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Artificial intelligence can boost productivity in the Danish economy

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The world is seeing rapid advances in artificial intelligence (AI), which has the potential to transform the economy. This can mean a boost in productivity, although the extent and timing of the effect are subject to considerable uncertainty. How much AI will impact productivity in the coming years depends on several factors, including how the technology develops and whether it drives more innovation alongside increased automation. Future productivity developments are key to the resilience of the Danish economy and thus Danmarks Nationalbank's work areas.

The use of artificial intelligence has increased rapidly in Denmark

The adoption of AI has increased quickly in Denmark, making it the EU country with the highest number of companies adopting it. International rankings indicate that Denmark is well-positioned to take advantage of AI opportunities, owing to a high degree of digitalisation and a flexible labour market. Productivity gains come from freeing up resources in the economy. Some jobs will therefore disappear due to AI, while new ones will emerge.

International studies predict AI will increase productivity, but by how much is uncertain

There are already several examples of large productivity gains from using AI for certain types of tasks, such as programming and translation. Several international studies predict that AI will also contribute positively to productivity growth in the economy as a whole in the coming years. However, the extent of the effect is uncertain and varies across countries. It is also uncertain when the impact of AI will be realised in productivity figures.

AI can boost productivity in the Danish economy

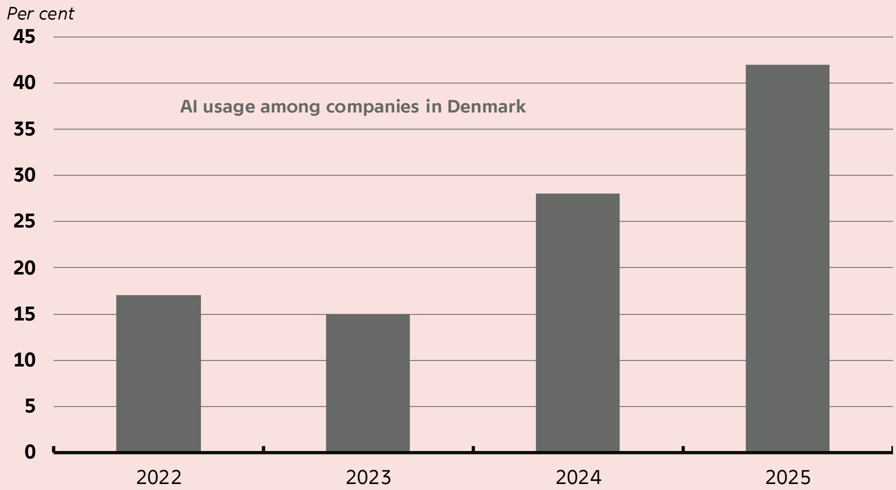
Scenario calculations indicate that AI can increase annual total factor productivity growth in Denmark by around 0.1-1.0 percentage points over a ten-year period. This suggests that AI can boost productivity, but the estimates vary widely and depend on assumptions. In comparison, the average annual productivity growth has been 0.5 per cent over the past five years.

Why is it important?

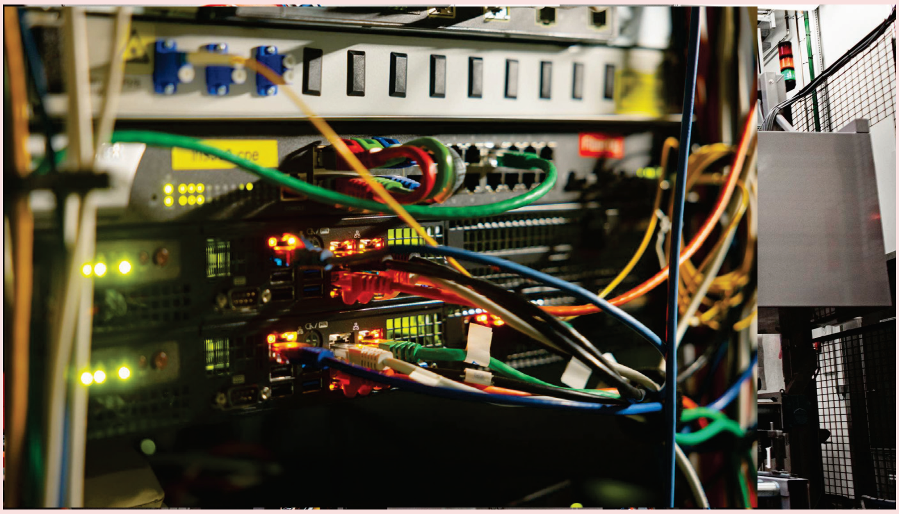
Artificial intelligence is expected to positively impact productivity in the Danish economy in the coming years. To what extent and how is a key question for the work of Danmarks Nationalbank. This is because the productivity development affects potential growth, competitiveness, the natural real interest rate and inflation.

Main chart

The use of AI has increased rapidly in Denmark



Note: Percentage of companies using AI. Companies with at least ten employees in the private, non-financial urban industries.
Source: Statistics Denmark.



Keywords

Economic activity | Digitalisation | Danish economy

01
Artificial intelligence affects several parts of society

Technological advances have traditionally been a key driver of Denmark's prosperity because they have made it possible to produce more with fewer resources. Artificial intelligence (AI) is currently experiencing significant breakthroughs that are already affecting our society in many ways. The technology offers a range of opportunities with the potential to improve living conditions and fundamentally transform the economy. AI can be used for a wide range of activities, from automating routine tasks to developing knowledge-based and creative work. In doing so, it provides workers and businesses with new opportunities to boost productivity, similar to previous inventions such as the steam engine, electricity and the computer. Generative AI models in particular have recently gained popularity as they can create new content that appears human-created rather than simply interpreting existing information, see box 1 for an introduction to AI.

AI is associated with both societal opportunities and risks

However, the increasing use of artificial intelligence can also give rise to challenges, several of which are relevant to the resilience of the Danish economy and thus Danmarks Nationalbank's work areas. The ongoing AI transformation is happening around the world at a rapid pace and may cause a sudden shift in demand and production patterns in the economy. This is a natural part of utilising the benefits of new technology in a market economy like Denmark. Productivity gains are achieved by freeing up resources that can be better utilised elsewhere in the economy. It is therefore likely that AI will displace existing jobs and create new ones. However, the rapid spread of AI poses a risk of abrupt changes in the labour market, with some existing jobs disappearing faster than the workforce can adapt to new tasks.

Another key aspect of AI is its potential geopolitical implications, as the multilateral and rules-based world order is under pressure. As many of the leading technology companies are located in the US and China, there is a risk that EU countries will become dependent on external players for technology and security. Such dependence can limit the strategic autonomy of European economies, i.e. their ability to act independently in areas critical to society. However, there are also societal costs associated with greater technological sovereignty, as the benefits of an efficient international division of labour are not fully realised.

The financial markets have focused strongly on AI. While investments are a prerequisite for the economy to realise the benefits of AI technology, they come with some short-term uncertainties. High valuations of US technology companies, for example, indicate high expectations for the capabilities of AI technology. In reality, it is not possible to predict with reasonable certainty either the direction of the financial markets or whether investments in AI will turn out to be profitable. Nevertheless, the rising share prices of technology companies carry the risk of abrupt price corrections that can cause sudden negative shocks to the global economy and financial stability.

Will artificial intelligence boost productivity in the Danish economy?

While there are many societal aspects of the AI transformation, the rest of the analysis focuses on productivity. There are already several examples of significant efficiency gains using AI, such as programmers working significantly faster with AI tools. However, the purpose of this analysis is to examine how much AI adoption can be expected to increase *macro-productivity* in the Danish economy as a whole. This is a key question, as productivity growth affects factors such as the economy's growth potential and capacity pressures. AI can therefore have an impact on Danmarks Nationalbank's recommendations for economic policy, see Bess et al. (2025).

AI-related productivity increases will also affect the inflation outlook via companies' unit costs and the natural real interest rate – the interest rate level at which monetary policy is neither tight nor loose. If AI affects productivity differently in Denmark than abroad, it also affects competitiveness, which is a key adjustment mechanism in a fixed exchange rate regime like Denmark.

To explore the possible effects of AI on productivity in the Danish economy, part 2 first examines trends in AI use, while part 3 presents an overview of studies that have examined the magnitude of productivity effects from increased AI use. Finally, part 4 presents a number of scenario calculations on the future impact of AI on Danish productivity.

BOX 1

What is artificial intelligence?

Artificial intelligence – often abbreviated to AI – is an umbrella term for technologies that enable machines to perform tasks that normally require human intelligence. Specifically, DTU (2026) describes AI as "computer programs and machines that mimic one or more aspects of human intelligence", such as language understanding, problem solving or pattern recognition. Another definition from the OECD emphasises AI systems' ability to make predictions and to demonstrate autonomy and adaptability after implementation.[1] From a macroeconomic perspective, AI can be described as a general technology that, like inventions such as the steam engine, electricity and the Internet, impacts society at large.

AI encompasses a variety of techniques, of which machine learning is one of the most important.[2] This is where computers learn to solve tasks by finding statistical relationships in large amounts of data. The models are trained on examples where they learn a probable relationship between input and output. They can then solve tasks by providing the most likely output data for given input data, and they can improve their accuracy over time by learning from new data.

AI technology has continuously evolved since the 1950s when the term first emerged, see Franch Artificial Intelligence Commission (2024) for a review of the historical background. Increased access to data and growing computing power have fuelled the development of AI. In recent years, the rise of generative AI in particular has opened up new applications, such as language models like ChatGPT. This branch of AI technology is characterised by its ability to create new content, such as text or images, rather than simply analysing existing information. This is done by models predicting the most likely next word or pixel when they receive a user query.

AI technology is already being used for several functions in society, including chatbots in customer service, robots and medical diagnostics. In 2024, Demis Hassabis and John Jumper won the Nobel Prize in Chemistry for the invention of the AlphaFold2 model, which uses AI to quickly predict protein structures. This gives researchers a better chance of accelerating the development of new medicines, for example, and illustrates how AI can potentially advance the development of ideas, not just the production of goods or services.

[1] The OECD definition is: "An AI system is a machine-based system that, for explicit or implicit purposes, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptability after deployment", see OECD (2024).
[2] Generative AI is based on deep learning, which is a form of machine learning based on neural networks, see, e.g. DTU (2026) for a more detailed discussion of the concepts behind AI technology.

02
The use of artificial intelligence has increased rapidly in Denmark

As a first step towards exploring the productivity effects of increased AI adoption, this section presents some facts as a starting point for the discussion in parts 3 and 4. This section argues that Danish companies have adopted AI to a greater extent than in other European countries, and that the Danish economy is generally well positioned to utilise the technology's potential. However, the level of venture capital investment in AI companies relative to the size of the economy is lower in Denmark than in both the US and Sweden.

The spread of AI has been rapid in Denmark in recent years

The use of AI technology has increased significantly in Denmark in a short time. According to a survey from Statistics Denmark, 42 per cent of Danish companies used at least one AI technology in 2025, see chart 1. The spread of AI is particularly supported by the fact that the largest companies have embraced the technology, while small companies use it to a slightly lesser extent. Overall, Denmark is the EU country where the most companies have adopted AI in their work processes, providing a good starting point for realising productivity gains. There is a clear tendency across the EU for companies in more prosperous countries to adopt AI more than those in less prosperous countries, see chart 2. This suggests that AI adoption has been faster in European economies that are already the most productive. The same trend is also seen worldwide, see Appel et al. (2025) or Microsoft (2025).

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42 per cent of Danish companies used AI in 2025

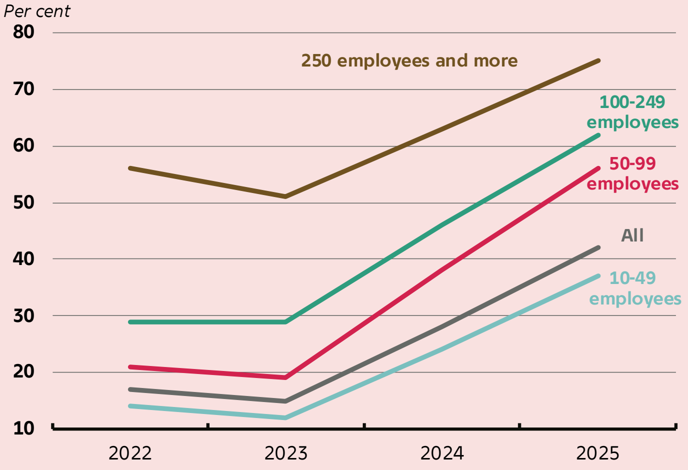
Although many of the leading companies in AI development are located in the US, American companies do not necessarily use AI more than European or Danish companies. For example, the EIB (2025) finds that 37 per cent of EU companies use generative AI, while the figure is 36 per cent in the US[1] and 58 per cent in Denmark. In economies with a large technology sector, AI could conceivably boost macro productivity more than in other economies, even if companies outside the technology sector adopt AI to the same extent. This is because the technology sector can see particularly high AI-related productivity gains.

[1] The Federal Reserve (2025) reviews a number of other studies on the use of AI in the US and finds that 20-40 per cent of US employees use AI, while the figure is 5-40 per cent for US companies.

CHART 1

In Denmark, the use of AI is highest among the largest companies

Percentage of companies using artificial intelligence

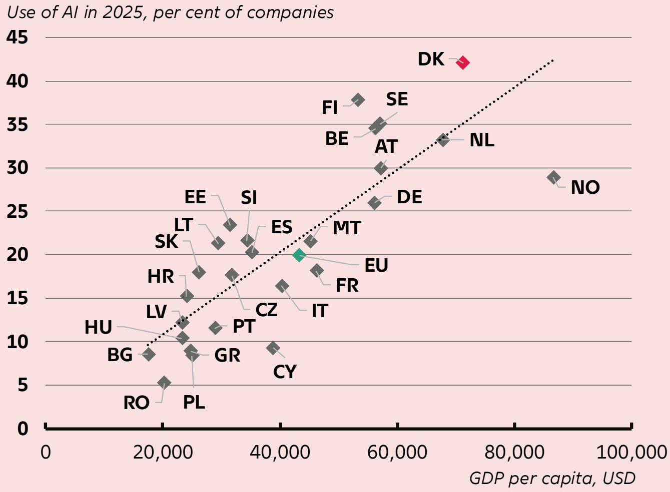


Note: All companies have at least ten employees in the private, non-financial urban industries.
Source: Statistics Denmark.

CHART 2

Denmark is the EU country with the highest number of companies using artificial intelligence

AI usage in companies in relation to GDP per capita



Note: Companies with at least ten employees using at least one AI technology across the economy, excluding agriculture, mining and finance. Ireland and Luxembourg have been excluded from the chart for readability, as their GDP per capita is significantly higher than that of other EU countries. If both countries are included, there remains a positive correlation between GDP per capita and AI use. GDP per capita is for 2024.
Source: Eurostat, IMF and own calculations.

Several companies report positive effects from using AI

There are signs that some Danish companies are already experiencing productivity gains with the help of AI. According to Statistics Denmark (2025a), 70 per cent of the companies surveyed have streamlined their workflows with AI technology, while DI (2025) reports that eight out of ten companies complete their tasks faster with generative AI. In addition to these efficiencies, some companies also report improved earnings, higher product quality, better customer contact and increased creativity in solving tasks.

There are several different ways to use AI and it is possible that the potential for productivity improvements will vary depending on the specific application. For example, more advanced AI solutions can have a greater impact than the readily available standard tools. In 2025, Danish companies mainly used AI for text production and analysis, while fewer used AI technologies for automation, advanced data analysis, or machines that move autonomously, see Statistics Denmark (2025b). According to the Danish Agency for Digital Government (2025), only one in four companies develop their own AI solutions, while the majority purchase standard solutions such as software. This suggests that companies use AI with varying degrees of complexity.

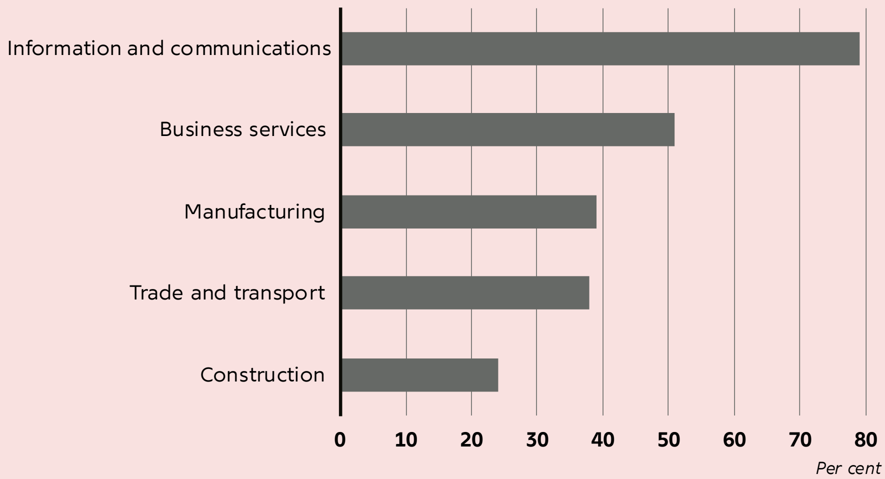
There are big differences in the use of AI across industries

The use of AI technology varies significantly across industries. For example, the information and communication sector has embraced AI much more than the construction industry, see chart 3. This shows that large productivity gains for specific tasks in individual sectors are not necessarily transferable to the whole economy. Several studies have investigated possible sector differences in AI adoption. Filippucci et al. (2025b), for example, suggests that AI will particularly boost productivity in knowledge-intensive industries such as professional services[2], IT, publishing, media and finance, while the effect is expected to be smaller in agriculture, mining, hotels, restaurants and construction, among others. A common feature of several of the latter industries is that they involve a degree of manual labour. Felten et al. (2021) has also developed an AI exposure measure that indicates that industries such as finance, accounting, insurance and legal services are among the most exposed to AI technology. In Denmark, AI has also become widespread in the financial sector. For example, a study from the Danish Financial Supervisory Authority (2024) shows that around 60 per cent of Danish financial companies used AI in 2024 for fraud prevention, marketing and customer service.

CHART 3

Information and communication uses AI more than construction in Denmark

Proportion of companies using artificial intelligence in 2025



Note: The chart shows industries in the private, non-financial urban industries.
Source: Statistics Denmark.

Denmark is well-positioned to benefit from artificial intelligence

Several factors indicate that the Danish economy is well-positioned to take advantage of the opportunities offered by AI, including a flexible labour market, a high level of education, and extensive digitalisation of the public sector.
The IMF's AI Preparedness index also indicates that Denmark is one of the countries best positioned to utilise the economic potential of AI, see chart 4. The index consists of 28 selected indicators that are considered relevant for the implementation of AI, see Cazzaniga et al. (2024) for more information. These are organised into four categories: digital infrastructure, innovation and economic integration, human capital and labour market policies, and regulation and ethics. Denmark's high AI preparedness score is partly due to a high sub-score on digital infrastructure. Specifically, the IMF index is based on indicators such as internet usage, science graduates, wage flexibility, research expenditure, tariffs[3]

[2] Professional services include consulting and advisory services in areas such as law, accounting and engineering.
[3] The technical documentation behind the IMF index (2024) argues that low tariffs promote trade and economic integration, which is important for accessing global AI technologies and knowledge.

and public sector efficiency. It does not say anything specific about the AI environment in a country, but gives an overall indication of the technology's general framework conditions.

In addition to the IMF AI Preparedness Index, Stanford University has developed a tool that measures and compares AI capabilities across countries. It differs in that it is based more on AI-specific indicators rather than on broader measures of technological framework conditions, such as the number of scientific publications in AI, AI patents, model development, AI investments, the establishment of AI companies and computing capacity, see Stanford University (2025) for more information. According to this index, the Danish AI ecosystem ranks slightly lower than in the other Nordic countries, see chart 5. For example, Sweden outperforms Denmark in investments in AI companies and supercomputers.[4] Luxembourg tops the ranking, reflecting factors such as the scaling of indicators by population size and a large net inflow of employees with AI skills, which is also included in the calculation. If one looks at the indicators behind the index in absolute size instead, the US is the leading AI nation. This is partly due to the positive interaction between universities, technology companies and investors in the San Francisco area, which is one of the world's most productive innovation clusters according to a ranking by the UN World Intellectual Property Organisation (2025).

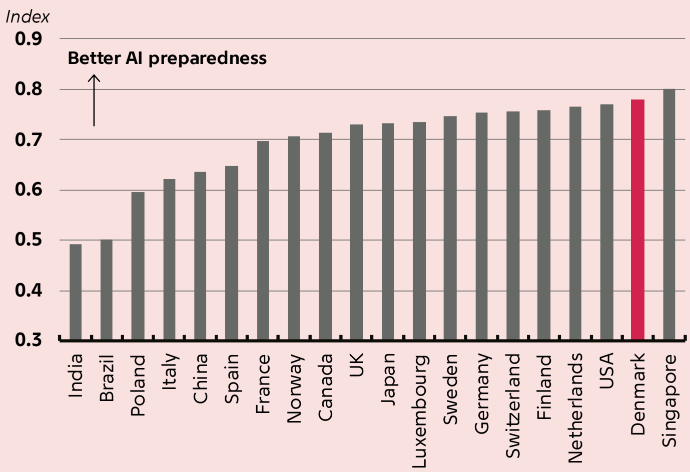
In addition to the aforementioned framework conditions, access to sufficient and skilled labour is crucial if AI is to realise its potential to drive productivity improvements.

Denmark ranks second in the world on the IMF's AI Preparedness Index

CHART 4

Denmark is well-positioned to benefit from AI, according to an IMF index

IMF AI Preparedness Index

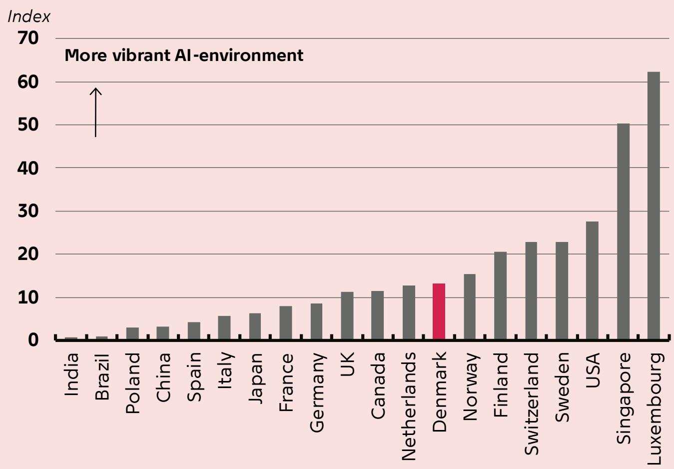


Note: The chart shows 20 selected countries. Denmark ranks second out of 174 countries in the overall ranking. The index is measured on a scale from 0-1.
Source: IMF.

CHART 5

Calculations from Stanford University show that Denmark is at a slightly lower level than the other Nordic countries in AI

Stanford AI Global Vibrancy Tool



Note: The chart shows 20 selected countries. Denmark ranks 13th out of 36 countries in the overall ranking. The index is based on 23 sub-indicators that are weighted together and measured on a scale from 0-100. It is shown here in a version calculated relative to population size.
Source: Stanford University Institute for Human-Centered AI.

[4] The Stanford University calculation is based on the number of supercomputers in the Top500 (2025) ranking of the most powerful computers in the world. There is one Danish computer in the ranking, while Sweden has eight. However, the difference between Denmark and Sweden is reduced when we measure total computing power, taking into account that some computers have more capacity than others.

Investment in AI is higher in the US than in Europe

Investing in various forms of physical and digital infrastructure is crucial for AI to eventually boost productivity in the economy. The value chain behind AI thus spans a wide range – from the production of microchips to the building of data centres, the development of advanced models trained on large amounts of data, and the production of software that can be used by end users. Some of these steps also require considerable energy consumption[5], research and new human skills. Therefore, AI investments encompass many different activities and there is no universal definition in, for example, national accounts. For some companies, it will be possible to reap productivity gains from AI by entering into licence agreements with software providers rather than having to make large investments in physical IT equipment for their own AI software development.

In the US, investments in AI-related categories such as computer equipment, software and data centres have increased significantly in recent years, see chart 6.[6] The data behind the chart covers investments in all parts of the economy, not just technology companies. Investments in computer equipment and software have increased significantly more in the US than in the EU and Denmark over many years.[7] These previous investments in IT have probably helped create a solid foundation for the current US AI environment. Fonteneau et al. (2025) estimates the level of AI investment at around 2 per cent of GDP in Denmark in 2023, which is higher than in several EU countries, see chart 7. The AI investment figures for EU countries in chart 7 are not directly comparable to the AI-related investments for the US, partly because not all investments in chart 6 are in AI. Fonteneau et al. (2025), however, also attempts to map the scale of AI investment in the EU and US using an identical definition that is less comprehensive than the data behind chart 7.[8] In this alternative estimate, AI investment in the US is estimated to be 1.2 per cent of GDP in 2023, while it was only 0.7 per cent of GDP in the EU. This indicates that American investments in AI exceed those in Europe.

In addition to real economic investment, the AI transition requires access to capital. Globally, financial investments in AI companies in the form of IPOs, mergers, acquisitions and in private markets totalled approximately USD 252 billion (0.2 per cent of GDP) in 2024, more than doubling in five years, see Maslej et al. (2025). This amount covers regional differences, with access to funding being greater in the US than in the EU.[9] This is especially true for venture capital. According to the OECD (2026), the US has attracted approximately USD 580 billion in venture capital for AI companies in 2021-25, compared to just under USD 76 billion in the EU. This corresponds to an annual average of 0.4 per cent of GDP in the US and 0.1 per cent of GDP in the EU. In comparison, annual AI

[5] For example, AI model development takes place in large and power-consuming data centres. According to the International Energy Agency, IEA (2025), data centres accounted for approximately 1.5 per cent of global electricity consumption in 2024. This covers regional differences, with data centres accounting for just over 4 per cent of electricity consumption in the US and just under 2 per cent in Europe. The IEA estimates that global electricity consumption from data centres will double by 2030, mainly due to the US.
[6] The data centre investments in chart 6 only include data centre construction. Aldasoro et al. (2026) estimates that investments in associated IT equipment for data centres are three times higher than investments in construction. As a result, they estimate that US investments in data centres total 0.5 per cent of GDP. IT equipment is included as a separate category in the chart.
[7] For example, Haag (2025) finds that annual real US investments in software, databases, and computer equipment increased more than tenfold from 1995 to 2021, while they increased by three to fourfold in Germany and France. A similar calculation for Denmark, based on the EUKLEMS database (2025), shows that annual real investment in software, databases, and computer equipment has increased more than sixfold in the same period.
[8] The alternative calculation of AI investments includes computer equipment, research and development, software and databases, and telecommunications equipment. In Fonteneau et al. (2025), AI investments are stated in millions of euros, while here they are converted to per cent of GDP.
[9] For example, AI companies attracted USD 109 billion in investments in the US (0.4 per cent of GDP) compared to just over USD 19 billion in the EU (0.1 per cent of GDP) when focusing solely on the volume of private financial investments, see Maslej et al. (2025). In Denmark, investments in AI companies totalled just over USD 130 million in 2024 (0.03 per cent of GDP), see Stanford University (2026).

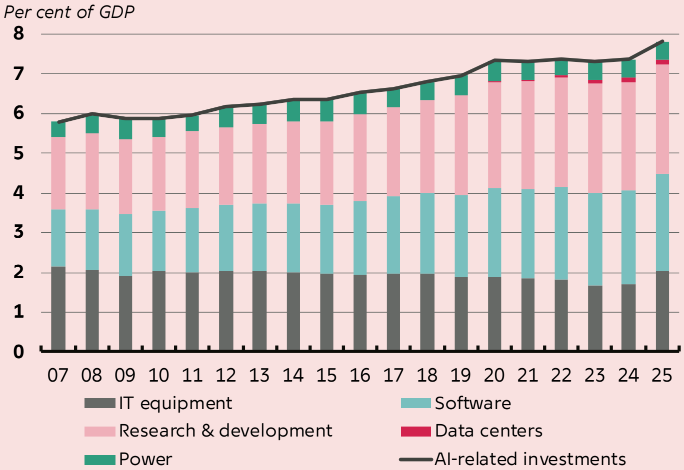
venture capital investments in Denmark averaged 0.1 per cent of GDP during the same period, while in Sweden it was 0.4 per cent of GDP.

Not all investments prove to be profitable or contribute to higher productivity over time. Investing in AI also involves an opportunity cost, as the resources could have been used for other productivity-enhancing purposes. The significant increase in AI-related investments and high valuations indicate very positive expectations for the technology's potential. Even if current expectations are corrected, it is still possible that AI will increase productivity.

CHART 6

In the US, private investment in AI-related activities has increased

AI-related investments in the US

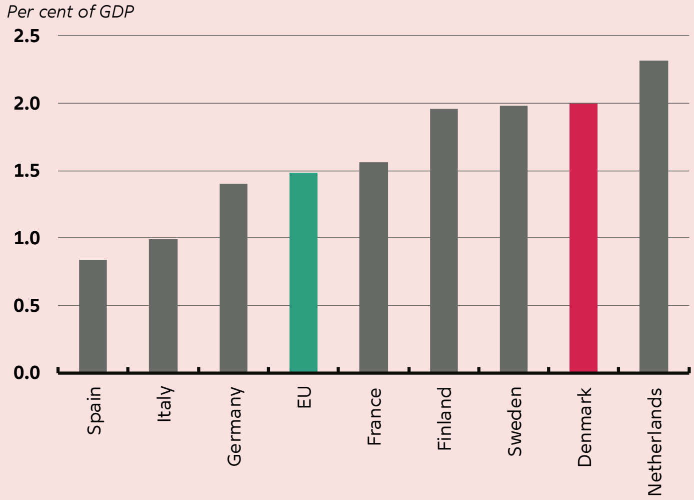


Note: The chart shows private-sector investments in current prices. Not all investments in the categories shown are in artificial intelligence. Data centres only include data centre construction.
Source: Macrobond, BEA and own calculations.

CHART 7

There are signs that investments in AI are higher in Denmark than in other EU countries

AI investments in EU countries by 2023



Note: AI investments are approximated by scaling data for investments in human skills, research and development, data and equipment, and intellectual property with an AI intensity coefficient based on, among other things, the share of AI patents in a country.
Source: Fonteneau et al. (2025), Eurostat and own calculations.

03

Studies predict AI will boost productivity, but by how much is uncertain

As illustrated in part 2, many companies have adopted AI tools in recent years. Part 3 of the analysis reviews the results from several international studies investigating the impact of increased AI adoption on productivity. Overall, the studies predict that AI will contribute positively to productivity growth in the economy as a whole in the coming years. However, the magnitude of the effect is uncertain and varies across countries. It is also uncertain when AI will actually affect productivity figures in the national accounts. Productivity gains are generally achieved by freeing up resources in the economy. This means that some jobs may be lost, but experience shows that new jobs are created elsewhere in the economy.

Large productivity gains for specific task types in specific industries cannot be directly transferred to the economy as a whole

Microeconomic studies have shown a number of examples of large effects on productivity and costs when using artificial intelligence for certain types of tasks in specific industries. For example, Brynjolfsson, Li and Raymond (2025) found a 15 per cent increase in productivity at a large US company after an AI conversational assistant was introduced to staff in customer service roles in a 2020-21 trial. As another example, Cihon et al. (2023) found in a 2022 experiment that programmers with access to an AI tool could complete their tasks 56 per cent faster, and Cui et al. (2025) found in experiments in 2022-23 a 26 per cent increase in the productivity of software developers at large US companies if they were given access to an AI tool.

However, care must be taken not to directly transfer such results from specific task types in specific industries to the economy as a whole. For some task types, AI has limited or no positive productivity effects.[10] In 2023-24, Humlum and Vestergaard (2025) conducted a broad survey of the use of AI chatbots among 25,000 Danish employees across 11 job types and 7,000 workplaces. They found that there was only a modest effect on productivity with an average time saving of 2.8 per cent. In another representative survey from the US in 2024 with around 10,000 respondents, Bick, Blandin and Deming (2025) found an average time saving of 1.4 per cent when using AI tools.

AI will increase productivity in the economy as a whole, but by how much is uncertain

There are a number of studies that suggest how macro productivity will be affected by AI in the coming years, see table 1.[11]

[10] Candelon et al. (2023) talks about a jagged technological frontier, meaning that some tasks are easy to streamline with AI, while others cannot be streamlined with AI. The study finds that errors are more likely to occur when AI is applied to tasks beyond the technological frontier.
[11] The studies operate with two different types of productivity growth: Labour productivity growth and total factor productivity growth. Labour productivity growth is an increase in production for a given labour input. This means that more can be produced for a given labour input, measured in terms of the number of employees or working hours. Total factor productivity indicates how efficiently companies utilise the total input of factors of production, so growth in total factor productivity is an increase in output for a given input of all factors of production. The growth in total factor productivity thus indicates the part of the growth in labour productivity that cannot be attributed to increased input of other production factors, e.g. increased capital stock or an increase in the educational level of the workforce.

When examining the impact of AI on productivity, it is important to distinguish between a one-off impact on productivity levels over a number of years and a sustained impact on productivity growth. Many studies examine a one-off effect on productivity levels assumed to occur over a ten-year period. However, Baily, Brynjolfsson and Korinek (2023) also include the productivity growth impact of AI's supposed positive effect on innovation. In table 1, all estimates are converted to average annual contribution to productivity growth in percentage points to make the results from the different studies as comparable as possible.

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Studies point to a 0.1-1.2 percentage point increase in annual growth in total factor productivity as a result of AI

TABLE 1

Wide variation in assessing the impact of AI on economy-wide productivity growth

Study	Labour productivity	Total factor productivity	Period	Country
Baily, Brynjolfsson and Korinek (2023)	1.8-2.8	...	Next ten years	USA
McCrory and Tamkin (2025)	1.8	1.1	Next ten years	USA
Briggs and Kodnani (2023)	1.5	...	Ten years after widespread adoption	USA
Filippucci et al. (2025a, 2025b)	0.2-1.3[2]	...	Next ten years	G7
Aghion and Bunel (2024)	0.8-1.3	0.1-1.2[1]	Next ten years	USA
Bontadini et al. (2025)	0.3-1.0[2]	...	Long term	USA and Europe
Chui et al. (2023)	0.1-0.6	...	Towards 2040	Global economy
Bergeaud (2024)	...	0.3	Next ten years	The euro area
Misch et al. (2025)	...	0.1-0.5[2]	Next five years	31 European countries
Acemoglu (2024)	...	0.1	Next ten years	USA

[1] In addition to this range, 0.7 percentage points is given as the central estimate.
[2] The range shows the variation in preferred estimates across countries.
Note: All figures are converted to average annual contribution to productivity growth in percentage points. Labour productivity growth is the increase in production for a given labour input. Total factor productivity growth is the increase in production for a given input of all factors of production.
Source: See the literature references.

The estimates from the studies range from very modest to substantial effects on productivity growth due to AI. Specifically, the studies point to an increase in annual labour productivity growth in the range of 0.1-2.8 percentage points and an increase in annual total factor productivity growth in the range of 0.1-1.2 percentage points. To put the figures into perspective, according to figures from Statistics Denmark, annual labour productivity growth in Denmark has averaged around 1.3 per cent over the past five years, while total factor productivity growth has been around 0.5 per cent. Thus, according to some estimates, AI has the potential to contribute significantly to future productivity growth. Yet, according to other estimates, AI will contribute only a small positive amount to productivity growth.

The studies do not directly address whether increased resources for AI development come at the expense of investments in other technologies, resulting in fewer productivity gains.

Several studies use the task-based approach to calculate productivity effects from AI

The impact of AI on macro productivity is a complex process, and many assumptions must be made to quantify the magnitude of the effect. AI can be used to streamline existing workflows and help develop new areas of work. This complexity helps to explain the wide range of estimates of the productivity gains from AI.

For example, many of the studies are based on the so-called task-based approach in Acemoglu (2024). In this approach, the effect on total factor productivity over a given period is found as a product of four factors: (1) the proportion of tasks in the economy that are exposed to AI; (2) the proportion of exposed tasks that are profitable to make more efficient with AI; (3) the average percentage savings in labour costs in cases where AI is introduced; and (4) the share of labour costs in value added in the economy.

Based on a literature review, Aghion and Bunel (2024) illustrate the uncertainty involved in estimating the productivity impact of AI using the task-based approach by providing ranges for key parameters in the calculation. The proportion of jobs in the US economy exposed to AI is 18.5-68 per cent. The proportion of AI-exposed jobs for which it is profitable to introduce AI is between 23 and 80 per cent. The average labour cost savings when AI is introduced are in the range of 27-40 per cent. Uncertainty about the magnitude of these key parameters can give rise to large differences in the estimated productivity gains from AI. If it is assumed that the productivity gains from AI come over a ten-year period and that labour costs account for 57 per cent of value added in the economy, the average annual contribution of AI to total factor productivity growth will be 0.1 percentage points if the most pessimistic central parameters are used in the calculation. The contribution to productivity growth is as high as 1.2 percentage points if the most optimistic central parameters are used.

Past inventions can also give an indication of the benefits of AI

Another way to estimate the productivity gains of AI is to compare it to the broad technological advances of the past. For example, Aghion and Bunel (2024) assess the impact of AI on labour productivity based on the introduction of electricity in Europe in the early 1900s and digitalisation in the US in the 1990s and early 2000s. Based on these, they estimate that AI will contribute 0.8-1.3 percentage points to annual labour productivity growth.

The task-based approach is based on the automation of existing work tasks. One reason for differences between results from the task-based approach and certain other approaches is that AI does not only enable efficiency gains from existing work tasks, as assumed in the task-based approach. AI can also boost future innovation, positively impacting productivity growth. Employees do not just become more efficient at doing their current job. They also become more inventive and better at developing new products. Including such effects is one of the reasons for the very high estimate of AI's impact on labour productivity in Baily, Brynjolfsson and Korinek (2023).

Wide variation in productivity gains across countries

In general, the studies show that the productivity gains from AI can vary widely across countries. For example, Misch et al. (2025) in a study of 31 European countries found the largest productivity gains for countries such as Denmark, Switzerland, Luxembourg and Norway (contributions from AI of 0.4-0.5 percentage points to annual total factor productivity growth), while the smallest gains are found for Romania, Bulgaria, Poland and Hungary (contributions of around 0.1 percentage points). The difference reflects that employers in high-income countries have greater incentives to invest in AI and that in high-income countries, there is generally a higher proportion of work tasks that can benefit from AI. Furthermore, Luxembourg has a large financial sector with strong potential to benefit from AI.

Productivity gains are achieved by freeing up resources in the economy – some jobs may be eliminated, and others may have a different content

AI will displace some jobs while creating new ones. Productivity gains and the associated increase in prosperity arise precisely because resources are freed up that can be used elsewhere in the economy. This does not mean that there will necessarily be fewer jobs in the economy as a whole in the long run. Total employment in Denmark has never been higher than it is now, despite repeated technological shocks over the past 150 years. This is because productivity gains lead to higher demand in the economy through higher wages and company profits, increased investment and lower prices. Technical progress has therefore not been shown to lead to lower employment in the long term. However, in the short term, AI may require adjustments in the labour market.

Brynjolfsson, Chandar and Chen (2025) find evidence that employment in the US has declined in recent years among young people in occupations with high AI exposure relative to employment among young people in occupations with low AI exposure[12], but it is uncertain to what extent this development can be attributed to increased use of AI. Iscenko and Millet (2026) thus point out that the relative decline in employment for young people in jobs with high AI exposure was a trend that began before ChatGPT emerged, and that the development is due to this type of labour being hit particularly hard by the tight monetary policy that took effect during the same period.

Some studies on European data find that the use of AI is associated with increased employment, partly because higher productivity allows companies to expand their business and demand more labour. For example, Aghion et al. (2025) conclude that employment increased more in French companies when they used AI than if they did not. Albanesi et al. (2023) also points out that in 16 European countries, employment has risen more in occupations exposed to AI. However, both studies are based on data prior to the rollout of generative AI in 2022, so their conclusions are not necessarily transferable to the situation in the coming years.

Renault (2025) has attempted to estimate the potential effects of AI on the Danish labour market. The study finds that around 21 per cent of Danish employment consists of jobs at risk of disappearing due to automation driven by AI. The scope roughly corresponds to the results of similar calculations for other Nordic and European countries. The jobs at risk of disappearing are mainly administrative jobs in the private and public sectors.

By contrast, the study finds that around 36 per cent of employment in Denmark has very little exposure to AI. These include employees in agriculture, construction, hospitality and personal services. Around 43 per cent of employment in Denmark consists of jobs where the work content can be changed by AI. These include jobs in the education and research sectors, the healthcare sector, and some in business services.

The risk of job losses due to AI highlights the need for a flexible labour market with ample opportunities to change jobs, retrain, and receive support during short periods of unemployment if the productivity gains from AI are to be recouped without high adjustment costs. These are all key elements of the Danish flexicurity model, which makes it easier for the economy to adapt to technological change.

[12] Atkinson and Yamco (2026), using an alternative dataset, also find a relative decline in employment among young workers in the US in the sectors most exposed to AI in recent years.

AI may affect different population groups differently

The distributional impact of AI adoption is still uncertain. On the one hand, AI can reduce wage inequality by displacing high-paid labour that is initially more exposed to the technology, see Rockall et al. (2025). On the other hand, high-paying jobs are often more complementary to AI than low-paying jobs, meaning they can better utilise AI as a valuable tool. High-paying jobs typically also contain elements that complement AI technology, such as decision-making or public speaking skills, see Pizzinelli et al. (2023). Therefore, it can be argued that they are less at risk of displacement by automation, even as AI is changing how work is done. In addition, high earners are generally better positioned to benefit from capital gains, for example, through rising technology stock prices.

If some demographics adopt AI technology at lower rates than others, this can be a barrier to realising the full potential of AI-driven productivity gains. Some studies suggest that the gender gap in AI adoption has narrowed in recent years and is now at roughly the same level for both genders, both in Denmark and globally, see Statistics Denmark (2026a) and Chatterji et al. (2025). By contrast, another report from Eurostat (2026) indicates that Danish men were more likely than women to use generative AI in 2025. The younger groups of the population also uses AI somewhat more than the older population, see Statistics Denmark (2026a). A wider adoption of AI across age groups can therefore strengthen the technology's overall contribution to productivity development.

It is difficult to predict when the productivity gains of AI will really impact the economy

Several studies emphasise that it is difficult to predict precisely when the positive effect of increased AI will affect productivity over the coming years. There is also a discussion of whether there is a J-curve effect, whereby productivity drops in the short term as employees get used to new AI tools.

Compared to broad technological advances of the past, such as electricity, there may be reason to expect the productivity effects of AI to have a more rapid impact on the economy, see Aghion and Bunel (2024) and Lagarde (2025). This is because a large part of the productivity gains from AI can be realised with existing capital equipment, such as computers, whereas investment in machines with electric motors, etc., was required before the productivity gains from electricity could be realised. Generative AI has also been adopted faster than the internet was when it emerged in the 1990s, see Bick, Blandin and Deming (2025).

Measuring productivity gains from AI can be difficult

Some studies discuss whether there may be measurement issues in capturing all the productivity gains of AI in national accounts, see Baily, Brynjolfsson and Korinek (2023).[13] It is well known that measuring and incorporating quality improvements in real terms into national accounts can be difficult, and this is particularly challenging in the context of knowledge work, which is very much a part of the economy that can benefit from AI. Official productivity figures may therefore underestimate real productivity growth in the coming years.

Furthermore, some of the efficiency gains from AI will come in the non-market part of the economy, which is not included in the national accounts GDP figures, see Waller (2025). For example, being able to write a wedding speech or plan a holiday faster with the help of an AI tool frees up time that can be spent on other pleasures.

[13] The Solow paradox has been discussed, which refers to Solow (1987), who noted in the mid-1980s that the computer age could be seen everywhere except in productivity statistics.

AI may also have some negative side effects

From a broader societal perspective, AI may have negative effects on productivity development.

If large parts of the AI value chain are concentrated in a few mega-companies, it can limit competition and inhibit the emergence of new innovative companies. This can eventually reduce the productivity gains that AI would otherwise contribute, see Aghion and Bunel (2024).

It has also been discussed whether there is a risk that the use of AI tools over time may have negative consequences for the user's learning ability or cognitive abilities more generally, see the literature review in Gerlich (2025).

Del Rio-Chanona, Laurentsyeva and Wachs (2023) have pointed out that the rise of AI tools has severely affected online "question and answer forums" such as "Stack Overflow", where users can get help from each other to solve programming problems. Users are no longer so willing to help each other – they ask an AI tool for advice instead. AI has thus had negative consequences for open digital public resources such as Stack Overflow. This may have implications for the development of future AI tools, which can no longer be trained on such online forums with the same good results, as the information content of these forums has been significantly degraded. Similar effects could conceivably occur for the volume and quality of information content in online encyclopaedias such as Wikipedia, where users may be less likely to contribute content when they seek information via an AI tool instead, and may also "feed" online encyclopaedias with AI-generated content rather than original, human-generated content.

AI also raises several ethical issues such as data security, privacy and bias concerns, creating a need for public regulation.

04

AI can boost productivity in the Danish economy

Productivity growth in Denmark has been slowing in recent decades. To shed light on the extent to which increased AI use can boost Danish productivity growth in the coming years, this fourth part presents a number of scenario calculations. These calculations are based on the task-based approach previously discussed in part 3, based on international studies. When adapted to Danish conditions, it confirms the impression that AI can boost productivity in Denmark. However, the results are wide-ranging and depend on the assumptions made. If AI significantly complements current productivity growth, it will affect the future course of the Danish economy, such as capacity pressure and inflation.

Scenario calculations indicate that AI can increase productivity in the Danish economy

The starting point for the scenario calculations is the approach in Bergeaud (2024), which produces country-specific estimates of the productivity impact of AI by adapting two parts of the task-based approach, as described in part 3. The two parts are the proportion of tasks in the economy that are exposed to AI and the share of labour costs in value added, respectively. However, the proportion of exposed tasks that are profitable to replace with AI and the average labour cost savings are assumed to be similar across countries, i.e. they are calibrated based on existing studies.

A key step in the scenario calculations is to determine the share of AI-exposed work tasks in Denmark. This share is estimated using Felten et al. (2023)'s indicator for AI-exposed jobs on the Danish employment structure by job function, see box 2 for a more detailed explanation of the calculations. Overall, the calculations indicate that 39-61 per cent of work tasks in Denmark are exposed to AI advances, depending on the chosen threshold for the indicator.[14] This is complemented by two findings from the literature review in part 3. As previously mentioned, Aghion and Bunel (2024) estimated from a review of previous microeconomic studies that the proportion of AI-exposed tasks for which it is profitable to introduce AI is in the range of 23-80 per cent. Furthermore, they found that, on average, 27-40 per cent of labour costs can be saved when AI is introduced. Finally, labour costs accounted for 51 per cent of value added in Denmark in 2024[15], and the effect on productivity is assumed to occur over a ten-year period in line with the norm in the literature.

Based on the above assumptions, the scenario calculations indicate that AI can boost annual total factor productivity growth in the Danish economy by 0.1-1.0 percentage points, see chart 8. The wide range emphasises that the effects are associated with great uncertainty. For example, the upper estimate reflects a possible outcome based on the most optimistic assumptions from the literature review in Aghion and Bunel (2024), while the lower estimate is based on the most pessimistic. The upper estimate assumes that 61 per cent of the Danish economy is exposed to AI, that it would be profitable to replace 80 per cent of the tasks in this part of the economy with AI technology, and that savings of 40

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Scenario calculations indicate that AI can increase total factor productivity growth in Denmark by 0.1-1.0 percentage points

[14] This is similar to Renault's (2025) results, which, in a similar calculation, find that more than 60 per cent of Danish employment is exposed to AI.
[15] When the share of labour costs in value added is included in the calculation, it is possible to obtain an estimate of total factor productivity growth, as studies of efficiency gains from AI at the task level are typically interpreted as labour productivity gains.

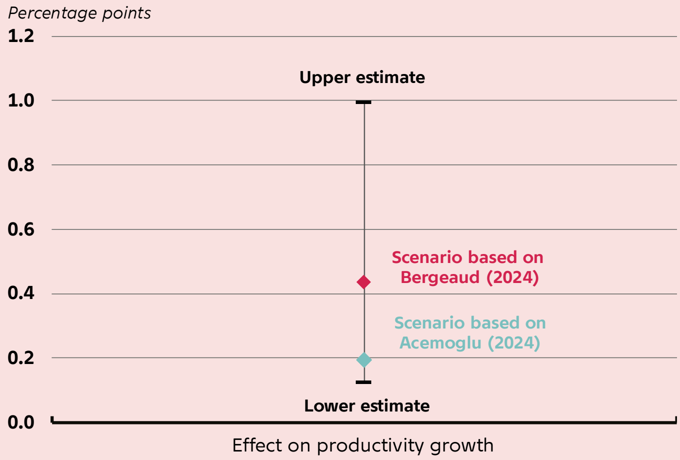
per cent of labour costs are achieved on average. Similarly, the lower estimate assumes that 39 per cent of the Danish economy is exposed to AI, that it would be profitable to replace 23 per cent of the tasks in this part of the economy with AI technology, and that savings of 27 per cent of labour costs are achieved on average. [16]

If the calculation is based on the assumptions in Acemouglu (2024), the effect on annual productivity growth falls at the lower end of the range, whereas it is 0.4 percentage points when using the assumptions in Bergeaud (2024). The results should be seen in the context that the average growth in Danish total factor productivity has been around 0.5 per cent over the past five years, see chart 9. This suggests that AI could provide a significant boost to productivity growth in Denmark, although estimates vary widely and depend on assumptions. A number of previous analyses also indicate that AI can positively affect productivity growth in Denmark. [17]

CHART 8

Scenario calculations indicate that AI can increase productivity

Scenarios for the contribution of AI to annual total factor productivity growth in Denmark



Note: In the *upper estimate*, 61 per cent of work tasks are AI-exposed, and the estimate uses the most optimistic estimates from the literature review in Aghion of Bunel (2024). In the *lower estimate*, 39 per cent of work tasks are AI-exposed, and the estimate uses the most conservative estimates from the literature. The scenarios indicated with dots are based on the assumptions in the respective studies and an AI exposure rate of 61 per cent. All scenarios use a pay ratio of 51 per cent.
Source: Own calculations based on Felten et al. (2023), Bergeaud (2024), Acemoglu (2024), Statistics Denmark and Bureau of Labour Statistics.

CHART 9

Productivity growth in Denmark has slowed in recent decades

Annual productivity growth in Denmark

Note: Five-year rolling average. Relates to the market-based part of the economy. Labour productivity growth rates are based on real gross value added per hour.
Source: Statistics Denmark.

Whether such productivity gains materialise depends on how AI technology develops in the coming years and on whether AI use continues to grow in society. This makes it difficult to determine whether the effects are gradual or

[16] The lower estimate is calculated as (0.39 x 0.23 x 0.27 x 0.51) / 10 = 0.1 percentage points. Similarly, the upper estimate is calculated as (0.61 x 0.80 x 0.40 x 0.51) / 10 = 1.0 percentage points.
[17] Misch et al. (2025), for example, estimates that AI can increase annual Danish productivity growth by 0.4 percentage points. In addition to this preferred estimate, a number of sensitivity calculations indicate an annual effect for Denmark in the range 0.0-0.8 percentage points. McKinsey & Company (2023) estimates that automation with generative AI can increase annual Danish productivity growth by 0.3-0.7 percentage points from 2022 to 2040.

more sudden. If the spread of AI not only streamlines the production of existing goods and services but also fuels the development of new, groundbreaking ideas, the actual productivity effects may differ from the calculations that focus on potential gains from increased automation.

AI can influence the future course of the Danish economy in several areas

Productivity growth requires the production of goods and services to continuously become more efficient as a result of new technological advances. In this context, it remains uncertain whether the positive productivity effects of AI can simply be added to productivity growth elsewhere in the economy. This is not necessarily the case if increased resources for AI development come at the expense of other investments, resulting in fewer productivity gains.

Due to uncertainty about the size and timing of the potential productivity effects, Danmarks Nationalbank does not include a separate contribution from AI in its latest three-year forecast for the Danish economy.

If AI significantly complements current productivity growth, it will affect the future course of the Danish economy. Higher productivity growth increases potential growth because companies can produce more with the same resources, reducing capacity pressure for a given demand. However, in the short term, the AI transition also requires more investment, which can pull in the opposite direction. The overall effect on capacity pressure is therefore not clear-cut in the coming years, as it depends on the timing between AI-driven demand and realised productivity gains.

As discussed in part 3 of this analysis, AI technology is likely to drive productivity gains by replacing some types of labour with greater automation, while increasing the demand for other types of jobs. While the short-term net effect of AI on labour demand is uncertain, experience shows that overall employment has historically increased despite repeated technological change. Since the introduction of generative AI in late 2022, total Danish employment has grown at a solid pace. However, employment in some AI-exposed jobs has decreased from 2022 to 2024, for example, in translation, while it has increased among software developers[18]. In a situation with low unemployment, AI can help alleviate labour shortages in some industries. In other parts of the economy, however, the potential is more limited. For example, the construction industry has reported more widespread labour shortages than manufacturing and service industries in recent years, while also being one of the industries with the lowest levels of AI adoption, see chart 3.

AI also has diverse effects on the inflation outlook. If the estimated productivity gains materialise as calculated in this section, they will dampen unit costs for companies and put downward pressure on prices. However, this may be partly offset by the AI transformation, which is pushing up energy prices as the use of data centres increases electricity demand.

AI can also leave its mark on the natural real interest rate, which influences whether monetary policy is tight or loose. To the extent that AI boosts productivity, it can increase the natural real interest rate as a result of more investments. At the same time, AI may have distributional consequences that affect global savings behaviour. For example, concentrating the gains from AI in the hands of few individuals with a low propensity to consume can increase savings and thus dampen the natural real interest rate.

[18] According to Statistics Denmark (2026b), employment in *Software Development* has increased 14 per cent from 2022 to 2024, while employment in *Translation and other linguistic work* has decreased 23 per cent. In both cases, this is an acceleration of a longer-term trend. Therefore, factors other than generative AI may also have affected employment development since 2022.

Analyses have indicated that Denmark potentially gains more productivity from AI than other European countries, see Misch et al. (2025). In practice, such calculations are so uncertain that it is currently impossible to determine whether AI leads to asymmetric effects between Denmark and other countries in areas such as competitiveness and inflation differentials relative to the euro area.

BOX 2

How much of the Danish economy is exposed to AI?

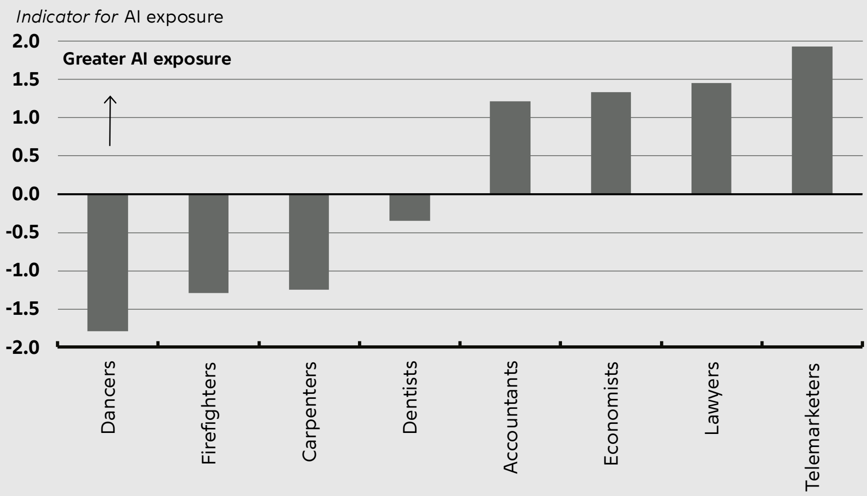
The calculation of how much of the Danish economy is exposed to AI is based on the results from Felten et al. (2023). This study develops an indicator to assess the extent to which different jobs are exposed to advances in AI language modelling capabilities. An indicator value is estimated for the exposure of 774 specific jobs to AI by linking ten specific applications of AI, such as reading comprehension and speech recognition, with 52 competences, such as mathematical reasoning or physical strength. This is based on a questionnaire in which freelance workers on the crowdsourcing marketplace Amazon Mechanical Turk answered whether an AI application can be used for a given competence. This gives each competency an individual AI exposure score, calculated as the sum of the ratings across the 10 AI applications. For example, competences such as memory and information processing are more exposed to AI than physical strength, see Felten et al. (2021). The AI exposure indicator value for each job is then calculated by weighting the importance of each of the 52 competencies for that job, defined by a scale in the O*NET database from the US Department of Labor. For example, the data suggests that telemarketers are more exposed to AI than carpenters, see chart 10. Even if one job is more AI-exposed than another, it does not necessarily mean that AI will displace more of these types of jobs. This reflects the fact that technology can be labour-saving and labour-augmenting. AI technology is also developing rapidly, and some jobs that are not currently AI-exposed may become so in the future.

Some additional steps have been taken to calculate the share of AI-exposed work tasks in Denmark. The AI exposure indicator from Felten et al. (2023), firstly, does not provide an actual threshold for whether a job is AI-exposed or not. Therefore, a job is classified as AI-exposed in this analysis if its indicator exceeds the mean value for all jobs. This follows the approach in Bergeaud (2024). In an alternative scenario, a job is considered AI-exposed if it is in the top quartile of the most AI-exposed jobs. Secondly, the indicator for AI exposure in Felten et al. (2023), is calculated according to an American standard job classification (SOC), which differs from the international standard job classification (ISCO-08) used in the EU and Denmark. A link between these different job classifications has therefore been created using a transition table from the US Bureau of Labor Statistics. Finally, data from Statistics Denmark on employment by job function was used to calculate the proportion of Danish employment exposed to AI.

Chart 10

Some jobs may be more exposed to AI than others

AI exposure indicator



Note: The chart shows selected industries. Telemarketing includes customer contact centres. The indicator is standardised to have a mean of zero across jobs and a standard error of one.
Source: Felten et al. (2023).

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