Group Economics | 20 July 2023

Macro Watch

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Artificial Intelligence gains foothold

- **Artificial Intelligence (AI) has the potential to boost productivity and GDP growth**
- **The productivity shift is likely J-shaped: first a decrease, then with a lag, an increase**
- **AI may lead to large shifts in the labour market: many jobs might disappear**
- **However, history suggests that innovation will create new occupations, supporting employment**

Introduction

AI will lead to further shifts in the labour market. An important difference with previous ICT waves is that with generative AI not only routine tasks can be automated, but also cognitive and creative ones. Up until now automation mainly affected lower-middle-skilled workers. Jobs at the middle of the wage scale disappeared, while the number of jobs at both the bottom and at the top increased. That may change if tasks of workers with higher levels of education can also be automated.

Expectations are that AI will boost productivity. However this may take time. History suggests productivity responds to technological shocks with a delay. In 1987 Robert Solow famously quipped "You can see the computer age everywhere but in the productivity statistics." Productivity responses to technological shocks tend to be J-shaped. Elevated capital expenditure costs related to the build-out of the new technology initially lowers productivity and then, with a lag, boosts productivity. An improvement in productivity will be accompanied by cost cuts and gradually diminishing inflationary pressures.

We do not expect an AI-driven productivity boost on our forecast horizon, to end 2024. While productivity is likely to rise somewhat as businesses start laying off workers in response to weaker demand – as we expect in our recession scenario for the US and eurozone – we do not expect AI to play much of a role in this initial phase. If anything, the upfront investment costs associated with AI may even dampen the productivity recovery we typically see during recessions. However, productivity is likely to see a more sustained improvement once the economy starts to recover, output rises faster than the number of workers, and AI investments pay-off. Thus, the productivity path is likely to follow a J-curve.

AI expectations bolstered after introduction of ChatGPT

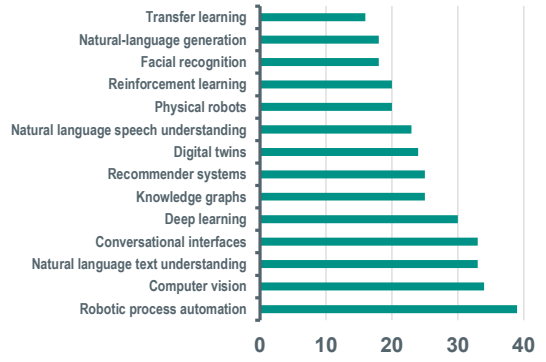
Since November, AI has been on everyone's mind. The introduction of ChatGPT and other generative AI technologies makes it clear that AI can have extensive social and economic implications. According to some this breakthrough technology could bring changes similar to those that followed the introduction of the steam engine and the electricity grid as it also may help to organise the production process differently, more efficiently, and to create new, still unimaginable products.

AI is an umbrella term for a range of applications.[1] Their common denominator is that individually and in combination they enable machines to operate intelligently. For example, with the help of computer programs, machines can learn a language and understand texts. In a human environment they can perceive, analyse and respond appropriately to individual reactions. AI also helps to make more accurate predictions, thus reducing uncertainty in decisions. AI also provides opportunities to combine already existing technologies that can reinforce each other and create innovations.

A growing number of companies are investing in AI, both to save costs (for instance through more efficient supply chain management) and to increase revenues (through more focused marketing and sales efforts and faster product development). Investors too, are paying more attention to AI. Research shows that the valuations of sectors and companies with broader applications of AI have increased relatively compared to sectors and companies with fewer applications.

Firms are embedding a great variety of AI applications

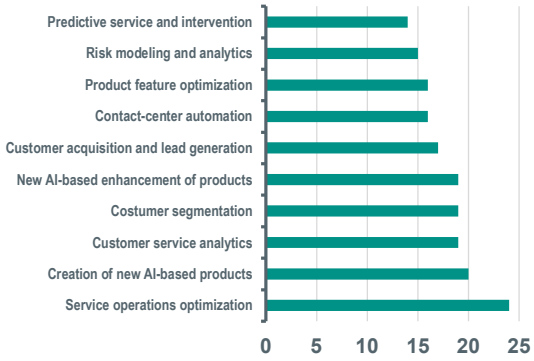
AI capability embedded in product or process (% respondents)



Source: McKinsey

AI is used for a wide range of firm use cases

Most commonly use cases (% respondents)



Source: McKinsey

With the help of AI, a variety of tasks can be performed by machines. McKinsey researchers estimate that half of workers' tasks will be automated sometime between 2030 and 2060. A change that is likely to occur most rapidly in developed economies, because wages are more elevated and cost advantages are greatest. Combined with the additional opportunities it offers, AI could create global value of USD 17.1 to USD 25.6 trillion, roughly a quarter of global GDP. According to the researchers, AI could increase global annual productivity growth from an average of 2.1% from 2012-2022 to up to 3.3% from 2023-2040.

It is likely to take time to see the effect of AI on the economy

The ultimate impact of AI on productivity and GDP growth will depend on the pace of adoption of new technological capabilities. Experience shows that investments in breakthrough technologies can take a while to translate into higher productivity and GDP growth. For example, it took decades for the introduction of electricity to penetrate American factories and produce more favourable industrial production figures. The figures improved only after managers redesigned and adapted their production lines to the new situation.

The introduction of computers and ICT starting in the 1980s also yielded limited results at first. Only in the mid-1990s did earlier investments lead to better productivity and GDP figures. This is because investments in breakthrough technologies initially create mostly uncertainty and distortions, and they only have a meaningful impact when they reach a certain scale and sufficient resources are allocated for flanking measures, such as staff education and the organizational adjustments required. A good example of this was Walmart in the late 1990s, which developed new inventory management and store formats to take better advantage of ICT, thereby raising productivity. As new practices are developed and proven, they are then replicated elsewhere in the economy.

[1] Examples of technologies underlying AI include: machine learning, deep learning, reinforcement learning, robotics, computer vision, natural language processing, collaborative systems, crowdsourcing and human computation, algorithmic game theory and computational social choice, internet of things and neuromorphic computing.

Still, it could be that AI spreads faster than previous breakthrough technologies. Firstly, because the physical infrastructure needed for success is already largely in place. Unlike in the 1980s, computers and ICT have penetrated deep into the economy. Secondly, there are substantial frictions in the labour market, reinforcing the incentive to invest in labour-saving measures. Thirdly, those who will work with the new technology must be convinced that it is useful and user-friendly. The rapid adoption of ChatGPT suggests that generative AI technologies may lead to more.

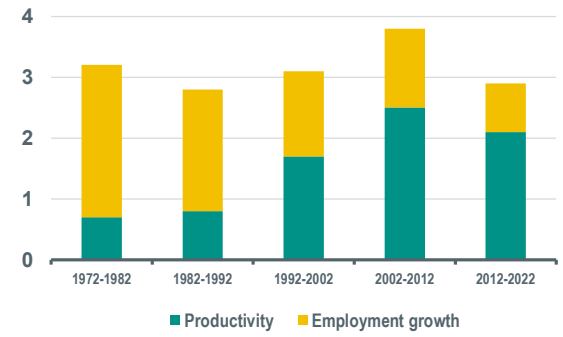
Measurement issues may negatively impact growth rates

Despite these favourable signals, the impact on productivity and GDP figures may still be disappointing. One reason for this is the way productivity and GDP are measured. Innovations contribute to higher-quality products, but this improvement in quality is not necessarily reflected in the price. Consumers therefore experience welfare gains without having to pay. As a result, perceived welfare gains are likely not always reflected in GDP and productivity statistics.

Measurement problems also arise when activities disappear from the market. This happens, for example, when new technology allows consumers to independently arrange things they previously had professionals do. Think of booking a trip. Previously, a travel agency was called in to do that. Nowadays that can very well be done independently via the Internet. These shifts made possible by innovation can raise prosperity, as the costs saved can eventually be spent on other goods and services. Nevertheless, this process is initially likely to push down on GDP and productivity.

Delayed effect of ICT-investments on productivity

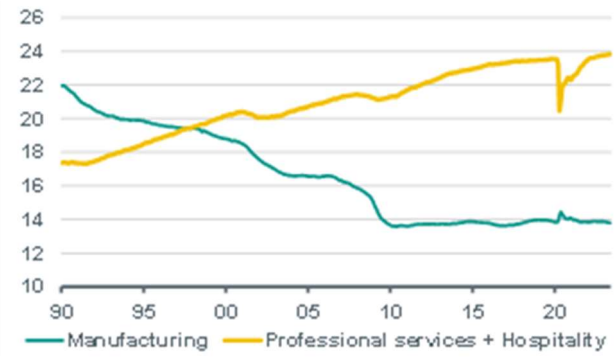
Contribution to growth (%)



Source: McKinsey

Relative share of manufacturing jobs has declined

% share of US employment by sector



Source: Refinitiv, ABN AMRO Group Economics

The demand side of the economy is also relevant to productivity

The ultimate impact of technological change on productivity and GDP is not solely determined by supply, but also by demand. With regard to demand, technological progress has two opposing forces: the substitution effect and the income effect. The net result of both determines whether demand (and thus productivity and GDP) increases or decreases. The substitution effect occurs when AI replaces workers. Workers that lose their job experience a drop in income, which depresses demand. This can be offset by the income effect. The cost savings realized by technology lead to higher wages for other workers, higher profits for capital providers, or price reductions in favour of consumers. All three actually fuel demand.

The net result of the substitution and income effect is hard to estimate in advance. It depends on the respective demand elasticities of the groups involved, thus their respective responses to a drop/rise in income. Initially the substitution effect might be dominant as people need to assess the new situation. This creates uncertainty, resulting in a drop in demand. Yet history suggests that the income effect turns out to become dominant in the long run. Once demand starts to rise this will result in higher GDP and productivity growth.

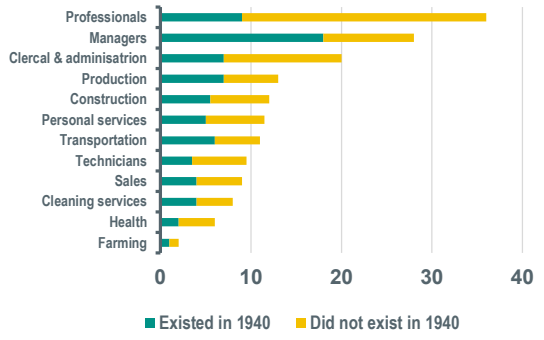
The labour market will change because of AI

AI will lead to further shifts in the labour market. An important difference with previous ICT waves is that with AI not only routine tasks can be automated, but also cognitive and creative ones. Up until now automation has mainly affected lower-middle-skilled workers, such as in manufacturing. The share of jobs at the middle of the wage scale has declined, while the share of jobs at both the bottom (such as hospitality) and at the top (such as professional services) increased. That may change if tasks of workers with higher levels of education can also be automated.

It is likely that jobs will disappear because of AI. However, this need not mean a rise in unemployment. Perhaps initially, when companies make labour-saving investments and layoffs occur. But after that, unemployment tends to decline. That's because jobs are created that did not exist before. These may be jobs supporting the new technology, or jobs created by demand for new products as a result of rising wealth. We are talking about big numbers here. Most of today's employment in the United States consists of job titles that did not exist in the 1940s.

Most current US job titles did not exist before 1940s

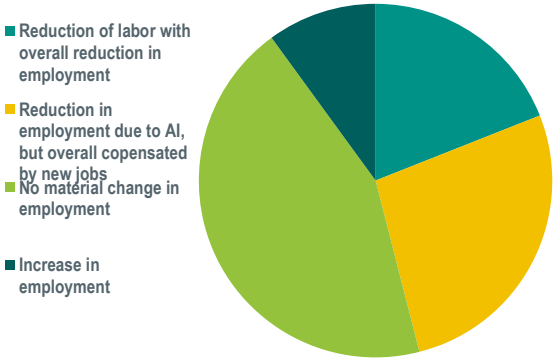
Number of jobs (millions)



Source: McKinsey

On balance managers expect employment to decline

% of respondents



Source: VOX.org

In advance, however, these types of new jobs are difficult to envision. That explains why, for the time being, the percentage of managers who take into account a decrease in employment under the influence of AI is greater than the percentage of managers who take into account an increase. Workers are also not yet comfortable with the labour market outlook. The more workers take job losses due to automation into account, the more sympathetic they are to higher taxes and redistribution. They are also more likely to join a union and inclined to follow additional training.

These results underscore the importance of a well-functioning social safety net that helps workers move from job to job. An option frequently mentioned in this respect is a universal basic income, which is effective in tackling poverty. However economists regard this solution as an inefficient way to redistribute since also high income groups would benefit. In "Power and Progress" Daron Acemoglu and Simon Johnson alternatively opt for a society in which technological progress is made by making machines useful to people, not displacing them.

Other pain points regarding AI

AI clearly has political implications. Concerns about job loss due to automation correlate with distrust of "the elite" and lead up to a reduced likelihood of voting in the next election. Some critics see in AI a direct threat to democracy. The risk of disinformation and manipulation lurks if it becomes easy to make image and sound fakes of individuals and spread them at the speed of light. Is social debate still possible in this way? This also may pose a threat to the economy, since a healthy democracy is the foundation of a well-functioning, dynamic economy.

There are also concerns about market concentration in the AI industry and how that limits competition. For example, the majority of AI talent is employed by a limited number of companies. This pooling of talent increases the risk that a limited

number of companies will eventually gain market power. If barriers to entry become too high for new competitors, this will weaken the incentive to innovate. Moreover, growing market power can lead to higher costs for buyers. This is especially true when the digital means of predicting individual customer behaviour leave room for difficult-to-trace manipulation. An example of this is Uber, which raised fare prices for customers with nearly empty phone batteries.

Meanwhile the adoption of AI by companies that are not directly involved in AI development may be an offsetting force. AI enables individuals and smaller companies to develop new products and scale up more easily, thus boosting innovation and lowering barriers to entry. These companies make a much larger chunk of the economy.

Then there is the legal aspect. Are copyrights properly protected when articles are scraped off the Internet and fed to an algorithm? What about privacy if private data roaming on the Internet due data breaches is used, or if smart cameras can recognize faces in public spaces? Is there discrimination involved? Many algorithms are built to identify outliers. That may work out well in detecting cancer cells, but poorly when it comes to fraud detection or credit allocation. Bias in, bias out. There are also question marks regarding liability. Who is responsible in the event of an accident caused by an error in a self-learning algorithm? The user or the software vendor?

Growing need for regulation

These associated risks will become even more pressing, as AI capabilities increase further. Against this background, it is understandable that calls for regulating of AI are growing. But rules are difficult to formulate because AI is a many-headed monster that can touch all sorts of societal domains that are as yet incalculable. Moreover, AI is transnational. National rules will not be able to prevent the development of applications across borders. Furthermore, regulations that are too stringent may hinder innovation without achieving the intended goal. Regulations can evoke a tick-the-box compliance mentality, where regulations are met only on paper.

Nevertheless, Brussels has thrown down the gauntlet to regulate AI. Unlike AI frontrunners China and the United States, Europe wants to first build a guardrail to control AI's development and only then give the market free rein. The European Parliament recently approved the 'Artificial Intelligence Act' by a large majority. Once negotiations between the European Parliament and the member states are completed, the law can enter into force, something expected to happen from 2024. The hope is that the Brussels effect will occur: experience shows that manufacturers want to keep access to the European market and follow European laws, not only in the European Union but worldwide. AI is gaining a foothold, and so are regulators.