Preparing for the age of the robots

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Around 50 years ago the coal mines in Limburg, Netherlands closed. The then Prime-Minister, Den Uyl, promised that all 45,000 local mining jobs would be replaced by others. Two years later, Dutch car manufacturer DAF opened a factory offering employment to former mine workers. But as the Dutch car industry struggled to keep up with its German and French rivals, the national government had to intervene in the 1990s and early 2000s to cover its financial difficulties. The pace of automation in the industry, off-shoring to low-cost countries and the facility's relatively small scale were blamed for the "death" of Dutch car industry. These developments were symptomatic of wider trends in European manufacturing. In 2014, a Dutch entrepreneur purchased the factory for two euros.

In his 1995 book "The End of Work", Jeremy Rifkin predicted the end of blue collar workers by half-way the current century.[1] Increasingly, robots can replace workers, even highly skilled professionals. At Cedefop's conference "Maximising skills for jobs and jobs for skills",[2] Richard Freeman explained that any sort of machinery from computers to artificial intelligence programmes may provide a good substitute for human workers.

Robotisation or automation are not new. New technologies have frequently and rapidly changed the shape and profile of the labour market throughout the 20th century. New technologies contribute to productivity. And while technological change tends to come at the expense of jobs in the very short run, the consensus among economists was that the indirect effects of higher productivity would benefit household income.

But recent research has challenged this consensus. For example, Brynjolfsson & McAfee (2014),[3] Rifkin (2014),[4] Krugman (2014)[5] and Cowan (2010)[6] highlight the rapid replacement of labour by machines and extensive automation. On the other hand, technology optimists, such as Miller & Atkinson (2013)[7] and Bessen argue that indirect effects of productivity growth may eventually boost demand. Bessen[8] cites, as an example, bank tellers who should have given way to cash machines and cashiers who should have surrendered to code scanners. But, in fact, there appeared to be more bank tellers and cashiers in 2009 than in 1999. The reason, he argues: demand for their products and services had increased[9].

Who wants to be a hotel manager?

Perhaps the more pertinent question is not how the increase in automation will affect the *total* demand for labour, but how it will affect the demand for *different job types and skills profiles* in the labour force. Bank tellers may not be fewer, but code scanners have inarguably changed the nature of their job and

led to the redeployment of their skills. So what makes a job susceptible to automation?

Autor, Levy and Murnane (2003),[10] conclude that computerisation can replace cognitive and manual tasks which are reducible to a series of basic rules and instructions – such as accounting, data processing and administration. Meanwhile, the consequent rise in productivity by the same trend may *complement* workers undertaking 'non-routine problem-solving and complex communications tasks', who benefit from the increased information flows and to manage increasingly complex machine systems and networks.

Building on this, Frey and Osborne (2013)[11] estimated the likelihood of jobs in the modern workforce being automated over the next two decades in the US. Top of the list are telephone salespersons, with a 99% chance of being replaced. Roles relying heavily on people skills such as teachers (0.7%) or hotel and bar managers (0.4%) carry very little risk of imminent automation. However, artificial intelligence has already reached a level that it can replace, even if only partially, some white collar, highly skilled jobs (e.g. lawyers, accountants), as stressed by Harvard Professor Richard Freeman.

Europe in the age of robots

Applying these trends to Europe, Brussels think-tank *Bruegel* estimates that around 54% of European jobs[12] could be at risk of automation, ranging from a low of 47% in Sweden to a high of 62% in Romania. All things being equal, employment demand may not decline due to technological change; but the nature of jobs and skill sets demanded by employers may change significantly.

The policy implications seem clear: provide workers with skills less susceptible to replacement by machines. Drawing lessons from Autor et al. (2003), this suggests that education policy should focus on those social and creative skills that complement the value added of new technologies.

But the question is how? Such skills do not lend themselves to being learned in the classroom and many people who need to learn to manage technological change left school long ago. Further, the jobs at risk of automation are not determined by skill level. In Limburg, the car factory returned in November 2015[13], with 900 robots and 850 employees. Another 1,000 employees may be taken on in the coming years. While there is no lack of qualified personnel at the moment, the company foresees a shortage of skilled workers in a few years.

So trends may be readily observable, but their implications are not yet fully clear. To better inform and enable policy decisions, we need to know more about the experiences of people and enterprises about how to develop, use and adapt skills in this new technological age. Fast-paced technological developments and their penetration in all industrial sectors underline the need for continuous training throughout one's career. Ensuring the high quality, content and relevance of, as well as easy access to such training is a multi-faceted policy challenge. As automatisation and new technologies are here to stay, it is strong and trusted partnerships among stakeholders that can provide suitable and sustainable responses to skill mismatch and changes in the labour market.

[1] Rifkin, J. (1995). The End of Work. The Decline of the Global Labor Force and the Dawn of the Post-Market Era. Kirkwood, NY: Putnam Publishing Group.

[2] Cedefop conference: Maximising skills for jobs and jobs for skills: The power of partnerships 7-8 December 2015, Thessaloniki, Greece.

[3] Brynjolfsson, E. & A. McAfee (2014). The Second Machine Age. Work, Progress, and Prosperity in a Time of Brilliant Technologies. New York: WW Norton.

[4] Rifkin, J. (2014). The Zero Marginal Cost Society. The Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism. New York: Palgrave Macmillan.

[5] Krugman, P. (2014) Four observations on secular stagnation. In: Teulings & Baldwin (eds.) Secular Stagnation. Facts, Causes, and Cures. A VoxEU.org eBook. London: CEPR, pp. 61-68.

[6] Cowan, T. (2010). The Great Stagnation. How America Ate All The Low-Hanging Fruit of Modern History, Got Sick, and Will (Eventually) Feel Better. New York: Penguin.

[7] Miller, B. & R.D. Atkinson (2013).Are robots taking our jobs, or making them?Washington: The Information Technology & Innovation Foundation (ITIF). .

[8] http://www.imf.org/external/pubs/ft/fandd/2015/03/bessen.htm

[9] See also: Bessen, James (2014) "Will robots steal our jobs? The humble loom suggests not." Washington Post, January 25, 2014

[10] Autor, DH, F. Levy, and R.J. Murnane (2003) "The Skill Content of Recent Technological Change: An Empirical Exploration" *The Quarterly Journal of Economics,*118 (4): 1279-1333

[11] Frey, C.B. & M.A. Osborne (2013).The Future of Unemployment. How Susceptible Are Jobs to Computerization? Oxford: Oxford Martin Publication.

[12] http://bruegel.org/2014/07/chart-of-the-week-54-of-eu-jobs-at-risk-of-computerisation/

[13]http://www.telegraaf.nl/autovisie/autovisie_nieuws/mini/24687471/__Productie_Mini_Cabrio_van_start_in_Born__.html

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