**Briefing note**

# Towards a complete jobs picture

## A new lens on labour data gaps and on automation

Stephen Gelb and Amina Khan

**Key messages**

- Little attention has been paid to the 2 billion people classified as outside the labour force, many of whom want to work.

- About two thirds of these 2 billion are women, with a disproportionately high share in the Asia-Pacific region, especially India and China, and in the group of lower middle-income countries.

- Of the 3.25 billion people in paid employment globally, close to 2 billion are men and 1.27 billion are women.

- The impact of automation is unlikely to be entirely negative: there will be job losses, though fewer than often claimed, and also new and transformed jobs as work is reorganised across most industries.

# 1 Introduction

Unemployment and underemployment are significant issues around the world. The global development community is right to be increasingly focused on creating jobs in developing countries, while the issues of job loss and job creation in industrialised countries are shaping the political environment, as the 2016 US election underlined. Jobs are crucial to achieving the Sustainable Development Goals (SDGs): job creation is the focus of Goal 8, and jobs are mentioned in several other Goals (UN, 2015).[1]

There are many issues around jobs which need further research and policy debate, including how to ensure 'decent work' for millions of workers, how to end forced and child labour, and how to raise incomes for the working poor. This briefing paper concentrates on two key areas where there are major gaps in the global debate. We highlight these to emphasise the need for much more thought and action, especially in relation to developing countries, in 2017 and beyond.

The first key area is the supply side of the labour market. The commonly used statistical standards to report on the global labour market indicate that (only) 200 million people are unemployed today. However, this is to ignore the very large group of people who are of working age but classified as 'outside the labour force', even though it is acknowledged that many of them wish to work and would work, if there were jobs for them. A disproportionate share of this group, unsurprisingly, is made up of women. The need to work of this group of people makes the challenge of job creation, and the broader challenge of meeting the SDGs, all the greater. These are challenges to which the world must respond. A response is also needed for those in 'vulnerable employment'.

The second area of focus is the demand side of the labour market, where automation – 'the rise of robots' – will, according to many commentators, accelerate job loss in industrialised countries and limit job creation in developing countries. If they are correct, we face an even greater challenge to create jobs. We argue here, though, that job losses from automation are highly unlikely to be as bad as many fear, at least in the long term, though managing the process of adjustment to new technology, and meeting the SDGs, will require careful policy to manage skills and technology systems and trade, as well as macroeconomic policy.

# 2 People outside the labour force need more attention

According to estimates from the International Labour Organization (ILO), 3.25 billion people are employed in the world today, of whom 1.68 billion (52%) are wage/salaried workers, while 1.5 billion (46%) are 'vulnerably employed', meaning they are own-account or contributing family workers.[2] 73 million people (2%) are employers. Another 200 million people are classified by the ILO as unemployed. These 200 million unemployed plus the 3.25 billion who are employed constitute the world's labour force of 3.45 billion people. The global unemployment rate is 5.8%.[3]

What is striking, though, is that the ILO estimates imply that the world's labour force is only 62.8% of the 5.49 billion people over the age of 15 – that is less than two thirds of the global working age population. Consequently, 2.04 billion people – equivalent to 37.2% of the world's working age population and 10 times the number of those unemployed – are classified as being outside the global labour force, meaning they are neither working nor looking for work (see Table 1).

We know very little about this group. In the global debate about jobs, surprisingly little attention is focused on those classified as outside the labour force in

## Table 1. The number of people of working age in the world within/outside the global labour force

| People in the global labour force (billions) | | People outside the global labour force (billions) | Number of people of working age (billions) | Share of working age population in the global labour force (employed + unemployed) | Share of working age population outside the global labour force |
|---|---|---|---|---|---|
| Employed | Unemployed | | | | |
| 3.25 | 0.2 | 2.04 | 5.49 | 62.8% | 37.2% |

*Source: ILO (2016a).*

1  SDG 8 states: 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'. Other goals that mention jobs include SDGs 2, 3, 4, 5, 9, 10 and 12. The Declaration itself mentions jobs in paragraphs 3, 9, 14, 20, 27 and 34.

2  Own-account workers and contributing family workers are added to estimate 'vulnerable employment', consisting of people who are less likely to have formal work arrangements, adequate social security or a voice at work. Wage and salaried workers together with employers constitute 'non-vulnerable employment' (ILO, 2016b).

3  200 million unemployed is 5.8% of 3.45 billion people in the labour force globally.

comparison to the two groups in the labour force, both those with jobs and those without jobs. Below, we look more closely at who these 2 billion people are, and where they are. Based on available data from the ILO, we look at their distribution by region, country status, gender and age group. Surprisingly, even the very broad-brush picture sketched here has not been put together in the context of the global jobs debate.

In its 2013 World Development Report on jobs, the World Bank (2013: 5) said only two things about this group: 'an unknown number of them are eager to have a job', and the majority of the group consists of women. The report did not discuss this group any further.

Our calculations based on ILO (2016a) show that of the 2.04 billion, 1.38 billion, or 68%, are women. Of this group, 50% (1.02 billion people) are adult women (defined as aged 25 and above), and another 0.36 billion, 18% of the whole group, are young women of working age (15 to 24-year-olds) (see Table 2).

We also looked at how this group is distributed across the world. Geographically, the largest share is in the Asia-Pacific region. In terms of countries' level of development, the largest share is in middle-income countries (MICs) rather than in low-income countries (LICs) (see Table 3 below and Tables 4 and 5 overleaf).

The Asia-Pacific region is home to about 1.16 billion, or 57%, of those outside the global labour force. India's share alone is very high, at 0.44 billion people, or 21.5% of the global total, which can be compared with its 15.1% share of the world's employed labour force. China is home to 0.33 billion people outside the labour force, 16% of the global total of this group, but China's share of the world's employed labour force is much higher at 23.7%. Even excluding these two countries, the Asia-Pacific region has 0.39 billion people outside the labour force, amounting to a 19% share of the global total of 2.04 billion people, which is still higher than all other regions.

Looking at countries by average income level (Table 5), MICs are home to nearly 1.5 billion, or 73%, of this group. Lower middle-income countries (LMICs) account for 0.85 billion, or 42% of the global total, and upper middle-income countries (UMICs) for 0.64 billion, or 31% of the global total. The LICs have roughly 90 million people classified as outside the labour force, equivalent to only 24% of their working age population, well below the global average, while 42% of the LMICs population is outside the labour force, as is 34% of the UMICs population, close to the global average. The high-income countries (HICs) also have a high proportion of their population – 39.5% – outside the labour force.

## Table 2. The number of women and men of working age within/outside the global labour force (billions of people)

| | 15-24 year olds (F) | 15-24 year olds (M) | 25 and above (F) | 25 and above (M) | World (15 and above, M and F) |
|---|---|---|---|---|---|
| Employed | 0.18 | 0.29 | 1.09 | 1.69 | 3.25 |
| Unemployed | 0.03 | 0.04 | 0.06 | 0.07 | 0.2 |
| People outside the global labour force | 0.36 | 0.28 | 1.02 | 0.37 | 2.04 |

*Source: Authors' calculations based on ILO (2016a). F = female, M = male.*

## Table 3. Regional distribution of people within/outside the global labour force (billions of people)

| | Asia-Pacific | Europe and Central Asia | North Africa | Sub-Saharan Africa | North America | Latin America and the Caribbean | Arab states | World |
|---|---|---|---|---|---|---|---|---|
| Employed | 1.91 | 0.40 | 0.07 | 0.36 | 0.17 | 0.29 | 0.05 | 3.25 |
| Unemployed | 0.09 | 0.04 | 0.01 | 0.03 | 0.01 | 0.02 | 0.0055 | 0.2 |
| People outside the global labour force | 1.16 | 0.31 | 0.08 | 0.16 | 0.11 | 0.17 | 0.05 | 2.04 |

*Source: Authors' calculations based on ILO (2016a).*

**Table 4. Distribution of people within/outside the global labour force: Asia-Pacific region (billions of people)**

| | China | India | Asia-Pacific (excluding China and India) | Asia-Pacific (including China and India) | World |
|---|---|---|---|---|---|
| Employed | 0.77 | 0.49 | 0.65 | 1.91 | 3.25 |
| Unemployed | 0.04 | 0.02 | 0.03 | 0.09 | 0.2 |
| People outside the global labour force | 0.33 | 0.44 | 0.39 | 1.16 | 2.04 |

*Source: Authors' calculations based on ILO (2016a).*

**Table 5. Distribution of people within/outside the global labour force based on country income level (billions of people)**

| | LICs | LMICs | UMICs | HICs | World |
|---|---|---|---|---|---|
| Employed | 0.27 | 1.13 | 1.19 | 0.66 | 3.25 |
| Unemployed | 0.016 | 0.062 | 0.076 | 0.046 | 0.2 |
| People outside the global labour force | 0.09 | 0.85 | 0.64 | 0.46 | 2.04 |

*Source: Authors' calculations based on ILO (2016a).*

Based on ILO (2016a) projections, we also know that the global working age population will grow by 5% between now and 2020, to reach 5.77 billion by 2020. But the number of people outside the global labour force will grow even faster, by 6%, to reach 2.16 billion by 2020. Africa's population growth will be much faster than the global average: its working age population will grow by 11.5% and its labour force by 12.4%. The growth rate in Africa of the group outside the labour force will be 9.9%, so that by 2020 there will be 0.27 billion people in Africa outside the labour force, its share then being 12.5% of the global total of this group.

As noted, existing statistical information at the global level about those outside the labour force is scant and, partly for this reason, they are not a major focus of the global debate about jobs. The good news is that in the future we are likely to learn a lot more about this group, because the ILO has belatedly started to pay attention to it. In 2013, it adopted a resolution at the 19th International Conference of Labour Statisticians (ILO, 2013) proposing an approach to measure and report how many of those currently identified as 'outside the labour force' – the 2.04 billion people – should be included in the 'potential labour force', people who express an interest in being employed, but for whom existing conditions limit active job search and/or their availability to take up a job.

The resolution proposes to measure 'labour underutilisation', which will include three groups: (i) time-related underemployment: people employed part-time but willing and available to work longer hours; (ii) unemployment: people not working but available and actively searching for jobs; and (iii) the potential labour force. The third is a new category which will include some share, as yet unknown, of people currently classified as 'outside the labour force'.

Groups included in the 'potential labour force' will be:

- 'unavailable jobseekers': those seeking employment, but not available to take it up within a specified period; or
- 'available potential jobseekers': those not seeking employment, but available for it. Discouraged jobseekers will fall into this category as not seeking employment for labour market-related reasons, such as recent job loss, the lack of available jobs, past unsuccessful job searches, the lack of experience or qualifications or jobs-matched skills, or being considered too young or too old by employers.

Another new category to be introduced into the data will include people who are 'willing non-jobseekers', those that are not seeking jobs, and are not available currently, but nonetheless want employment. These people will not be measured as part of the 'potential labour force' or 'labour underutilisation', but will be considered 'outside the labour force', and distinct to those who are not seeking jobs and do not want employment.

This advance in the collection and processing of the labour force data will help policy-makers to understand the true dimensions of the jobs challenge, by shedding more light than is currently possible on who and how many in the 2 billion are part of that challenge. Hopefully, the ILO statisticians, and those in individual countries who work with them, will start publishing their new data very soon.

## 3 Vulnerable workers need more attention

Of the 3.25 billion people in paid employment globally, close to 2 billion are men, but only 1.27 billion are women, the gender split being three men working for every two women. A similar proportion of the 1.68 billion wage/salaried workers, 61%, is made up of men, while over 80% of the 73 million employers are men (see Table 6). These ratios are striking, given that the global working age population of 5.49 billion is split evenly between the two sexes.

Vulnerable employment – the share of own-account work and contributing family employment subject to high levels of precariousness – accounts for 1.5 billion people, or over 46% of total global employment (see Table 7 overleaf ). As well as having limited access to contributory social protection schemes, vulnerable workers have low productivity and low and highly volatile earnings (ILO, 2016c). Most people in vulnerable employment, about 1.23 billion or 82%, are found in MICs.

The Asia-Pacific region has about 1.06 billion or 71% of the world's vulnerable workers (Table 7). China and India alone have 0.35 billion and 0.38 billion vulnerable workers, 23.3% and 25.3% of the global total respectively.

## 4 Discussions on automation often miss the point

We turn now to the demand side of the labour market, and the potential for job creation. Can enough jobs be created to provide for those currently excluded from the labour market, as well as the large numbers who will reach working age, over the next 15 years or so, the time horizon of the SDGs? For many commentators not only is extensive job creation unlikely, but a large share of existing jobs has either already disappeared or will do so soon, as a result of automation in the production of goods and services. Books abound with titles like *Rise of the robots* (Ford, 2015) and *Race against the machine* (McAfee and Brynjolfsson, 2011), as do media stories along the lines of 'Welcome to a world without work' (Avent, 2016) or 'Driverless cars will change everything' (Kuper, 2016).

The apparent threat of the disappearance of jobs, especially low-skill jobs in formal enterprises, is seen as a problem in both industrialised and developing countries. But, if it happens, it poses particular problems for developing countries, where apart from China, formal sector industrial scale activities in manufacturing and high-productivity services already provide only a limited share of output and, as importantly, of employment. This has prompted analyses of 'premature' deindustrialisation as the employment share of manufacturing is argued to be declining in LICs and MICs, hampering their future growth. If low-skill formal jobs were to disappear across the world, the material well-being of growing shares of populations would depend increasingly on household enterprises and family farms – informal activities with low income security and low productivity growth potential.

Social panic about the disappearance of the need for human work has frequently been associated with industrial technology advance in the past, the best-known example being the Luddite movement in nineteenth-century England, which resorted to smashing machinery in a futile effort to discourage factory owners from installing them. But the Luddites were artisans, the high-skill workers of their day, and feared being replaced by lower-skill workers. In fact, overall employment rose strongly

**Table 6. Men and women in vulnerable and non-vulnerable employment (billions of people)**

|  |  | Men | Women | World |
|---|---|---|---|---|
| Wage/salaried workers |  | 1.02 | 0.66 | 1.68 |
| Employers |  | 0.06 | 0.01 | 0.07 |
| Vulnerably employed | Own-account workers | 0.78 | 0.39 | 1.17 |
|  | Contributing family workers | 0.12 | 0.21 | 0.33 |
| Total in employment |  | 1.98 | 1.27 | 3.25 |
| Total working age population |  | 2.75 | 2.74 | 5.49 |

*Source: Authors' calculations based on ILO (2016a).*

**Table 7. Regional distribution of people in vulnerable and non-vulnerable employment (billions of people)**

| | | Asia-Pacific | Europe and Central Asia | North Africa | Sub-Saharan Africa | North America | Latin America and the Caribbean | Arab states | World |
|---|---|---|---|---|---|---|---|---|---|
| Wage/salaried workers | | 0.83 | 0.33 | 0.04 | 0.10 | 0.15 | 0.19 | 0.04 | 1.68 |
| Employers | | 0.02 | 0.01 | 0.005 | 0.01 | 0.01 | 0.01 | 0.0014 | 0.07 |
| Vulnerably employed | Own-account workers | 0.85 | 0.05 | 0.015 | 0.16 | 0.01 | 0.08 | 0.007 | 1.17 |
| | Contributing family workers | 0.21 | 0.01 | 0.007 | 0.09 | 0.00016 | 0.0144 | 0.0013 | 0.33 |
| Total in employment | | 1.91 | 0.4 | 0.07 | 0.36 | 0.17 | 0.29 | 0.05 | 3.25 |

Source: Authors' calculations based on ILO (2016a).

in the long term, as also happened with later spurts of technological advance.

But is this time different? Today the anxiety is that low-skill workers are being replaced by machines, leading to much higher unemployment rates as low-skill jobs disappear. This has produced metaphors purporting to shape policy, such as 'the race' between skills and technology. But there is surprisingly little in-depth research on automation's potential impact. A single study of the US labour market conducted at Oxford University seems to be most commonly cited; it showed alarming results, concluding that 47% of total US jobs are at high risk of automatibility 'over the next decade or two' (Frey and Osborne, 2013). Later work at the World Bank applied the same methodology to the Organisation for Economic Co-operation and Development (OECD) countries, estimating 57% average job loss, and to a set of 41 developing countries – apparently the only study as yet to look at the latter – concluding that the share of jobs at high risk of being lost to automation ranged between 55% (Uzbekistan) and 85% (Ethiopia), with China at 77% and India at 69% (World Bank, 2016; Citi GPS, 2016).

These researchers classified occupations according to their risk of disappearance, based on the task-content of the occupations. They argue that, because machines are now capable of learning, the automation of non-routine cognitive tasks is possible, while robots will replace manual tasks, leaving only a limited range of tasks to be done by people, due to those tasks requiring perception and manipulation of differentiated objects, or requiring a sense of touch ('tactile feedback'), or requiring social or creative intelligence. They call these tasks 'engineering bottlenecks'. Based on the occupational distribution of the current labour force, they then predicted that many occupations would disappear, leading to high employment losses.

These results and the underlying method have been strongly criticised by the OECD, whose own analysis gives much more moderate results for job losses: only 9% of all US jobs are seen as being at high risk of automation (over the same one- to two-decade time span). Extending the analysis to the rest of the OECD, the same average of 9% of all jobs was identified as at risk, but with significant cross-country differences in vulnerability to automation, from 6% in Korea and Estonia to 12% in Germany and Austria (Arntz et al., 2016). The variations reflect cross-country differences in workplace organisation and job content, as well as differences in national systems for skills development, and for technology and innovation. This is unsurprising, and will apply to developing countries, too. Both the OECD and Oxford figures are cited in a very recent White House report, which also points out that the 'churn' (the turnover of people in the labour market, equivalent to the total number of job openings, hirings and separations) in the US labour market *each quarter* amounts to 6% of employment, which suggests that the 9% expected US job loss over the long term is a manageable adjustment level for the labour market (Executive Office of the President, 2016).

The OECD analysis used the same assessment of tasks at risk of automation as the Oxford/World Bank

methodology, but criticises the latter for not distinguishing between occupations and jobs, and assuming implicitly that occupations, and therefore also jobs, are composed of a fixed set of tasks. This is not merely a technical point: a clearer understanding of the differences between tasks, jobs and occupations (all determined by interactions between technology and social factors, not only by the former) allows for the possibility that automation of a task can have different effects on jobs, even within the same occupation. Within a country, jobs within an occupation may differ significantly in terms of their task-content, while across countries the task-content of jobs in the same occupations differs significantly. In other words, the social and cultural contexts are crucial aspects of the definition of jobs and occupations. These, in turn, shape the potential impact of automation. The OECD research concludes that 'information on task-usage at the individual level leads to significantly lower estimates of jobs "at risk", since workers in occupations with high automatibilities [that is, occupations which are more easily automated according to the Oxford study's methodology] nevertheless often perform tasks which are hard to automate', so that the occupation, or at least the job, is in fact *not* easy to automate (Arntz et al., 2016: 15).

The more modest results in the OECD study, and much other research,[4] should not be taken to mean that automation can be dismissed as unimportant, but that our attention should be not so much on whether jobs will vanish, as on how jobs, and the incomes they provide, will *adjust* to changing realities and new technologies. Focusing on the variable task-content of jobs also puts emphasis on complementarities between machines and people, an aspect which is seriously underplayed in popular and media discussions at the expense of overemphasis on machines' labour substitution effects (Autor, 2015a). As mentioned above, some tasks cannot be automated – such as those which involve a high level of 'tacit' knowledge which is difficult to codify and thus to programme. Machines and people need to work together, and the machinery raises the productivity of the tasks which are tacit-knowledge intensive. The introduction of machines leads to shifts in the organisation of work and work activities, including changes in the task-content of many jobs. Some tasks are now performed by machines, but at the same time new tasks, including routine and manual tasks, emerge as a result of the machines. These may require tacit knowledge and, therefore, human execution. Thus, machines eliminate some jobs and occupations, change the task-content of many jobs and occupations, and spur the emergence of new jobs and new occupations.

An increasing number of case studies provide examples of the complementary impact of automation in creating low-skill jobs. A frequently-cited example is the use of human 'pickers' by Amazon in collaboration with its Kiva robotics system in its warehouses. Another is the use by Netflix of people to classify and categorise its film and video offerings, or the use by the 'Alldone' online market platform in the US to prepare marketing text for their business services customers (Tett, 2016, drawing on Shestakofsky, 2015).

Complementarity leads to the simultaneous growth of low-skill and high-skill work, what Autor (2015a; 2015b) refers to as 'employment polarisation'. As this suggests, many middle-skill jobs have proved to be more at risk of automation, and this has led to job losses in industrialised countries. But the changing task-content of middle-skill jobs means that this risk may also be overstated, at least in the longer term: 'While many middle-skill tasks are susceptible to automation, many middle-skill jobs demand a mixture of tasks from across the skill spectrum' (Autor, 2015a: 164).

Employment polarisation underlines the importance of costs to automation. The very high Oxford/World Bank estimates of the risk of job loss take account, surprisingly, only of technological possibilities without considering wages or capital costs. As is well-known, many middle-skill tasks have been shifted – via outsourcing and offshoring using new digital technologies – from high-wage to lower wage locations in developing countries, what former World Bank Chief Economist Kaushik Basu calls 'labour-linking technology' (Basu, 2016). The jobs are lost in their original location, but not to the world. These jobs in developing countries generally have low wages, poor working conditions and limited job security, similar features to the low-skill jobs which remain in industrialised countries. But the implications for poverty reduction, distributional equality and productivity growth are often positive in the developing countries, while negative in the latter.

On the one hand, as case studies show, automation leads to outsourcing of complementary low-skill jobs to offshore low-wage locations, while on the other hand, the low costs of production of some activities where outsourcing is already extensive may make automation of many jobs a less profitable alternative. Garments and footwear, for example, are largely assembled in developing countries, and the automation of many assembly tasks is difficult and still costly, because the process requires human characteristics like dexterity and tactile feedback. Thus, assembly in these sectors is likely to remain in low wage-cost locations, employing many people at low wages, even if some specific tasks within the assembly process could become automated in those countries, raising productivity and growth.

The extent of job loss from automation will also be affected by the pace of diffusion of automation, which is likely to be slow in many sectors. The vast majority of robots currently used in production are found in two sectors – the automotive industry, and electrical and electronic equipment (UNCTAD, 2016) – in which products consist of modular components made from

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4   For example, Graetz and Michaels (2015) used data for 1993-2007 and found that for industrialised countries increasing robot use raised GDP growth, productivity and wages, but had no effect on overall employment, though low-skilled and some middle-skilled workers lost jobs.

metal, plastic or other 'hard' materials, which allow routine manual tasks to be carried out more easily by machines. And the pace of diffusion of robots across countries is also low, with China – the world's largest manufacturer – being the only rapid adopter amongst developing countries. Even in industrialised countries, the 'rise of the robots' is much slower than may be inferred from the levels of social anxiety – there is a well-substantiated 'innovation pessimism' argument which suggests that the limited progress of automation thus far is holding back economic growth in industrialised countries (Gordon, 2016; Erixon and Weigel, 2016). In the current global growth environment, increasingly recognised as 'secular stagnation' and characterised by low 'animal spirits' among private firms, the rate of investment in new machinery – and hence the progress of automation – is unlikely to pick up in a sustained manner, short of extensive public sector intervention. And, in any event, more rapid automation is not necessarily a good thing even for growth. Graetz and Michaels (2015) found, interestingly, a 'congestion' effect whereby increasing the number of robots led to diminishing increases of output growth and productivity at the aggregate sector level.

In sum, there are a number of reasons to conclude that the jury is still very much out regarding the extent of aggregate job loss resulting from the 'rise of the robots' and automation in general. What is not in question is that the impact will involve a long-term adjustment, with significant costs for workers in both industrialised and developing countries. As a result of this adjustment, which has already begun, income inequality will increase. But it seems wrong to think of the situation as a 'race' between skills and technology, as that seems to suggest that low-skill jobs will be redundant, rather than there being a spectrum of skill categories.

Policy intervention will be necessary, such as labour market adjustment policies to support workers whose job (or the task-content of their job) is changing, and to adapt, expand and upgrade systems for skills development for people entering the labour force. There will be a need for innovation and technology development, for information and communications technology (ICT) connectivity and

for goods and services 'connectivity' (in other words, trade facilitation). This is nothing new – policy in these arenas has always been needed to address technological change, even if it has not always been formulated and implemented. It is especially necessary in those developing countries which are better able to achieve system improvements in these areas and so are more likely to benefit in net terms from automation.

## 5 Conclusion

Global economic growth would offer a much more favourable environment for meeting the SDG job creation challenge, and in particular bringing into employment many of the 2 billion people discussed in the first section of this brief, currently classified as outside the global labour force, but who need and want jobs.

But the outlook for sustained growth recovery in the global economy is grim, and the current political situation is very uncertain. There is some prospect of a stimulus via rising public investment in the US once the new administration is in place. However, even if it happens, its growth impact is likely to be uneven. Meanwhile, other US policy shifts, in international trade for example, may lead to uncertainty and growth decline at the global level in the short run.

Whatever the future path for global growth, this briefing paper has emphasised the significant gaps around two major issues in the picture of the demand for and the supply of jobs, both now and into the future. Much more research and debate is needed on these two major issues and on the overall jobs challenge.

Adjustment to automation would be far easier if the world economy were growing, which it has not done in a sustained way since the global financial crisis of 2008. It is unlikely that automation and the diffusion of robots on their own can lead to sustained economic growth over a number of years; that will require a more directed stimulus to investment in the world's leading economies.[5] But automation is unlikely to produce only job losses or obstruct job creation because, as in earlier spurts of technological advance, the labour market is likely to be reorganised rather than devastated.

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5  China is undertaking an active policy to install robots (UNCTAD, 2016), but it is unlikely that this investment drive will be sufficient to lead a global growth recovery.

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