Artificial Intelligence and Employment

NEW EVIDENCE FROM OCCUPATIONS MOST EXPOSED TO AI

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Key findings

- In recent years, Artificial Intelligence (AI) has made significant progress in areas like information ordering, memorisation, perceptual speed, and deductive reasoning – all of which are related to non-routine, cognitive tasks.
- As a result, the occupations that have been most exposed to advances in, and automation by, AI have tended to be high-skilled, white-collar ones, including: business professionals; managers; science and engineering professionals; and legal, social and cultural professionals. This contrasts with the impact of previous automating technologies, that have tended to take over primarily routine tasks performed by lower-skilled workers.
- Higher exposure to AI may be a good thing for workers, as long as they have the skills to use these technologies effectively. New OECD research finds that, over the period 2012-19, greater exposure to AI was associated with higher employment in occupations where computer use is high. This suggests that workers who have strong digital skills may have a greater ability to adapt to and use AI at work and, hence, to reap the benefits that these technologies bring.
- By contrast, there is some indication that higher exposure to AI is associated with lower growth in average hours worked in occupations where computer use is low.
- On the whole, these findings suggest that the adoption of AI may increase labour market disparities between workers who have the skills to use AI effectively and those who do not. Making sure that workers have the right skills to work with new technologies is therefore a key policy challenge.

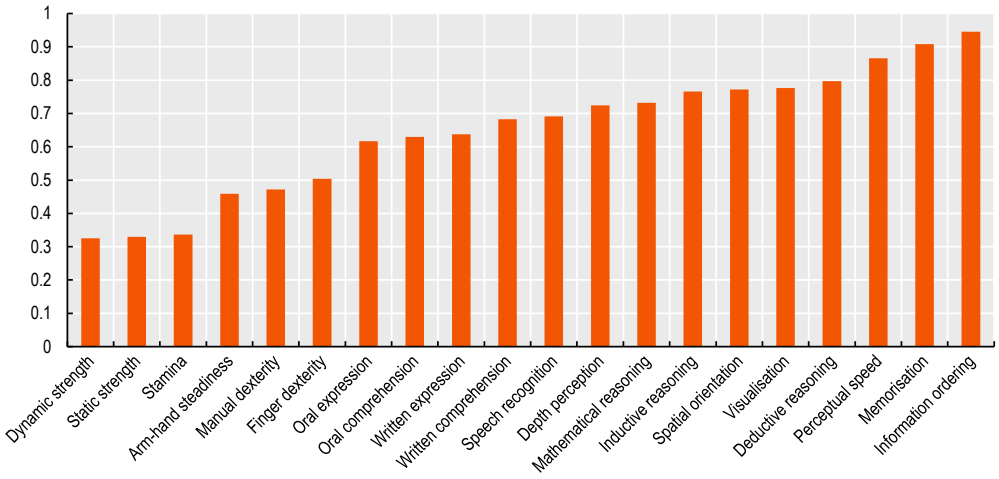
White-collar occupations are most exposed to AI

In the past, automating technologies have primarily affected low- and middle-skilled workers whose tasks tended to be routine. This is one of the reasons why, for instance, the share of employment in manufacturing in many OECD countries has declined dramatically over the past couple of decades, as robots have taken over the jobs of lower-skilled workers.

However, Artificial Intelligence (AI) is a game changer. Over the period 2010-15, AI has made most progress in areas such as: information ordering, memorisation, perceptual speed, and deductive reasoning – all of which are required to perform non-routine, cognitive tasks. By contrast, AI has made the least progress in physical and psychomotor abilities (Figure 1).

Figure 1. AI has made the most progress in abilities that are required to perform non-routine, cognitive tasks

Progress made by AI in relation to each ability, 2010-15 (selected abilities)

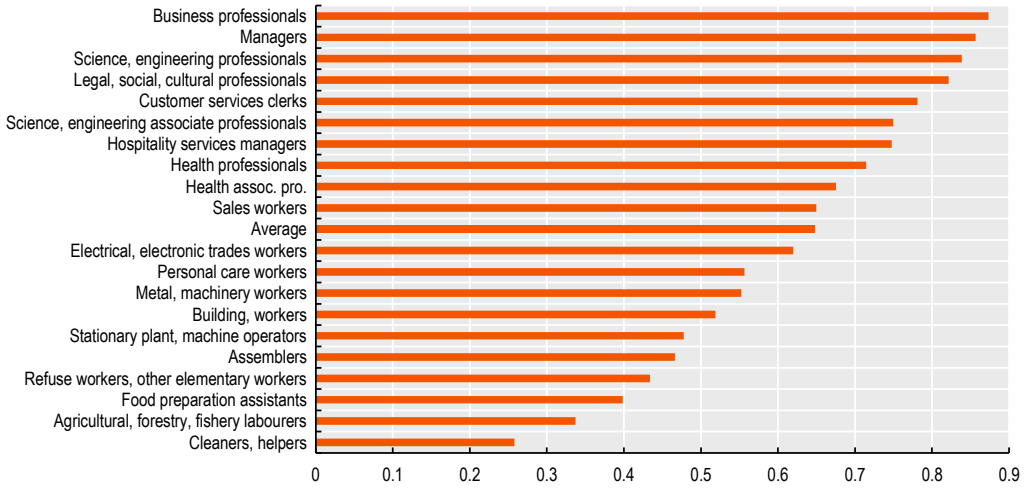


Note: This chart combines: (i) progress of AI in certain applications (taken from the Electric Frontier Foundation); and (ii) mapped onto abilities (taken from O*NET). The mapping is taken from Felten, Raj and Seamans (2019[1]).
Source: Georgieff and Hyee (2021[2]) based on Felten, Raj and Seamans (2019[1]), "The Occupational Impact of Artificial Intelligence: Labor, Skills, and Polarization", https://doi.org/10.2139/SSRN.3368605.

As a result, white collar occupations requiring high levels of formal education now tend to have the highest exposure to AI. These occupations include: Business Professionals; Managers; Science and Engineering Professionals; and Legal, Social and Cultural Professionals. By contrast, occupations with the lowest exposure to AI include those with an emphasis on physical tasks, like: Cleaners and Helpers; Agricultural Forestry, Fishery Labourers; and Food Preparation Assistants (Figure 2).

Figure 2. Highly educated white-collar occupations are among the occupations most exposed to AI

Average exposure to AI across countries by occupation, 2012 (selected occupations)



Note: The averages presented are unweighted. Cross-country averages are taken over the 23 countries included in the analysis.
Source: Georgieff and Hyee (2021[2]).

An occupation's exposure to AI will reflect: (i) the progress made by AI in specific abilities; and (ii) the extent to which those abilities are used in an occupation.

Exposure to AI was associated with higher employment growth in occupations where computer use is high

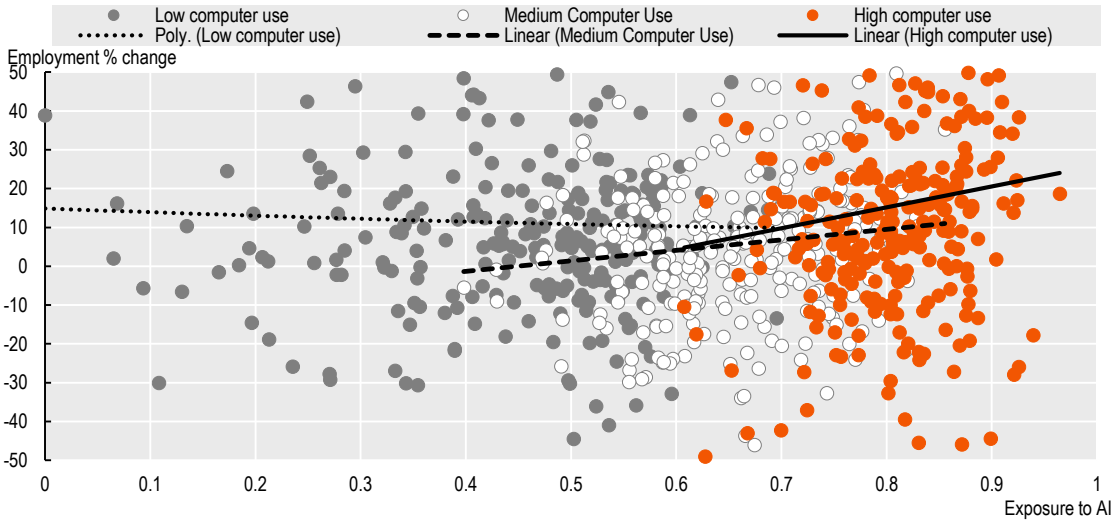
Higher exposure to AI is not necessarily detrimental to workers' jobs – as long as workers have the skills to use AI effectively. Over the period 2012-19, higher exposure to AI was associated with higher employment growth in occupations where computer use is high.

This was a period of high employment growth overall, as OECD economies recovered from the financial crisis. Employment grew by 10.8% on average across all occupations and the 23 OECD countries where comparable data are available. Average employment growth was negative for only four occupations: Other Clerical Support Workers (-9.2%), Skilled Agricultural Workers (-8.2%), Handicraft and Printing Workers (-7.9%), and Metal and Machinery Workers (-1.7%).

While employment grew in nearly all occupations, there is some indication that it grew slightly faster in occupations that were most exposed to AI. This positive relationship between AI exposure and employment growth is clearest in occupations where computer use is high. This can be seen in Figure 3, which shows all occupation/country combinations for which comparable data are available, and differentiates between occupations that were low (grey), medium (white) and high (orange) in computer use.

Figure 3. AI exposure is associated with higher employment growth in occupations where computer use is high

Employment growth for each occupation/country combination, by level of computer use



Note: Each dot represents an occupation/country pair. The colours represent different levels of computer use (low, medium, high). Linear lines of best fit have been drawn through each computer use group. The graph has been rescaled so that outliers are not visible.
Source: Based on Georgieff and Hyee (2021[2]).

The chart shows how the relationship between AI exposure and employment growth is flat or even slightly negative for occupations where computer use is low, while a positive relationship emerges for occupations with high computer use. This positive relationship remains statistically significant in multivariate regressions when a number of controls for other factors are included in the analysis. One standard

deviation increase in AI exposure (i.e. the difference in exposure between clerks and production managers in the United States) is associated with 5.7 percentage points higher employment growth (Georgieff and Hyee, 2021[2]).

In sum, even if AI may substitute for workers in certain tasks, it also appears to be associated with higher growth in jobs in occupations that require digital skills.

These findings hold even after excluding IT technology professionals and IT technicians, two occupations with a high degree of exposure to AI, as well as high employment growth over the period considered. These two occupations are excluded from the analysis because the interest is mostly in occupations where AI is used, not in occupations were AI is developed.

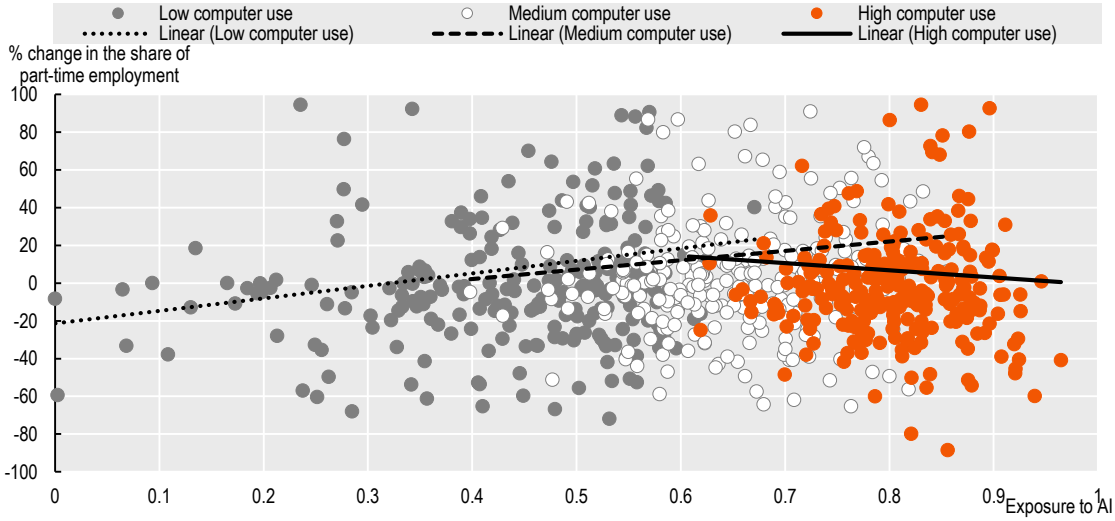
While exposure to AI is positively associated with the growth in the demand for AI skills, the increase in jobs requiring such skills cannot account for the additional employment growth observed in computer-intensive occupations exposed to AI. This is because job postings requiring AI skills still represent a very small share of overall job postings. In 2019, on average across the 36 occupations analysed, job postings that require AI skills accounted for only 0.14% of overall postings in the United Kingdom and 0.24% in the United States. By contrast, across the same 36 occupations, employment grew by 8.8% on average in the United States and 11.2% in the United Kingdom.

AI exposure was associated with lower growth in hours worked in occupations where computer use is low

Over the period 2012-19, even though employment increased overall across OECD countries, the average number of hours worked per worker declined. There is some suggestive evidence of a negative relationship between AI exposure and subsequent growth in average hours worked per worker among occupations where computer use is low. This negative relationship is driven by part-time employment and is shown in Figure 4 which, again, shows all occupation/country combinations included in the research and differentiates between occupations that were low (grey), medium (white) and high (orange) in computer use.

The relationship between AI exposure and part-time work is positive for occupations where computer use is low, while a negative relationship emerges for occupations with high computer use. The positive relationship is driven by involuntary part-time workers, suggesting that the greater decline in hours worked associated with AI exposure among occupations with low computer use does not reflect worker choice.

Figure 4. AI exposure is associated with an increase in part-time work in occupations where computer use is low



Note: Each dot represents an occupation/country pair. The colours represent different levels of computer use (low, medium, high). Linear lines of best fit have been drawn through each computer use group. The graph has been rescaled so that outliers are not visible.
Source: Based on Georgieff and Hyee (2021[2]).

Policy makers should keep an eye on the distributional impact of AI

The research findings presented in this brief do not say anything about causality and further research will be required to confirm some of the relationships uncovered. However, they suggest that AI may further increase labour market disparities – in particular between workers who have the skills to use AI effectively and those who do not.

A key message for policy makers is therefore to keep a close eye on future developments, through further labour market monitoring and research. Policy makers can also take a proactive approach by investing in skills that appear valuable in working with AI, such as digital skills – especially since previous research has shown that a large share of adults in OECD countries lack such skills (OECD, 2016[3]).

Besides preparing individuals through training and education, policy makers should also ensure that labour markets are capable of adapting to technology-induced changes by putting in place adequate social protection mechanisms, combined with reactivation strategies that boost employability, and encouraging constructive social dialogue around the future of work (OECD, 2019[4]).

References

Felten, E., M. Raj and R. Seamans (2019), "The Occupational Impact of Artificial Intelligence: Labor, Skills, and Polarization", *SSRN Electronic Journal*, http://dx.doi.org/10.2139/SSRN.3368605. [1]

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