power/class_domination.html) [8 Jan. 2018].
- Dünhaupt, P. 2017. "Determinants of Labour's Income Share in the Era of Financialisation", in *Cambridge Journal of Economics*, Vol. 41, No. 1, pp. 283–306.
- Mishel, L.; Shierholz, H. 2017. *Robots, or Automation, Are Not the Problem: Too Little Worker Power Is*, (Washington, DC, Economic Policy Institute).
- EcoWatch. 2015. *World's First Robotic Farm to Produce 30,000 Heads of Lettuce Per Day*, (Ohio).
- EEF. 2018. *We are EEF*. Available: <https://www.eef.org.uk/> [8 Jan. 2018].
- Ernst, E. 2011. *The Future of Finance: Scenarios of Financial Sector Reforms and Their Labour Market Implications*, The Global Crisis. Causes, Responses and Challenges 223–40 (Geneva, ILO).
- Esposito, M. et al. 2017. "Enhancing Job Creation through Green Transformation", in T. Altenburg.; C. Assmann (eds.): *Green Industrial Policy: Concepts, Policies, Country Experiences* (Geneva, UN Environment; German Development Institute), pp. 51-64.
- Estevadeordal, A. et al. 2017. "The Future of Work in Latin American Integration 4.0", in *Integration and Trade Journal*, Vol. 21, No. 42.
- EU-OSHA. 2015. *The Future of Work: Crowdsourcing*, (Brussels, European Commission).
- Eurofound.; International Labour Organisation (ILO). 2017. *Working Anytime, Anywhere: The Effects on the World of Work*, (Geneva, ILO)
- European Commission. 2014. *Employment and Social Developments in Europe*, (Belgium, European Union).
- . 2016. *The Future of Work Skills and Resilience for a World of Change*, (Belgium, European Union).
- Farrel, D.; Greig, F. 2016. *Paychecks, Paydays, and the Online Platform Economy Institute*, (Geneva, JPMorgan Chase & Co).
- Fabre, A.; Pallage, S.; Zimmerman, C. 2014. *Universal basic income versus unemployment insurance*, CESIFO Working Paper No. 5106 (Bonn, IZA).
- . 2016b. *The Online Platform Economy*, (Geneva, JPMorgan Chase & Co).

- FIAP. 2011. *Advancing in the Strengthening and Consolidation of the Individually-Funded Pension Systems*, (Santiago, FIAP).
- Finkel, A. 2017. *Finkel's law: Robots won't replace us because we still need that human touch*, (London, The Conversation)
- Fine, J. 2015. "Alternative Labour Protection Movements in the United States: Reshaping Industrial Relations?", in *International Labour Review*. Vol. 154, No. 1, pp. 15–26.
- Finextra. 2016. *Banking on Blockchain: Charting the Progress of Distributed Ledger Technology in Financial Services*, Finextra White Paper (London: Finextra Research Ltd).
- Fogel, R. 2008. *Forecasting the Cost of U.S. Health Care in 2040*, NBER Working Paper No. 14361 (Cambridge, NBER).
- Fontagné, L.; Harrison, A. 2017. *The Factory Free Economy*, (England, Oxford University Press)
- Forbes. 2016. *Will Labor Unions Survive In The Era Of Automation?*, (New York, Forbes).
- France Strategie. 2015. *Les Métiers En 2022*, (Paris, France Strategie).
- Fraser, E.; Charlebois, S. 2016. *Automated Farming: Good News for Food Security, Bad News for Job Security?* Available: <https://www.theguardian.com/sustainable-business/2016/feb/18/automated-farming-food-security-rural-jobs-unemployment-technology> [8 Jan. 2018].
- French, S. 2017. *Bill Gates says Robots should pay taxes if they take your job*. Available: <https://secure.marketwatch.com/story/bill-gates-says-robots-should-pay-taxes-if-they-take-your-job-2017-02-17> [8 Jan. 2018].
- Friedman, M. 1962. *Capitalism and Freedom*, (Chicago, University of Chicago Press).
- Frey, C.; Osborne, M. 2013. *The Future of Employment: How Susceptible Are Jobs to Computerisation?*, Working paper (Oxford, University of Oxford)
- . 2015. *Technology at Work: The Future of Innovation and Employment*, Citi GPS Reports (Oxford, University of Oxford).
- Furceri, D.; Loungani, P. 2015. *Capital Account Liberalization and Inequality*, IMF Working Papers 15/243 (Washing, D.C, IMF).
- Gallup.; International Labour Organisation (ILO). 2017. *Towards a Better Future for Women and Work: Voices of Women and Men*, (Geneva, ILO).
- German Federal Ministry of Labour and Social Affairs. 2016. *White Paper - Work 4.0*, (Berlin, Federal Ministry of Labour and Social Affairs).
- GMB. 2016. *GMB wind monumental victory in employment case against Uber*. Available: <http://www.gmb.org.uk/newsroom/GMB-wins-uber-case> [2 Jan. 2018].
- González-Páramo, J.; Melguizo, A. 2013. *Who Really Pays Social Security Contributions and Labour Taxes?*, (New York, Vox).

- Goos, M.; Manning, A. 2007. "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain", in *The Review of Economics and Statistics*, Vol. 89, No 1, pp. 118–33.
- Goos, M. et al. 2015. *Employment Growth in Europe: The Role of Innovation, Local Job Multipliers and Institutions*, Discussion paper no.50 (Belgium, Vives).
- Gorbis, M. et al. 2014. *The Future of Youth Employment: Four Scenarios Exploring the Future of Youth Employment*, (California, Institute for the Future).
- Gordon, R. 2000. *Does the 'New Economy' Measure up to the Great Inventions of the Past?*, Working Paper No. 7833 (Cambridge, NBER).
- . 2012. *Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds*, Working Paper No.18315, (Cambridge, NBER).
- Graetz, G.; Michaels, G. 2015. *Robots at Work*, IZA Discussion Paper No. 8938 (Bonn, IZA).
- Guerreiro, J.; Rebelo, S.; Teles, P. *Should Robots Be Taxed?*, (London, Centre for Economic Policy Research).
- Hagen, J.; Walz, U. 1995. "Social Security and Migration in an Ageing Europe", in B Eichengreen; J. Von Hagen (eds): *Politics and Institutions in an Integrated Europe* (Berlin, Springer).
- Hallward-Driemeier, M.; Nayyar, G. 2017. "Trouble in the making? The future of manufacturing-led development", (Washington, D.C, World Bank).
- Hardoon, D. 2017. *An Economy for the 99%: It's Time to Build a Human Economy That Benefits Everyone, Not Just the Privileged Few*, Oxfam briefing paper (Geneva, Oxfam).
- Hardoon, D. et al. 2016. *An Economy For the 1%: How Privilege and Power in the Economy Drive Extreme Inequality and How This Can Be Stopped*, Oxfam briefing paper (Geneva, Oxfam).
- Harrold, M. et al. 2002. *Poverty and Climate Change : Reducing the Vulnerability of the Poor through Adaptation*, Working paper No. 52176 (Washington, D.C., AGRIS).
- Hein, E.; Christian, S. 2011. "Interest Rates, Distribution and Capital Accumulation -- A Post-Kaleckian Perspective on the US and Germany", in *International Review of Applied Economics*, Vol. 25, No. 6, pp. 693–723.
- Hines, J. 1995. *Taxes, Technology Transfer, and R&D by Multinational Firms*, Working paper no. 4932 (Cambridge, NBER).
- Hördahl, P. et al. 2016. *Low Long-Term Interest Rates as a Global Phenomenon*, Working paper No. 574 (Basel, BIS).
- Hughes, A. 2014. *Short-termism, impatient capital and finance for manufacturing innovation in the UK*, Centre for Business Research Working Paper, No. 457 (Cambridge, Cambridge University).
- Hyman, R. 2015. "Three Scenarios for Industrial Relations in Europe", in *International Labour Review*, Vol. 154, pp. 5-14.
- Ideal. 2016. *AI For Recruiting: A Definitive Guide For HR Professionals*. Available: <https://ideal.com/ai-recruiting/> [8 Jan. 2018].

- Independent Drivers Guild. 2017. *About the IDG*. Available: <https://drivingguild.org/about/> [1 Feb. 2018].
- IEA. 2016. *World Energy Outlook (Executive Summary)*, (Paris).
- International Labour Organisation (ILO). 2015a. *Anticipating and Matching Skills and Jobs*, (Geneva).
- . 2007. *Decent Working Conditions, Safety and Social Protection*, (Geneva).
- . 2011. *Promoting Decent Work in a Green Economy*, (Geneva).
- . 2013. *Skills Mismatches Hurt Job Creation Prospects*, (Geneva).
- . 2013b. *National Tripartite Social Dialogue: An ILO guide for improved governance*, (Geneva).
- . 2013c. *Social Dialogue*, (Geneva).
- . 2013d. *Sustainable development, decent work and green jobs*, (Geneva).
- . 2015a. *World Employment and Social Outlook. Trends*, (Geneva).
- . 2015c. *Decent Work, Green Jobs and the Sustainable Economy*, (Geneva).
- . 2016a. *ASEAN in Transformation: How Technology Is Changing Jobs and Enterprises*, (Geneva).
- . 2016b. *Women at Work Trends*, (Geneva).
- . 2016c. *World Employment and Social Outlook 2016: Trends for Youth*, (Geneva).
- . 2016d. *Technological Changes and Work in the Future: Making Technology Work for All*, (Geneva).
- . 2016e. *Non-Standard Employment around the World: Understanding Challenges, Shaping Prospects*, (Geneva).
- . 2016f. *Global Wage Report 2016/17: Wage Inequality in the Workplace*, (Geneva).
- . 2016g. *Non-Standard Employment around the World: Understanding Challenges, Shaping Prospects*, (Geneva).
- . 2017a. *World Employment Social Outlook*, (Geneva).
- . 2017b. *How Useful Is the Concept of Skills Mismatch?*, (Geneva)
- . 2017c. *Inception Report for the Global Commission on the Future of Work*, (Geneva).
- . 2017d. *World Social Protection Report*, (Geneva).
- . 2017e. *Strengthening Social Protection for the Future of Work*, (Geneva).
- . 2017f. *Synthesis Report of the National Dialogues on the Future of Work*, (Geneva).
- . Forthcoming. *Care Report*, (Geneva).

- ; OECD. 2015. *The Labour Share in G20 Economies*, (Geneva).
- ; UNDP. 2016. *Climate change and labour: Impacts of heat in the workplace*, (Geneva).
- International Monetary Fund (IMF). 2017a. “The Future of Work”, in *Finance and Development*, Vol. 54, No. 2.
- . 2017b. “Understanding the Downward Trend in Labor Income Shares”, In *World Economic Outlook: Gaining Momentum?* (Washington, DC).
- International Organisation of Employers (IOE). 2017. *Understanding the Future of Work*, (Geneva).
- Jappelli, T.; Pistaferri, L. 2010. “Does Consumption Inequality Track Income Inequality in Italy?”, in *Review of Economic Dynamics*. Vol. 13, No. 1, pp. 133–53.
- Jaumotte, F.; Buitron, C. 2015. *Inequality and Labor Market Institutions*, IMF Staff Discussion Note (New York, IMF).
- Johnston, H.; Land-Kazlauskas, C. 2018. *Organizing on-demand: Representation, voice, and collective bargaining in the gig economy*, Conditions of Work and Employment Series No. 94 (Geneva, ILO).
- Keister, L.; Aronson, B. 2017. “Immigrants in the One Percent: The National Origin of Top Wealth Owners”, in *PLOS ONE*, Vol. 12, No. 2.
- Kessler, S. 2015. *What Does A Union Look Like In The Gig Economy?*. Available: <https://www.fastcompany.com/3042081/what-does-a-union-look-like-in-the-gig-economy> [1 Feb. 2018].
- Kharas, H. 2011. *The Emerging Middle Class in Developing Countries*, (Washington, D.C, Brookings Institute).
- Kind, H.; Koethenbueger, M. 2016. *Taxation in Digital Media Markets*, Working Paper Series No. 6202 (Munich, CESifo).
- Korteweg, D.; McGonagle, T. 2012. *The Digital Dividend: Opportunities and Obstacles*, Research Paper No. 2012-11 (Amsterdam, Amsterdam Law School).
- Krauss, M. 2015. *The Inequality of Politics: Social Class Rank and Political Participation*, Working Paper No. 120-15 (California, Institute for Research on Labour and Employment).
- Kucera, D. 2017. *New automation technologies and job creation and destruction dynamics*, Employment Policy Brief (Geneva, ILO).
- Loayza, N. 2016. *Informality in the Process of Development and Growth*, Policy Research Working Paper No. 7858 (Washington, D.C, World Bank).
- Luksha, P. et al. 2015. *Atlas of Emerging Jobs*, (Moscow, Skolkovo).
- Lundgren, K. et al. 2013. “Effects of Heat Stress on Working Populations When Facing Climate Change.”, in *Industrial Health*, Vol. 51, No. 1, pp. 3–15.
- Lutz, W.; Butz, W.; Samir KC. 2014a. *World Population and Human Capital in the Twenty-First Century*, (New York, Oxford University Press).

- Magill, J.; Quinzii, P.; Jean-Charles, R. 2013. *A Critique of Shareholder Value Maximization*, Research Paper No. 13-16 (Zurich, Swiss Finance Institute).
- Mandl, I. et al. 2015. *New Forms of employment*, (Dublin, Eurofound).
- Mann, K.; Puttmann, L. 2017. *Benign Effects of Automation: New Evidence from Patent Texts*, (London, VOX).
- ManpowerGroup. 2017. *The Skills Revolution: Digitalization and Why Skills and Talent Matter*, (Geneva).
- Manyika, J. et al. 2017. *A Future That Works: Automation, Employment and Productivity*, (New York, McKinsey & Company).
- . 2017b. *Help Wanted: The Future of Work in Advanced Economies*, (New York, McKinsey & Company).
- . 2016. *Independent Work: Choice, Necessity, and the Gig Economy*, (New York, McKinsey & Company).
- . 2015. *A Labour Market That Works: Connecting Talent with Opportunity in the Digital Age*, (New York, McKinsey & Company).
- Mascherini, M. et al. 2016. *The Gender Employment Gap: Challenges and Solutions*, (Publications Office of the EU, Luxembourg).
- Matsaganis, M. et al. 2015. *Non-standard employment and access to social security benefits*, Research Note 8/2015 (Brussels, European Commission).
- Maybud, S. 2015. *Women and the Future of Work – Taking Care of the Caregivers*, (Geneva, ILO).
- McKinsey & Company. 2015. *The Four Global Forces Breaking All the Trends*, (New York).
- McKinsey Global Institute. 2016. *Technology, Jobs and the Future of Work*, Briefing Note (New York).
- McKinsey & Company. 2017. *Blockchain in insurance - opportunity or threat?*, (New York).
- Meade, J. 1935. *Outline of an economic policy for a labour government*, (London, Unwin Hyman).
- Milanovic, B. 2016. *Global Inequality. A New Approach for the Age of Globalization*, (Cambridge, Harvard University Press).
- Nadler, S. 2010. *Geographic Mismatch: Coping with Dislocation in the Global Economy*. Available: <http://ehsjournal.org/http://ehsjournal.org/scott-nadler/environmental-management-geographic-mismatch-coping-with-dislocation-in-the-global-economy/2010/> [1 Feb. 2018].
- Nubler, I. 2016. *New technologies: A jobless future or golden age of job creation?*, Research Department Working Paper No. 13 (Geneva, ILO).
- Nowak, Paul. 2015. "The Past and Future of Trade Unionism", in *Employee Relations*, Vol. 37, pp. 683-691.

- OECD. 1990. *Employer versus employee taxation: The impact on employment*, Employment Outlook, ch. 6 (Paris).
- . 2007a. *Globalisation, Jobs and Wages*, Policy Brief (Paris).
- . 2007b. *Financing Social Protection: The Employment Effect*, (Paris)
- . 2009. *The Future of International Migration to OECD Countries*, (Paris).
- . 2010a. *A Family Affair: Intergenerational Social Mobility across OECD Countries*, Economic Policy Reforms, ch. 5 (Paris).
- . 2010b. *Perspectives on Global Development 2010: Shifting Wealth*, (Paris).
- . 2011. *An Overview of Growing Income Inequalities in OECD Countries: Main Findings, Why Inequality Keeps Rising* (Paris).
- . 2014a. *Focus on Inequality and Growth*, (Paris).
- . 2014b. *Is Migration Good for the Economy?*, (Paris).
- . 2015. *Are We Getting It Right? The Importance of Assessing and Anticipating Skill Needs, Skills and Work* (Paris).
- . 2016a. *Automation and Independent Work in a Digital Economy*, (Paris)
- . 2016b. *Perspectives on Global Development 2017*, (Paris).
- . 2016c. *OECD Science, Technology and Innovation Outlook 2016*, (Paris).
- Olesinski, B. et al. 2014. *Short-Termism in Business: Causes, Mechanisms and Consequences*, (Lancy, Ernst and young).
- Orr, J.; Rosen, R. 2000. "Current Issues in Economics and Finance.", in *Current Issues in Economics and Finance*, Vol. 6, No. 5, pp. 1-6.
- Paine, T. 1975. *Agrarian Justice*, (Harmondsworth, Penguin).
- Parker, J. 2016. *Trade Unions Must Adapt to the Gig Economy in Order to Survive*, (London, Newstatesmen).
- Parsons, K. 2014. *Human Thermal Environments: The Effects of Hot, Moderate, and Cold Environments on Human Health, Comfort, and Performance*, (Florida, CRC Press).
- Pestel, N. 2014. "Employment Effects of Green Energy Policies.", in *IZA World of Labor*, pp. 1-76.
- Piketty, T. 2015. "Capital and Wealth Taxation in the 21st Century", in *National Tax Journal*, Vol. 68, No. 2, pp. 449–58.
- Piketty, T. et al. 2014. "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities", in *American Economic Journal: Economic Policy*, Vol. 6, No.1, pp. 230–71.
- Polaski, S. 2017. "Making U.S. Labor and Social Protections Fit for the 21st Century", in *RDW 2017* (Geneva).

- Pollin, R. et al. 2014. *Green Growth: A U.S. Program for Controlling Climate Change and Expanding Job Opportunities*, Energy and Environment (Washington, D.C, Centre of American Progress).
- Prodhon, G. 2017. *European Parliament Calls for Robot Law, Rejects Robot Tax*, (London, Reuters).
- PwC. 2017. *The Long-View: How Will the Global Economic Order Change by 2050?*, (London).
- Quinlan, M. 2016. *The Effects of Non-Standard Forms of Employment on Worker Health and Safety*, Conditions of Work and Employment Working Paper, No. 67 (Geneva, ILO).
- Raleigh, C.; Jordan, L.; Salehyan, I. 2008. *Assessing the Impact of Climate Change on Migration and Conflict*, Social Dimensions of Climate Change (Washington, D.C, World Bank).
- Rappaport, A. 2006. *Ten Ways to Create Shareholder Value*, (Cambridge, Harvard Business Review).
- Rechard, D. et al. 2016. *Global Trendometer: Essays on Medium- and Long-Term Global Trends*, (Brussels, European Parliament).
- Reinert, D. 2016. "The Future of OSH: A Wealth of Chances and Risks", in *Industrial Health*, Vol. 54, no. 5, pp.387-88.
- Restrepo, P. 2013. *Skill Mismatch and Structural Unemployment*, (Massachusetts, MIT).
- Reuveny, R. 2007. "Climate Change-Induced Migration and Violent Conflict", in *Political Geography, Climate Change and Conflict*, Vol. 26, No. 6, pp. 656–73.
- Robertshaw, S. et al. 2015. *The Collaborative Economy*, (Brussels, European Parliament).
- Rockefeller Foundation. 2013. *Reimagining the Future of Informality: Scenarios from the Global South*, (New York).
- Roland Berger. 2016. *The Industrie 4.0 Transition Quantified*, (Munich).
- Runge, J. 2017. *The Changing World of Work*, (London, NIESR).
- Russell Group. 2017. *Closing the STEM Skills Gap Inquiry: Russell Group Input*, (London).
- Rycroft, R. 2017. *An Economic Encyclopedia of Progress and Poverty*, (California, Greenwood).
- Sachs, J. et al. 2015. *Robots: Curse or Blessing? A Basic Framework*, NBER Working Paper Series No. 21091 (Cambridge, NBER).
- Salvatori, A. 2015. *The Anatomy of Job Polarisation in the UK*, Discussion Paper Series no. 9193 (Bonn, IZA).
- Santos, L. et al. 2011. *Novas Tecnologias E Pessoas Com Deficiências: A Informática Na Construção Da Sociedade Inclusiva?*, (Campina Grande, EDUEPB).
- Saxer, M. 2017. *The Future of Work in Asia: How Can India Create Livelihoods in the Digital Age?*, (Bonn, Friedrich-Ebert-Stiftung).
- Scheil-Adlung, X. 2016. *Health Workforce: A Global Supply Chain Approach. New Data on the Employment Effects of Health Economies in 185 Countries*, Extension of Social Security Working Paper No. 55 (Geneva, ILO).

- Schmidt, A. 2017. *Digital Labour Markets in the Platform Economy - Mapping the Political Challenges of Crowd Work and Gig Work*, (Bonn, Friedrich-Ebert-Stiftung).
- Schwab, K. 2016. *The Fourth Industrial Revolution*, (Cologny, World Economic Forum).
- Schwarz, M. et al. 2014. *The Inverting Pyramid : Pension Systems Facing Demographic Challenges in Europe and Central Asia*, (Washington, D.C., World Bank).
- Science. 2017. *Even Artificial Intelligence Can Acquire Biases against Race and Gender*, (Washington, D.C.)
- ServiceNow. 2017. *Today's State of Work: At the Breaking Point*, (California).
- Smith, A.; Anderson, J. 2014. *AI, Robotics, and the Future of Jobs*, (Washington, D.C., Pew Research Center).
- Sokas, R. 2017. "The Gig Economy and Contingent Work: An Occupational Health", in *Journal of Occupational and Environmental Medicine*, Vol. 59, No. 4, pp. 63-66.
- Solomon W. et al. 2017. "Skill Mismatch in Labor Markets", in *Research in Labor Economics*, Vol. 45, pp. 199-241.
- SPERI. 2017. *'De-Globalisation', or 're-Globalisation'?*, (Sheffield).
- Standing, G. 2013. "Why a Basic Income Is Necessary for a Right to Work", in *Basic Income Studies*, Vol. 7, No. 2, pp. 19-40.
- . 2014. "From Cash Transfers to Basic Income : An Unfolding Indian Agenda", in *The Indian Journal of Labour Economics: A Quarterly Journal of Indian Society of Labour Economics*. Vol. 57, No. 1, pp. 111-137.
- Stiglitz, J. 2015. *Rewriting the Rules of the American Economy*, (New York, W.W. Norton & Company).
- Stiglitz, J. 2016. *The Euro and its Threat to the Future of Europe*, (New York, Penguin Books).
- Sudarshan, A. et al. 2015. *The Impact Of Temperature On Productivity And Labor Supply - Evidence From Indian Manufacturing*, Discussion Papers in Economics 14-10 (Delphi, Indian Statistical Institute).
- Summers, L. 2017. *America Needs Its Unions More than Ever*, (London, Financial Times).
- Tanner, M. 2015. *The Pros and Cons of a Guaranteed National Incomes*, Policy Analysis No. 773 (Washington, D.C., CATO Institute).
- Teamsters. 2017. *Seattle For-Hire Drivers Vow to Continue Organising Efforts*, (Washington, D.C.).
- The Atlantic. 2016. *The Case for Smart Protectionism*, (Washington, D.C.).
- The Conference Board. 2017. *What Does the Coming Labor Shortage from Retiring Baby Boomers Mean for Your Company?*, (New York).
- The Economist. 2006. *The Rich, the Poor and the Growing Gap between Them*, (London).

- . 2014. *Why Globalisation May Not Reduce Inequality in Poor Countries*, (London).
- . 2015. *Why Trade Unions Are Declining*, (London).
- . 2016. *The Rise of the Superstars*, (London)
- Thiess, R. 2012. *The Future of Work: Trends and Challenges for Low-Wage Workers*, (Washington, D.C., Economic Policy Institute).
- Thompson, P. 2013. “Financialization and the Workplace: Extending and Applying the Disconnected Capitalism Thesis”, in *Work, Employment and Society*, Vol. 27, No. 3, pp. 472–88.
- 3D Hubs. 2017. *What Is 3D Printing? The Definitive Guide*, (Amsterdam).
- Totterdill, P. 2013. *The Future We Want? Work and Organisations in 2020*, (London, UK's Work and Organisation Network).
- Treasury. 2013. *Income Inequality in Australia*, (Canberra).
- Tyrone, N. 2016. *What Is the Future of Trade Unionism in Britain?*, (Vienna, Radix).
- UK Commission for Employment and Skills. 2013. *UKCES Employer Skills Survey*, (London).
- . 2014. *The Future of Work: Jobs and Skills in 2030*, (London).
- United Nations Conference on Trade and Development (UNCTAD). 2016. *Robots and Industrialization in Developing Countries*, Policy Brief No. 50 (Geneva).
- United Nations Development Programme (UNDP). 2016. *Asia-Pacific Human Development Report: Shaping the Future - How Changing Demographics Can Power Human Development*, (Geneva).
- United Nations Children's Fund (UNICEF). 2014. *Generation 2030 - Africa*, (Geneva).
- United Nations (UN). 2015. *World Population Prospects: The 2015 Revision, Key Findings and Advance Tables*, Working Paper No.241 (New York).
- United Nations High Commissioner for Refugees (UNHCR). 2015. *Global Trends Forced Displacement in 2015*, (Geneva).
- Visco, V. 2017. *Getting The Robots To Pay Tax*, (London, Social Europe)
- Wagner, D. 2017. *Deglobalization and the Rise of 'Smart' Protectionism*, (New York, Huffington Post).
- Wallace-Wells, D. 2017. *When Will the Planet Be Too Hot for Humans? Much, Much Sooner Than You Imagine*, (New York, Daily Intelligencer).
- West, D. 2015. *What Happens If Robots Take the Jobs? The Impact of Emerging Technologies on Employment and Public Policy*, (Washington, D.C., Brookings).
- Wolbring, G. 2016. “Employment, Disabled People and Robots: What Is the Narrative in the Academic Literature and Canadian Newspapers?”, in *Societies*, Vol. 6, No. 2, pp.1-16.
- World Bank. 2016. *World Development Report 2016: Digital Dividends*, (Washington, D.C.).

- ; International Monetary Fund (IMF). 2016. *Global Monitoring Report 2015/2016*, (Washington, D.C.).
- World Economic Forum (WEF). 2015a. *Deep Shift: Technology Tipping Points and Societal Impact*, (Geneva).
- . 2015b. *How can we protect workers in the gig economy?*, (Geneva).
- . 2016a. *The Future of Jobs*, (Geneva).
- . 2016b. *What Is the Future of Work?*, (Geneva).
- . 2017a. *The Global Risks Report 2017*, (Geneva).
- . 2017b. *Robot Revolution: The Economics of Automation*, (Geneva).
- . 2017. *5 Things You Need to Know about the Global Pension Crisis*, (Geneva)
- World Health Organisation (WHO). 2011. *Global Health and Ageing*, (Geneva).
- World Health Organisation (WHO). 2015. *World Report on Ageing and Health*, (Geneva).
- World Health Organisation (WHO). 2016. *Health Workforce Requirements for Universal Health Coverage and the Sustainable Development Goals*, (Geneva).
- Zhao, Z.; Zhang, K. 2006. "Multinational Corporations and Technology Transfers in Developing Countries: Evidence from China", in *International Economics*, Vol. 60, No.2, PP.249-264.