Robotization and manufacturing: who benefits?

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Fears that automation will lead to mass unemployment are a recurring social and economic issue. In recent decades, these fears have been fed by the rapid spread of industrial robots, the use of which has become prevalent in the wind industry. While robotization within the industry has many positive aspects, such as carrying out the notoriously dangerous 'blade walks' on offshore wind turbines, the threat of technology replacing jobs is ever present.

The International Federation of Robotics (IFR) confirms the steep rise in the use of robots and automation. Sales of professional service robots increased by 32% to USD11.2 billion worldwide in 2018-2019. And, says the IFR, the Covid-19 pandemic is set to further boost the market, with high demand for robotics logistics solutions in factories and warehouses.

The use of robotics has been praised for a multitude of savings: revolutionizing manufacturing production lines with the use of autonomous mobile robots (AMRs), helping to reduce carbon footprints by reducing the energy consumption of production with better energy efficiency and higher precision rates, and strengthening global supply chains by leveling productivity through automation.

The wind industry has embraced the use of robotics and their potential benefits. Research from 2019[1] into the potential of automation in the sector concluded that robots could meet the requirements of a significant proportion of processes, including manufacturing of turbines, quality control, remote inspection and maintenance, and even self-driving machines to transport wind turbines from factories.

1 J. Iqbal et al.: Robotics Inspired Renewable Energy Developments: Prospective Opportunities and Challenges

'From production to assembly of resources, robots with user-friendly software and sophisticated control have got the potential to reduce cost without compromising quality in the global market,' say the authors of the research.

Around 80% of operation and maintenance costs on offshore wind farms currently relate to deploying personnel,[2] so the potential for industry savings created by an increased in automation and robotics is huge. But while the benefit for industry profits it clear, what is the impact on jobs and wages?

There's no denying that the number of jobs in the wind industry has plateaued. An analysis of the number of jobs in the wind energy industry worldwide[3] showed employment levels rise steeply over seven years, from 500,000 in 2009 to 1,155,000 in 2016. But this flattened off in 2016, with little to no growth since.

However, according to the IFR, robots create jobs and increase productivity. 'The impact of automation on employment is not in any respect different from previous waves of technology-driven change,' says IFR's president Milton Guerry. 'Productivity increases and competitive advantages of automation don´t replace jobs – they will automate tasks, augment jobs and create new ones.'

2 D.Mitchell et al: Symbiotic System Design for Safe and Resilient Autonomous Robotics in Offshore Wind Farms

3 https://www.statista.com/statistics/268400/jobs-in-the-wind-energy-industry-worldwide-since-2005/

These claims are supported by a 2018 paper published in leading economics journal, the Review of Economics and Statistics, entitled 'Robots at Work'. The paper was the seminal contribution to investigate the economic consequences of modern industrial robots, and its authors Georg Graetz and Guy Michaels analyzed for the first time the impact of automation on productivity, prices, wages, and the skill composition of the workforce.

The paper quickly became an influential piece of work of the impact of robotics on both the economy as a whole and within the manufacturing industry. Its results were overwhelmingly encouraging: the authors found that increased robot use raised productivity, lowered output prices and, crucially, did not significantly reduce total employment. Rather than being something to fear, they suggested, robotization had a positive impact on industry.

But the data collected by the IFR and used for Graetz and Michaels analysis includes the use of robotics across all sectors between 1993 and 2007 – including sectors

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that have been barely impacted by automation, or not affected at all. For a clearer picture of the impact of robotization on the sectors which are heavily impacted by its use, it's necessary to exclude from the data those sectors which have seen little or no change.

When we did this for our own research, 'Robots at Work? Pitfalls of Industry Level Data'[4]' published by EconPol Europe in February 2021, we found a very different picture. Rather than clearly improving conditions for the sectors which have seen a rise in robotization, we found rather mixed results: significantly lower productivity effects than assumed, falling wages and hints for job polarization – or the loss of the type of 'middle-class jobs' which require a moderate level of skills.

Previous findings suggest that the contribution of robots to productivity growth is five percent for the period

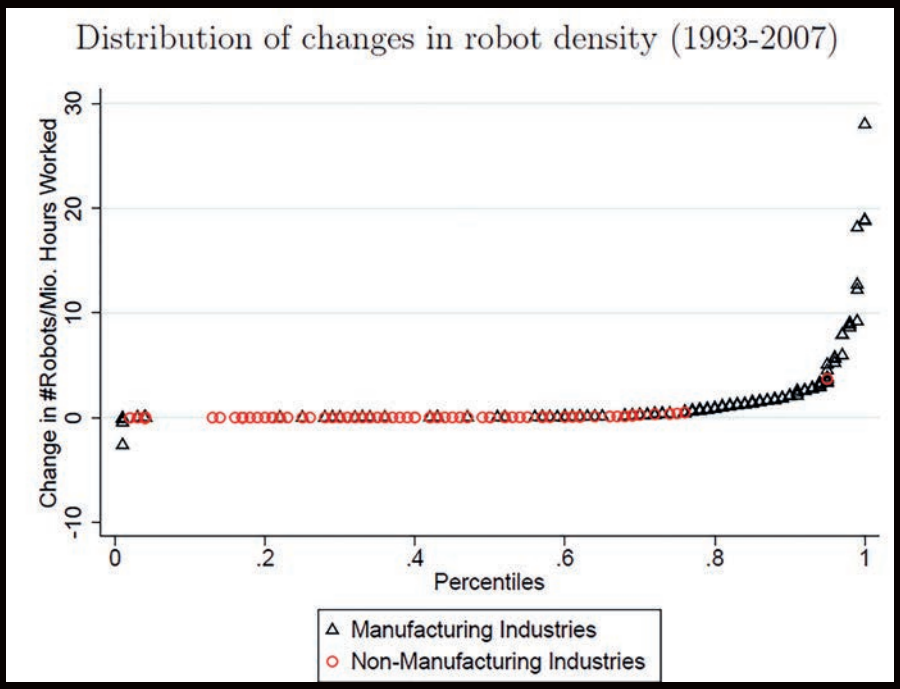

Figure 1

1993-2007, placing it on a similar level as the steam engine in the nineteenth century, highways in the middle of the twentieth century, and, more recently, ICT. But our analysis found that productivity in the economy when counted as a whole would have been only two percent higher in 2007 – not even half the amount claimed by previous research.

Additionally, when we repeated the investigation using data for 2008-2015, we were unable to detect any significant effects of robotization on productivity, prices, or wages. This suggests that the aggregate economic effects of robotization have come to a halt in recent years.

Positive effects on productivity can, however, be recovered if the demographic structure of the workforce is taken into account. As the share of middle-aged workers decreases through population ageing, firms face a relative shortage of labor supply from these workers. The price for hiring these workers then increases, which in turn makes investment in automation technologies, like industrial robots, more profitable.

A 2018 investigation into the impact of automation on different worker demographics[5] found that an ageing workforce leads to greater industrial automation, particularly to a more intensive use and development of robots. Using data from the United States, researchers found robots were increasingly substituting workers between the ages of 36 and 55. The

4 Karim Bekhtiar, Benjamin Bittschi, Richard Sellner: 'Robots at Work? Pitfalls of Industry Level Data' EconPol Working Paper 58, February 2021 https://www.econpol.eu/publications/working_paper_58

5 Acemoglu, Daron and Pascual Restrepo. 2018. 'Demographics and Automation.' Tech. rep., National Bureau of Economic Research, Cambridge, MA.

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model used by researchers also predicted that automation technology would be more pronounced in industries that rely more on middle-aged workers, with a decline in labour share in industries that are most amenable to automation.

Our research supports the idea that the ageing process is closely connected to automation. However, according to our results robotization is not, as previously reported, detrimental for workers with lower skill levels. Instead, increased use of robot technology tends to create job polarization – with fewer roles requiring a moderate level of skills, compared to those requiring less or high levels of skills.

To interpret our results, it is important to keep in mind that robots have a very low prevalence across all industries, and thus it is not astonishing, in contrast to what one might expect, that there are not necessarily any substantial positive or negative effects for the economy as a whole.

Further literature shows that the disruptive potential of current robot technology may have been overstated as it possibly does not represent a break with known automation technologies, but is rather an iteration of the same.

Nevertheless, empirical microeconomic studies, such as ‘Robots and Firms’ by Michael Koch, Ilya Manuylov, and Marcel Smolka in 2019, or more recently ‘Robot Imports and Firm-level Outcomes’ by Alessandra Bonfiglioli, Crinó Rosario, Harald Fadinger and Gino Gancia in 2020, provide evidence that the relatively small share of firms that made use of industrial robots clearly benefited in terms of productivity.

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