

41. Inequality in an increasingly automated world

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Technological advances are changing the way we live, work, spend and interact, with profound consequences for inequality.

77 per cent of existing jobs in China are susceptible to automation. Such was the conclusion of a 2016 World Bank *World Development Report*, which also found that 47 per cent of US jobs, 69 per cent of Indian jobs and an average of 57 per cent of jobs in OECD countries could be replaced by automated processes and robots.

While the debate about workers being replaced by machines is certainly not new, the accelerating pace and scope of technological change has led to claims that we have entered the 'Second Machine Age' (Brynjolfsson and McAfee, 2014). The 'Fourth Industrial Revolution'¹ is one in which technological advances are changing the way we live, work, spend and interact.

The rise of algorithms

The trend for technological change to replace routine manufacturing tasks and low-skilled jobs looks set to continue, and technological advances are also making it possible to automate a greater number of non-routine tasks. Advances in machine learning technology, coupled with increasingly available big data, could replace knowledge-intensive roles in sectors such as business and health care in the first half of the twenty-first century. Some estimate that machine learning algorithms could displace 140 million knowledge workers globally (McKinsey Global Institute, 2013), further contributing to a 'hollowing-out' of middle-income jobs (Frey and Osborne, 2013) and to growing polarization of the labour market. Added to this is the increasing availability of improved data-collecting sensors. These support mobile robotic development for use in a wide variety of settings, from elderly care to driverless cars and surgical robots.

Potential job losses in low and middle-income sectors, and the barriers to retraining and relocating workforces to suit the demands of new technology, mean that automation may generate unemployment and deepen existing economic and knowledge inequalities. In addition, automation may mean that wages continue to stagnate or even fall, meaning that the number of low-paid workers increases.

Increasing inequalities, diverging trends

While technological advances will shape employment opportunities and growth in future years, exactly what those advances look like and where they will happen is shaped by existing and future differences in labour and development patterns. Those without access to technological advances risk being left behind, and greater automation in the workplace without a corresponding rise in workers' skill levels risks increasing inequality. If productivity gains brought about by increased process efficiency do not occur in tandem with the creation of new jobs or with increased compensation for a broad spectrum of the workforce, they risk creating exclusion, reduction in demand and economic stagnation. Yet automation entails not only innovation in the development of existing products, but also the development of entirely new products and ways of working, and thus the creation of new jobs.

Ever since the Industrial Revolution, technological change has been an engine of income growth in developed countries. In more recent years there has been some convergence in how quickly countries worldwide adopt new technologies, but once those technologies have been taken up by a minority of users ('early adopters'), there is a divergence in how long they take to become widely used by large numbers of the population.

To see this latency in technology adoption as a reflection of widening income inequalities within countries may be a leap too far, but the present technological revolution is likely to make economic growth increasingly uneven, a worrying perspective for global inequality.

If the Industrial Revolution formed the building blocks of sustained growth in the developed world, more recent industrialization has allowed a number of emerging economies, particularly the so-called 'Asian tigers', to catch up rapidly. At the same time inequality declined, although this trend has reversed more recently in several of the countries, with the rich getting richer considerably faster than the poor. As technology advances, emerging market economies will need to keep pace with innovation in order to stay competitive.

Likewise, the rate of automation in manufacturing industries is contributing to concern over 'premature deindustrialization' in low-income countries, where jobs are relatively vulnerable to automation. An estimated 85 per cent per cent of jobs in Ethiopia could be automated (World Bank, 2016). Industrial automation also provides an increasingly cheap substitute for labour, meaning that low-wage countries may lose their cost advantage over time. As a result, companies in advanced economies may shift production to automated factories, or move manufacturing to 3D printing facilities located closer to their domestic markets. Furthermore, technological advances mean that industrialization is less likely to create jobs in manufacturing in the next generation of emerging economies. Low-income countries will no longer be able to follow the rapid growth trajectories that China has achieved by shifting workers from farms to higher-paying factory jobs. If export-led manufacturing growth is limited by technology-facilitated 'onshoring', and the automation of low-skill services means that service-led growth is limited, new models of growth will need to be found to ensure sustainable development in the world's poorest countries.

At a more local level, new product and process innovations have the potential to transform regions and cities. However, new jobs often emerge in different places from the ones in which old jobs disappear. This could cause uneven development and exacerbate regional inequalities.

The new jobs created by new technology will require highly skilled workers and computational literacy, while in some cases reducing demand for low-skilled workers. In the digital age, a focus on income-generating growth driven by access to data and connected devices (the 'internet of things') may deepen existing digital divides.

Where will workers hold the comparative advantage?

Frey and Osborne (2013) identify three human characteristics that currently appear difficult to automate: creative intelligence, involving the development of original ideas; social intelligence, relying on social interaction; and perception and manipulation, requiring manual dexterity and interaction with unstructured physical environments. Yet the rapid development of robotic technology and the potential of embodied artificial intelligence – based on an understanding of living organisms – may pose a challenge to at least two of these categories.

The knowledge-driven economy in a world of knowledge divides

One of the most commonly cited policy responses to automation is increasing innovation and upskilling of the workforce. However, ensuring that education systems produce the right mix of skills to respond to such a rapidly changing environment will remain a challenge.

With the pace of technological change now much faster than at any time in history, the future implications for life and work are far from certain. The advent of artificial intelligence and quantum computing to solve complex problems could create untold changes for the labour market.

Yet with prominent scientist Steven Hawking warning that the development of artificial intelligence 'could spell the end of the human race' (quoted in Cellan-Jones, 2014), and Google's director of engineering, Ray Kurzweil, stating that humans will have become immortal 'hybrids'² by 2030, perhaps it's not unrealistic to say that the future of inequality lies far beyond the scope of human understanding.

Notes

1. The focus of the 2016 World Economic Forum.
2. Speaking at the Exponential Finance conference in New York, 3 June 2015.

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