

# AI and future skills in the labour market

Aging populations and skills-mismatch  
may accelerate the automation of work

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The past provides *some* guidance on how to handle the effects of technological change on society and the labour market. The question is how much. During the Industrial Revolution, some skilled workers lost their jobs as factories were built and machines gradually came into use. This was a period of rapid and tumultuous change in society. It was also a time of significant urbanisation, as the young and able departed from the regions to find better lives and opportunities in the cities. It was not inevitable, but the social changes thrust upon people led to new ways to organize work and to lessen the risks to which individuals were exposed: The establishment of trade unions, the introduction of suffrage for both men and women, the right to a pension and social security, to name a few. New institutions and safety nets were part of a process towards safer and more inclusive democracies and societies.

One lesson from the past is thus that societies may eventually find ways to respond to changes – be they from technology or some other source. However, this may be scant comfort for those who find themselves in the midst of a major change, as the adjustment period often measures in decades rather than in years. What is more, citizens in modern welfare states also have strong expectations that the current levels of welfare will not only continue but also follow general increases found elsewhere in private production. For example, when the private sector offers interactive services online via web-pages, we soon expect the public sector to provide similarly.

With the institutions that have been developed after the Industrial Revolution, we are now better able to cope with the effects of technology on people's lives. However, the lessons from the past serve as a rough guide and each period has its own set of challenges without a delineated answer

from the past. Looking ahead, we cannot know if the labour market adjustment from digitalization will be harsher than in the last few decades. On the technology side, a particular unknowable is when the next breakthrough in AI (artificial intelligence) will be made.

So-called narrow AI already exists, for example, chess computers that can beat the best human players. However, AI-researchers have widely different opinions about when we will see so-called general artificial intelligence, that is computers able to tackle a wide range of problems and to self-learn. In the book *Life 3.0* by Max Tegmark, for example, some AI-researchers believe the breakthrough will come soon, within the next decades, while others that it will take at least another century if it comes at all.

I think here it is essential to distinguish between technical breakthroughs per se and the societal impact of the many steps that precede and those that follow. When computers win against humans in various games or well-defined intellectual tasks, this typically conveys fervent symbolic value, that may result in newspaper headlines. However, we know from the past that changes typically take a long time to be fully implemented. For instance, according to work by economists Comin and Mestieri Ferrer, it took on average about half-a-century for a large number of countries to adopt electricity in the 19th century.

Even as the time to adopt a technology continually shrinks, it still takes time for societies to use and fully benefit from new inventions. During this time, a myriad of small changes take place that affect people in a variety of ways. A concrete example is that of a firm considering whether or not to hire additional workers and what skills it should prioritize. If a new technology is on the

horizon, the firm may even refrain from a recruitment altogether or to consider a different skill set compared to what existing employees have. An industrial worker in the past might, for example, be required to maintain a machine whereas a new worker might be expected to also be able to update the software that guides the robot.

Whether it is the question of automation or narrow AI advancements, the impact on human labour is often ultimately about what level of skills that are required and if people can climb the skill ladder as demands evolve, change or shift.

### What do we know about labour market effects from technology?

Ever since the infamous Luddites destroyed machines some hundreds of years ago, the effect of technology has been hotly contested. In the popular zeitgeist, fears of job automation have resurfaced with some studies predicting that half of all jobs will be automated within the next two decades.

Though there have always been winners and losers from technological change, by and large, societies have become more affluent, bad jobs have become fewer and life-expectancies have mostly increased.

There is a fair consensus among economists that technical change has led to:

- Favourable development for those with high levels of skills (so-called skill-biased technical change).
- Labour market polarization through a declining middle class and increased shares of low- and high skilled work.
- And stagnant wage growth in some countries during the most recent decades.

Thus, the distribution of income (and wealth) has been favourable to some groups, but the fear that robots replace humans has so far *not* materialised.

Indeed, a simple look at recent data shows that jobs are not disappearing. From Figure 1, it can be seen that employment levels in OECD countries between 2005 and 2017 have even increased somewhat. This period covered the Great Recession when many workers became unemployed, but new jobs were also created. Despite experiencing a financial crisis in the economy as a whole, employment levels remain steady or even above pre-crisis levels.

That is not to imply the absence of economic hardship on the populations. With stagnant

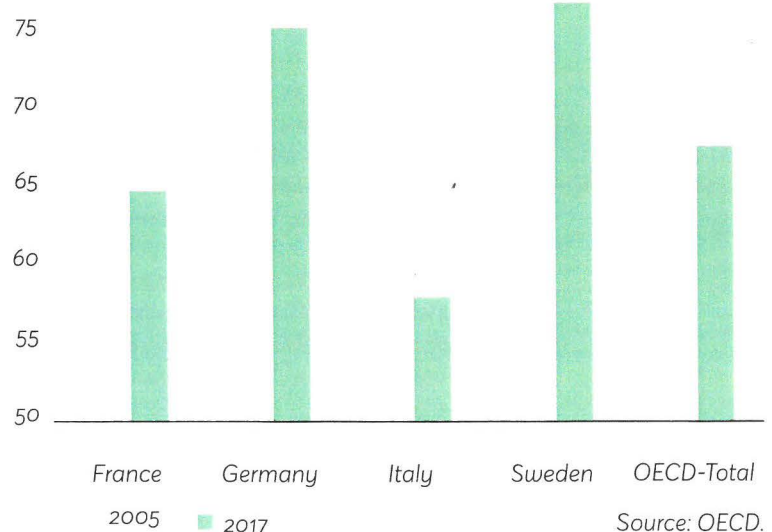
wages and job polarization, income inequality has risen and may in part have contributed to political polarization in many countries.

### Skills mismatch and aging societies

Focusing on the effects of technology on the labour market from the past decades already bring out some lessons for the future. For one, modern labour markets have a high capacity for change and new jobs are continually being created. The challenge is that the skill set required for new jobs may be lacking among those already in the labour market, especially if the technological shift is quick and wide.

In the past, many jobs were shredded in industry and manufacturing with the advent of robots and automation, but today's digital platforms are increasingly also transforming a broad set of service sector jobs. Jobs requiring versatility tend to be less affected, but tasks that are repeated in predictable ways are increasingly subject to automation, all from low to high-skilled jobs. Often intermediary services, as exemplified by the 'middle' man or woman, are increasingly exposed to automation. Due to firms' incentives to improve efficiency and reduce costs, intermediary services tend to be automated whenever possible, for example as with travel consultants, back-office

Employment levels in selected OECD countries, age 18–64, percent. (Figure 1)



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and administrative functions. However, also legal services could be affected, as some work on contracts may also follow predictable patterns and can become more standardised. Though it has not happened yet to a significant extent, block-chain technologies may also lessen the need for today's system of legal arbitration.

Reducing costs is one driver for automation. Another often overlooked force driving automation is the change in demography and the declining share of the working population compared to those in retirement. As large cohorts of older workers retire, finding new workers is becoming difficult in some sectors. For some firms, increased automation is part of the answer to the dearth of skilled workers. In Japan, with the oldest population in the world, robots are being introduced to help with activities in the care of the elderly. For example, the robot *Pepper* is used to lead various social and physical activities.

Economists would typically predict that a lack of workers would cause wages to increase, but this has not yet happened in Japan – and not in many other countries either. While superstars and those with highly sought-after skills, such as AI-programmers, can demand large wage-premiums, stagnant wages are still not unusual even in areas where there is a lack of skilled workers. This wage development presents a bit of a paradox to economists.

One explanation could be that there is now a relatively large supply of unskilled workers who can wield some of the machines and thus compete with those with middle-level skills. This is what

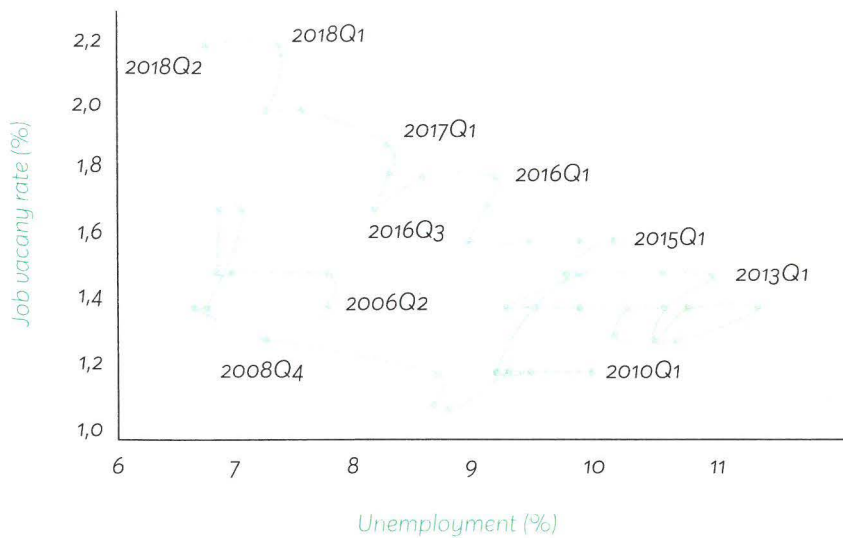
happened during the Industrial Revolution. It has also to some extent occurred in the USA (“the college-educated barista”) but appears to be rarer in Europe.

Another explanation is that automation and outsourcing may lower the relative power of workers in wage-bargaining vis-à-vis employers. A developer for mobile apps in Stockholm, Paris or Berlin is not only competing against his or her peers in the same city; instead, the competition is with similarly skilled freelancers *worldwide*, such as in the Ukraine, India or Sri Lanka. For example, through the platform *Upwork*, millions of workers are available from around the world, who are ready to perform small or large tasks at a fraction of European wages. An additional factor is that the tax rates on labour in non-OECD countries tends to be lower and also harder to enforce, as transactions on the platforms are not visible to others.

It is seldom the case that a whole job can be outsourced to such a platform due to a range of practical issues, language barriers and such. However, what matters is that it may be harder for workers to achieve the same wage growth as in the past, especially as productivity growth has been anaemic in OECD countries since the beginning of the millennium. Indeed, the International Monetary Fund showed in its World Economic Outlook in October 2017, that wage growth has been stagnant in most advanced economies at least since the beginning of 2000.

Stagnant wage growth could be a symptom that it is difficult for workers to keep up with the pace of technological change. There is no consensus on

## The Beveridge curve shows increasing mismatch between available jobs and the unemployed, European Union, 2006Q2–2018Q2. (Figure 2)



Source: Eurostat. Note: The closer to the lower left-hand side corner, the better is the match between available jobs and job-seekers. Each point in the figure represents one particular date with unemployment and job vacancies.

the underlying causes for this development or how long it will persist. What we know is that mismatch in the labour market has increased in recent years. Figure 2 displays the so-called Beveridge curve for the European Union that depicts the share of vacant jobs and unemployment. From about 2008, unemployment began to increase (during the financial crisis) and deteriorated for about half-a-decade. When the labour market subsequently recovered, the matching of available jobs to job seekers did not return to its pre-crisis level. As can be seen from the figure, the job vacancy rate is almost twice as high in 2018 compared to the late 2000s. One probable explanation is that the financial crisis had a long-lasting effect on the employability of some job-seekers, especially those that had been out of work for a long time. But rising demands for skill-levels and weakened bargaining power of labour may also have contributed.

### AI and skills for the future?

It is hard to say what the impact of general AI would be on the labour market, though it would not be unreasonable to suspect that the effects could be rather severe. If we instead consider advances in automation and narrow AI, the recent decades' experiences of labour market adjustment are likely to offer more insight.

Let us consider medicine as an example, where so-called neural networks and deep learning have successfully been used to detect various forms of cancer. By scanning thousands of images, the computer can compare an established diagnosis with data extracted from the patient's pictures. Research shows that the neural network is as good – and sometimes better than specialist doctors at detecting

the most common as well as the deadliest form of skin cancer. The same has been found for some other cancers as well as eye-diseases.

Fields of medicine that require large amounts of data and that rely on predictable patterns are likely to be most susceptible to advances in neural networks. General medical diagnosis may also someday routinely be made by AI. The app Babylon in the UK is already taking the first steps and is now being used.

Although the robots are not replacing doctors any time soon, even highly skilled specialists may need to upgrade their skills or eventually see themselves surpassed by the computer. Those who do not upgrade their skills may risk facing dimmer wage prospects as the computers become better in an increasing number of areas. The process may take time, but it is already underway.

In some cases, the skills needed may be quite clear. In other cases, it may be quite thorny and it may even become necessary to switch into another area of work altogether. Many EU countries already spend large sums of money on adult learning and education, so the problem is not in the first instance a question of more money, but how to put existing funds to better use. In recent surveys, more than half of the working populations in the EU express the fear that their digital skills are too low to change jobs. However, as evidenced from the increased mismatch between job seekers and vacancies, knowing what areas to study is absolutely vital. Other social policies may also be needed, but the most significant one remains helping workers acquire the right skills, and to shift in time, before it becomes much harder. ■