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The €100 billion economic opportunity of generative AI in Central Eastern Europe

Capturing the next wave of benefits from *generative* AI

An Implement Consulting Group study commissioned by Google

May 2024

The Central and Eastern Europe (CEE) region

Ten countries with a combined population of 100 million people, representing 11% of the EU's GDP.

- The Central and Eastern European region (CEE) consists of ten countries in the EU: Slovenia, Lithuania, Latvia, Czechia, Croatia, Hungary, Slovakia, Poland, Bulgaria and Romania.
- The CEE region is home to close to 100 million people (22% of the EU population).
- Economically, the combined GDP of the CEE region is €1.8 trillion (11% of the EU GDP).
- Digitally, the CEE countries are around or below the EU average measured by the DESI Index.

Central Eastern European countries

Slovenia
#11 in DESI in 2022

Lithuania
#14 in DESI in 2022

Latvia
#17 in DESI in 2022

Czechia
#19 in DESI in 2022

Croatia
#21 in DESI in 2022

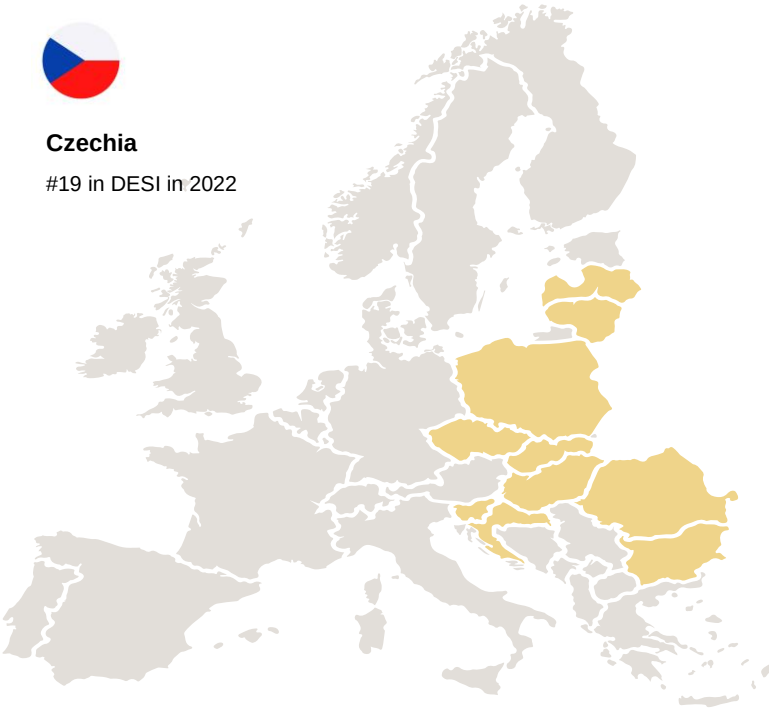
Hungary
#22 in DESI in 2022

Slovakia
#23 in DESI in 2022

Poland
#24 in DESI in 2022

Bulgaria
#26 in DESI in 2022

Romania
#27 in DESI in 2022



Note: Implement Economics based on Eurostat and the European Commission.

Generative AI has the potential to boost GDP by €100 billion across the CEE region

The ease of use of generative AI presents CEE with an opportunity to make a technological leap. It will require more digital skills and investment in innovation.

The economic opportunity

Generative AI technology is developing fast. In the most advanced countries, the economic contribution could peak in as little as ten years.

Around ten years from now, generative AI alone could boost CEE's annual GDP by

€90-100 billion

+5% GDP

annual contribution in around ten years if CEE achieves widespread adoption of generative AI.

Gains come from three sources …

Productivity boost from people working with generative AI.

Freed-up time when generative AI helps to automate our work.

Re-prioritised and re-employed time for other value-creating activities.

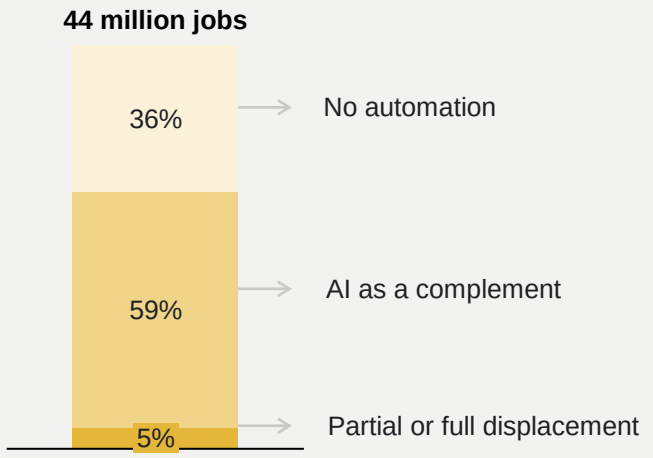
The job implications

59% of jobs in CEE are estimated to work **together with** generative AI.

45% of companies in CEE expect **significant productivity impacts** from generative AI on their business in the next five years.

Share of jobs exposed to automation by generative AI

% of total employment in CEE



If CEE can leverage the potential gains from generative AI, the vast majority of the workforce stands to benefit.

New jobs in the AI-powered economy are expected to replace those lost due to automation, resulting in unchanged employment levels. The highly exposed jobs represent only 8-15% of the expected level of job changes in CEE.

The transition is expected to be gradual, allowing workers time to adapt to new tasks and develop new skills.

CEE can capture the benefits of AI by investing in skills and supporting local innovators

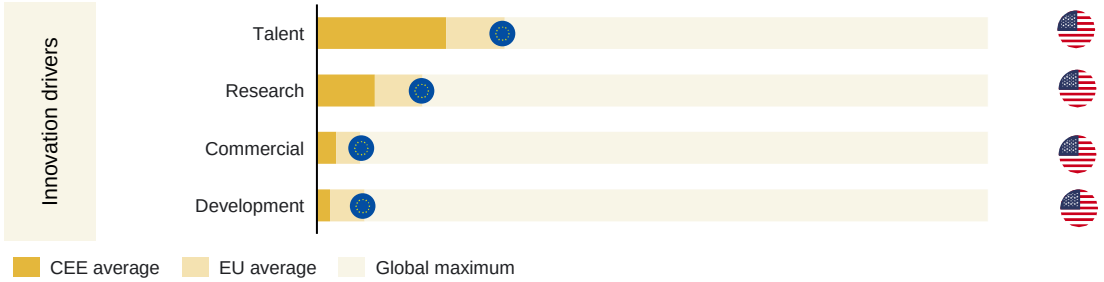
AI readiness in CEE

CEE is close to the EU average on basic adoption drivers …

CEE's AI capacity according to the Tortoise Global AI Index

Global AI Index, score out of 100 (global leader)

… and like the rest of the EU, CEE needs to catch up on AI innovation drivers required to reap the full potential.



Note: The Tortoise Global AI Index is underpinned by 111 indicators collected from 28 different public and private data sources and 62 governments.

Conclusions and policy implications

The 5% annual boost to GDP given a comparable ten-year adoption timeline is lower than in other more digitalised economies.

Generative AI is expected to significantly boost medium-term economic growth in CEE. However, the impact is expected to peak later than in more digitalised economies, unless the region leapfrogs the development.

A five-year delay in adoption will reduce the annual GDP potential of generative AI in CEE from 5% to 1% of GDP, i.e. from around €100 billion to only around €15 billion.

A leapfrog scenario would increase the annual GDP potential of generative AI in CEE from 5% to 8% of GDP, i.e. from around €100 billion to around €140 billion.

Capturing the full economic gains relies on progress in skills, innovation and digital infrastructure.

Retrain and upskill workforce

Grow R&D by local innovators

Accelerate commercial uptake

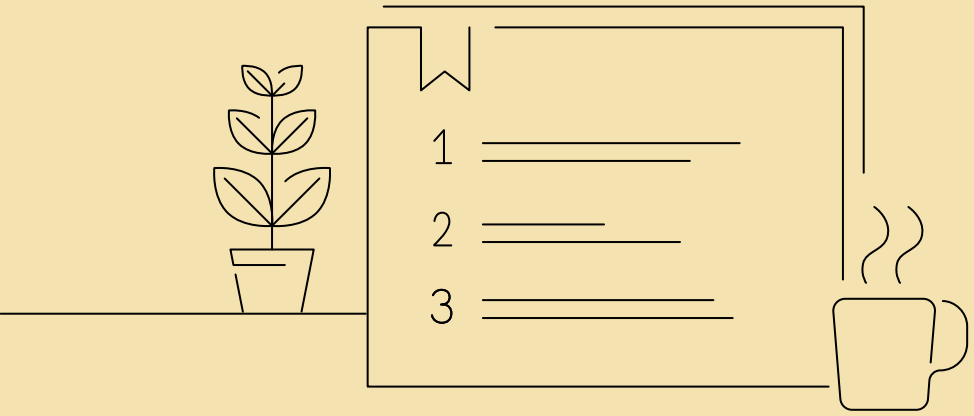
Foreword

Making AI benefit society as a whole requires an adaptive, human-centric and trustworthy approach

AI and the next wave of generative AI have the potential to be the most powerful technology in decades. Responsible AI can help solve global challenges like climate change and access to quality medical care.

AI can make countries more prosperous, productive, innovative, creative and secure. At the same time, there are plenty of pitfalls, paradoxes and tensions that choice-makers will need to navigate.

This report estimates the economic potential of generative AI in CEE while recognising the significant economic potential of other types of AI and acknowledging that a number of policy choices are needed to capture the potential.



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01

Introduction to AI

This report covers all types of AI with a particular focus on generative AI.

AI can help humans solve tasks faster and better – and with generative AI, machines can now understand and interact in language, sound and images

Artificial Intelligence (AI)

- AI is a general term for anything that allows computers to carry out human-like behaviours, including rule-based programmes.

Machine Learning (ML)

- ML is a subset of AI where machines do not need to be explicitly programmed. They use algorithms to identify and learn patterns in data, apply that learning and improve themselves to make better and better decisions.

Deep Learning (DL)

- DL is a subset of ML where computers learn in a way that mimics the human brain. In deep learning, machines build layers of knowledge that are increasingly complex.
- These AI models are typically trained on specific data sets and used within a given field or industry.

Capabilities include:

Forecasting and prediction

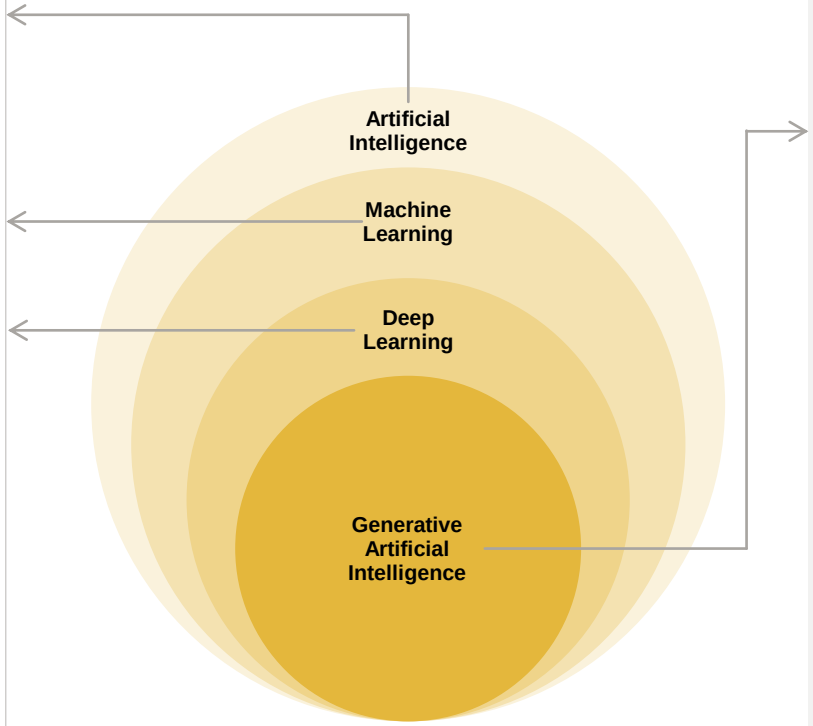
For example, weather forecasting using meteorological data to predict future weather and climate patterns.

Categorisation and recognition

For example, email spam filters that recognise and categorise messages as spam or not spam.

Optimisation

For example, routing algorithms used by GPS systems to find the quickest or shortest path to a destination.



Generative AI

- Generative AI is a new form of AI made publicly available in 2022. It can understand text, code, images, sound, video and can use it to generate or synthesise new content.
- Generative AI models are trained on huge general data sets to gain a general comprehension of text, visuals, code and sound.
- Generative AI can be used generally across almost any field or industry.

New capabilities include:

Create new unique images

For example, generating an image of a product that does not yet exist based on user input in natural language.

Interact with voice and sound

For example, translating a doctor's memo into a structured text or following up with a customer in writing based on a phone conversation.

Analyse and revise text and code

For example, translating text and adapting it to a different target group or translating code between programming languages.

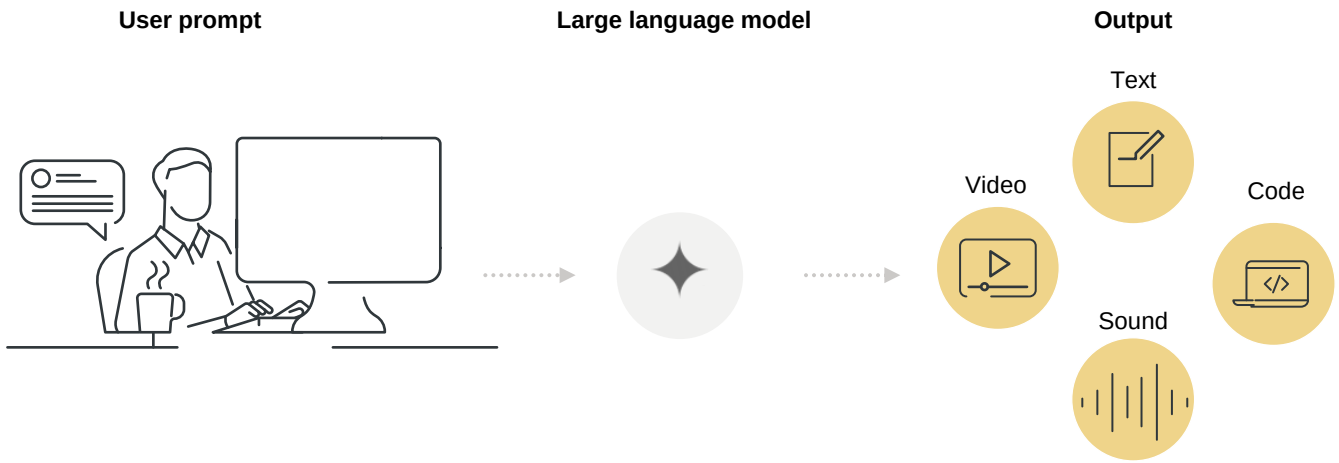
Do research and analyse data

For example, searching the web for relevant information and synthesising conclusions from large data sets.

Note: An algorithm is a detailed set of instructions that a computer follows to carry out a task or solve a problem.
Source: Implement Economics based on expert interviews.

Recent developments have increased the capabilities and availability of AI models and have accelerated uptake

Generative AI models have strong built-in capabilities and are easy to work with …



No or low data requirements

Generative AI models are already trained on huge data sets. This makes them readily available for many tasks without any further data needed.

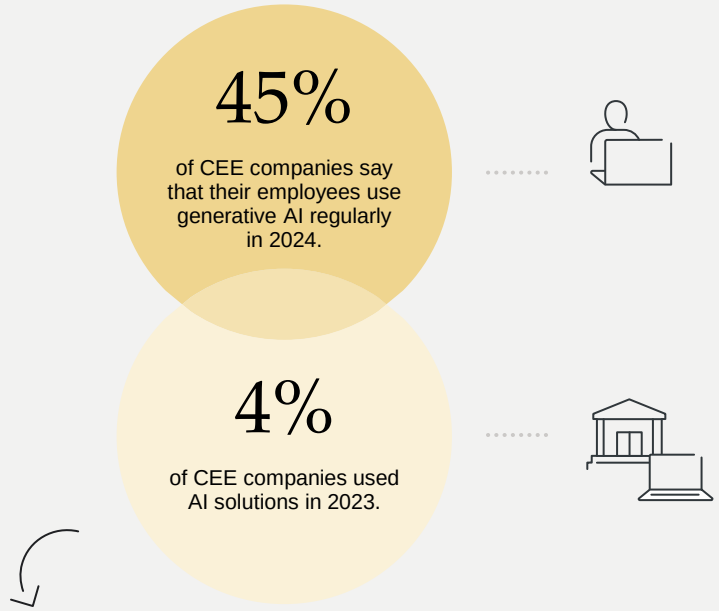
Easy to use in plain language

Generative AI models can be operated using ordinary language and do not require any specific coding skills to use.

Many models are online and free of charge

Several high-performing generative AI models are available online and do not require local ML setups or infrastructure to use.

… and many users have already adopted the technology



Solutions adopted at a company level are driven by non-generative solutions today.

Generative AI is still at an early stage and is yet to be widely adopted at a company or institution level.

Source: Implement Economics based on the European Commission and Public First survey.

Leveraging the full potential of AI will require further research, development and innovation

AI capabilities and requirements by level of development

	Organisational ML-based AI	Generic pre-trained models used online	Adaption of pre-trained models using APIs	Specialised fine-tuned models	Foundation models
Solvable tasks	Specific	General	General and moderately specialised	General and specialised	Most
Example	*E.g. detection of flawed products in manufacturing*	*Online chatbots, e.g. Gemini or ChatGPT*	*Organisation-level automation solution, e.g. auto-replies*	*Pre-trained model like Llama trained further on context-specific data*	*Model trained from the ground on new data, e.g. BLOOM and Llama*
Requirements					
Competences for use	●	○	◔	◔	◔
Competences for integrating solution	◕	◔	◔	◕	●
Data and infrastructure	◑	○	◔	◕	●
	Pre-2022	Current fast-adopting models	Next level of adoption	Only adopted by few frontrunner organisations	New frontier of AI

- Generative AI is still in its early phase using generic pre-trained models.
- Future value creation from AI requires more advanced models than the pre-trained models that are available online today.
- Leveraging the full potential of AI technology requires more advanced and specialised models.
- This requires new organisational skills, more data, more computing power and better infrastructure.

Figure explanation

○ No requirements

● Highest requirements

Note: Training or fine-tuning generative AI models generally requires significantly more computational resources compared to classic machine learning training.
Source: Implement Economics based on OECD.

02

Economic and job opportunities of AI in CEE

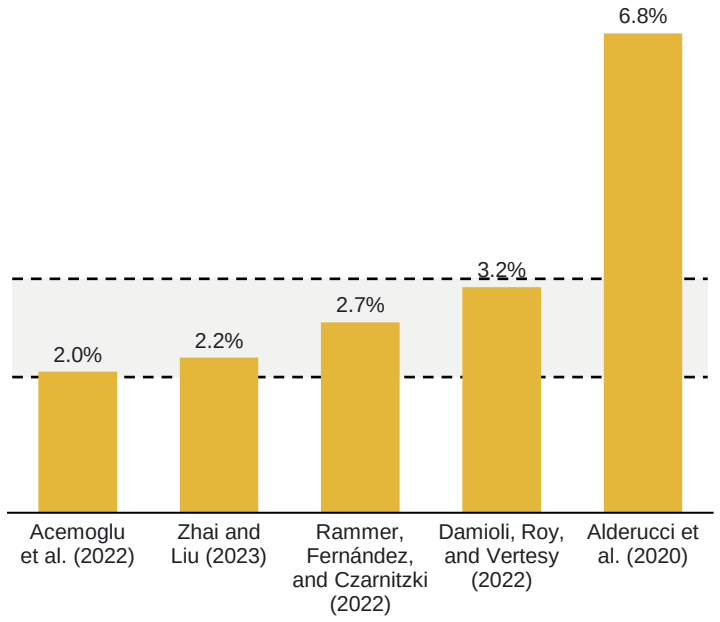
The main economic opportunity in CEE arises from humans working together with generative AI.

Generative AI offers the opportunity to accelerate AI adoption and achieve benefits sooner than previously believed

AI can increase productivity

Academic studies conclude that labour productivity typically increases by 2-3 percentage points per year after firm-level AI adoption. The studies have been carried out on early adopters of AI technology and, as such, cannot be extrapolated to the general effects of AI on productivity.

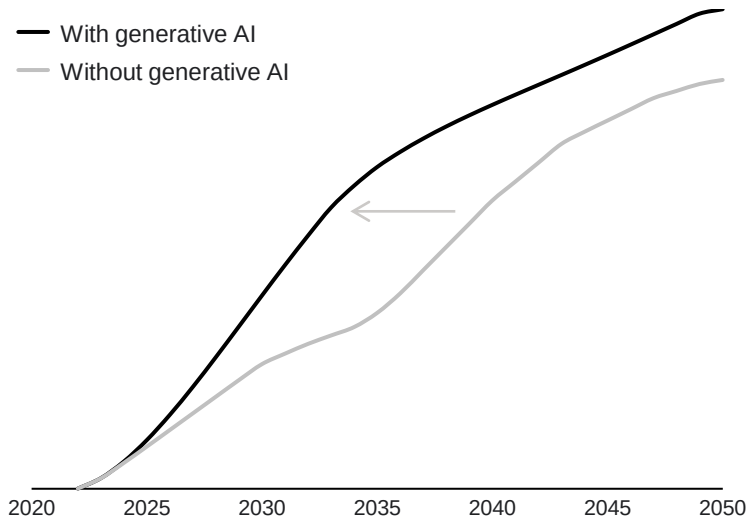
Growth in labour productivity from AI adoption
Percentage points



Generative AI advances automation

Generative AI can advance automation by nearly a decade because it is easier to use for individuals and organisations. However, significant uncertainty about adoption rates and speed of realisation of its benefits remains.

Automation potential
Adoption of AI technology



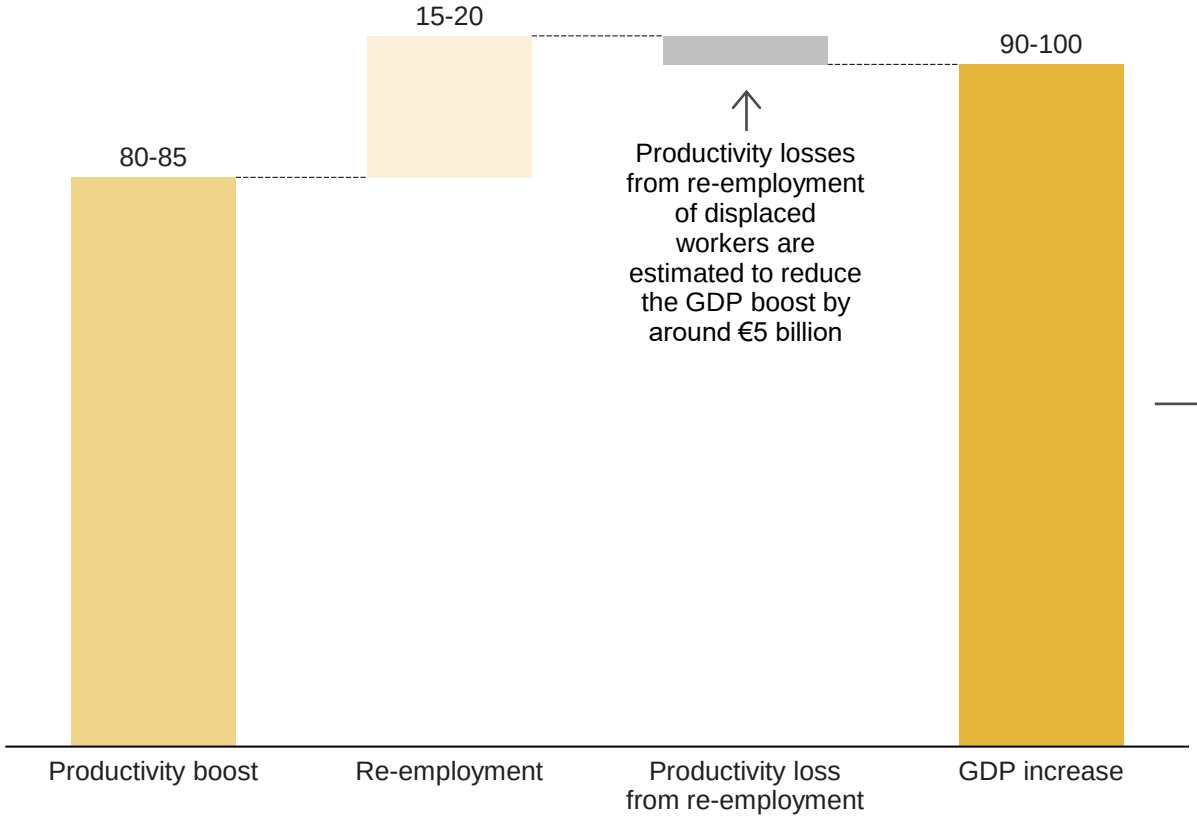
- AI has evolved rapidly with the recent breakthrough of generative AI. Due to its user-friendly nature, generative AI is expected to greatly accelerate the potential of AI to create economic impacts.
- Generative AI is only a part of AI's overall economic potential. Some studies estimate with some uncertainty that generative AI accounts for around one-third of the total effect of AI.
- This report estimates the macroeconomic potential of generative AI while recognising the significant economic potential of other types of AI.
- Due to its relative ease of use, generative AI offers the possibility for the CEE countries to make a large technological leap. However, the rate of adoption of generative AI depends on the CEE region's digital infrastructure, talent pool and R&D capabilities (see section 6 on the region's AI readiness).

Source: Implement Economics based on Brynjolfsson et al. (2019), Acemoglu et al. (2022), Andersen et al. (2023), Alderucci et al. (2022), Rammer, Czarnitziki, and Fernández (2022), Damioli, Roy, and Vertesy (2022), Zhai and Liu (2023).

Generative AI could increase CEE's GDP annually by 5% in ten years and is a €100 billion-a-year opportunity

GDP potential of generative AI in CEE

€ billion annual increase from baseline GDP after a ten-year adoption period



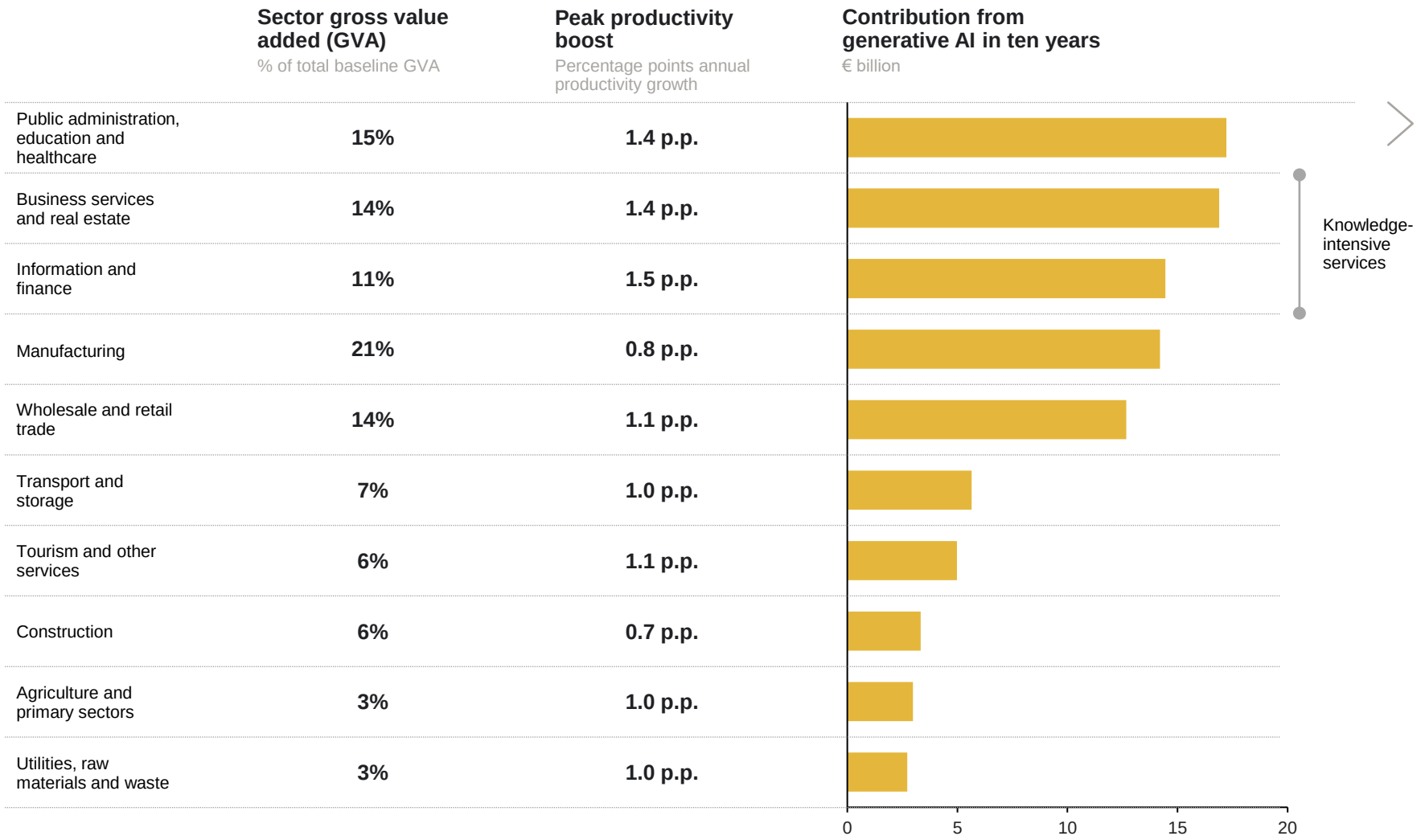
+5% GDP

annual contribution if CEE achieves widespread adoption of AI.

- We estimate a potential increase in GDP of €90-100 billion in around ten years, corresponding to 5% of the region's GDP.
- The main impact of generative AI comes from a productivity boost for the majority of workers (59%) by augmenting their capabilities, quality and efficiency, which is estimated at €80-85 billion for CEE. This includes the value created with the small share of worktime being re-prioritised for other value-creating tasks.
- There is also a value contribution from re-employment of a small share of workers (5%), where generative AI is freeing up a significant share of work for other tasks. This contribution to GDP is estimated at €15-20 billion in CEE.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for CEE by around €5 billion.
- At its peak, the isolated productivity effect of generative AI in CEE is estimated to be equivalent to 1.1% annually.

Note: There is lot of uncertainty around the capability and adoption timeline of generative AI. The size of the productivity boost depends on the difficulty level of tasks that generative AI will be able to complete and the number of jobs it can automate. GDP is in 2022 levels. The average number of work activities that potentially can be performed by generative AI across all types of tasks for both complemented and highly exposed workers corresponds to 20-25%. Our estimate is the isolated potential of generative AI around ten years from now, when the impact is assumed to peak in leading countries. The estimated boost from generative AI may not be fully additive to GDP trends, as the GDP forecast already assumes a growth contribution from new technologies and generative AI may substitute some of that. Also, the boost from generative AI may be partially offset by an underlying growth slowdown.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

Generative AI is especially potent in public administration and knowledge-intensive services, and there are also opportunities in the large manufacturing sector in the CEE region



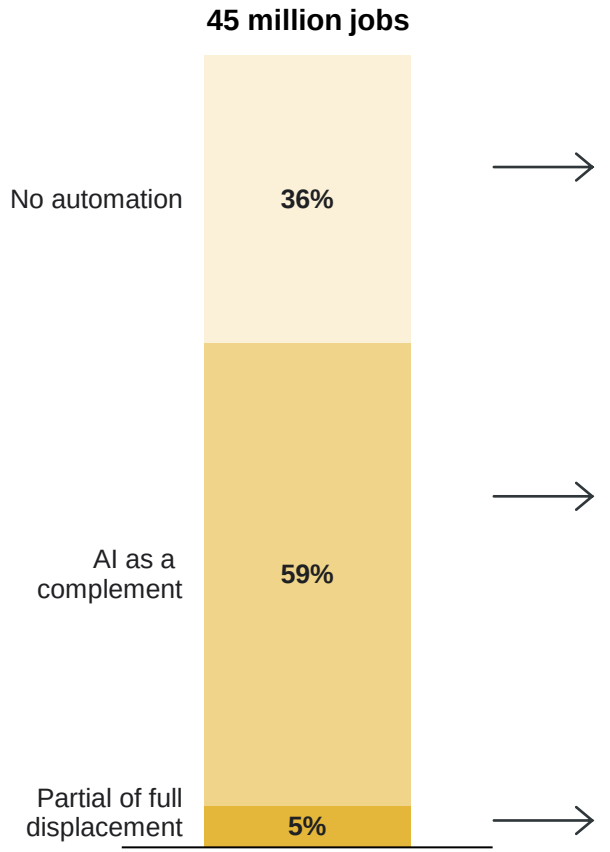
- Generative AI is most effective in automating knowledge-intensive tasks, such as those carried out in IT services, finance and business services.
- The largest economic potentials are found in public administration and business services, where generative AI is estimated to increase value added by around €16-18 billion in each sector.
- The economic potential is also large (around €14-15 billion) in manufacturing despite a lower annual productivity boost of 0.8% at peak due to the large manufacturing sector in CEE (21% of regional gross value added).
- This is especially true in Czechia and Slovenia, where the boost from generative AI to manufacturing makes up a larger share of the total value added (28% and 24%, respectively).
- Fewer tasks in manufacturing are exposed to automation by generative AI, but manufacturing workers are, on average, more productive than in many services. So, large absolute gains can be achieved from adopting generative AI in the CEE manufacturing sector.

Note: Based on 2022 GVA data. Sectors are aggregated according to NACE categorisation. "Information and Finance" is a combination of information, communication, financial and insurance activities. Labour productivity gains are mapped one to one to GDP if total employment (as here) is assumed constant and the capital stock increases to match productivity improvements. The estimates take into account that the growth impact of generative AI may not be fully additive to the current GDP trend. First, AI-related gains may substitute for growth that would otherwise occur in a non-AI baseline. Second, underlying productivity growth has slowed over the past decades. The estimated boost from generative AI may be partially offset by an underlying growth slowdown. The contributions from generative AI shown are based on sectoral gross value added and are scaled to reflect the total GDP increase from generative AI. The contributions from generative AI shown are based on sectoral gross value added and are scaled to reflect the total GDP increase from generative AI.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a).

Generative AI augments most jobs in the CEE region

Share of jobs exposed to automation by generative AI

% of total employment in CEE



~ 16 million jobs are unlikely to be exposed to automation

An estimated 36% of jobs in CEE are likely to remain largely unaffected by generative AI. These jobs include manual labour, outdoor tasks, such as construction and cleaning, and human-to-human tasks, such as personal care and food services. The share of unaffected workers is slightly higher in the CEE region compared to Europe's most digitised economies due to a larger share of employment in agriculture and construction.

~ 27 million jobs are likely to be augmented by generative AI

Most jobs (59%) are expected to be assisted by generative AI by automating a limited share of their tasks and helping to create content (text, code and images), collaborating with workers on complex problems and contributing to product design.

Unlike previous waves of automation that mainly impacted manual workers, generative AI is expected to primarily affect office-based professionals. The CEE region has slightly fewer workers in these types of occupations compared to Europe's most digitised countries.

~ 2 million jobs are likely to be fully or partially displaced

A small share of jobs (5%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations. This share is similar in the most digitised EU countries.

Note: Based on 2022 employment data. In accordance with Briggs and Kodnani (2023a), "No exposure" are occupations with less than 10% exposure, "Medium exposure" are occupations with 10-49% exposure and "High exposure" are occupations with exposure of or above 50%. Note that percentages and absolute numbers are rounded.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a),

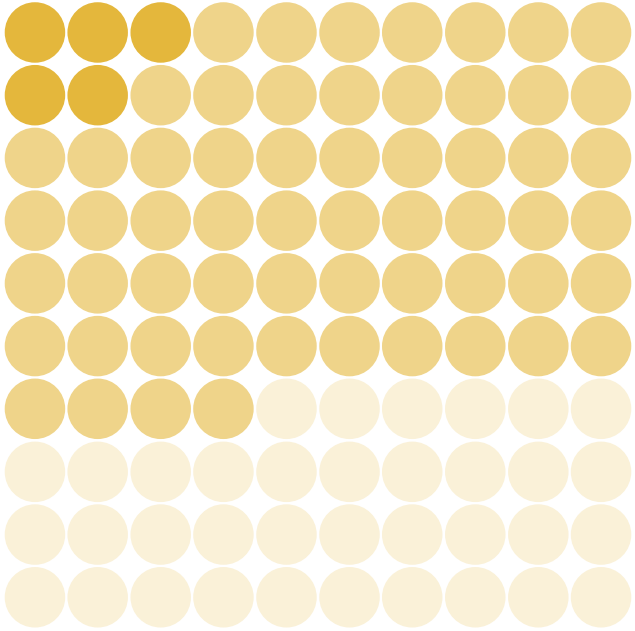
The AI-powered economy is expected to create new jobs in the CEE region and ensure full re-employment of potentially displaced workers

Share of jobs exposed to automation by generative AI

% of total employment in CEE

Partial or full displacement | AI as a complement | No automation

5% of jobs in CEE are estimated to be highly exposed to generative AI, leading to some job closures.



At the same time, 59% of jobs are expected to see a boost in productivity. This will create new jobs due to:

I

Increase in general demand for goods and services

With higher GDP growth, the AI-powered economy will demand more labour across a wide range of occupations and skill levels.

II

Creation of new AI-related tasks

Widespread use of AI will also create new jobs such as AI prompt engineers, AI content creators and data trainers – and create jobs we cannot preconceive.

III

Demand within occupation

Generative AI will also make highly exposed occupations, such as translators, more efficient and therefore cheaper, which in turn can increase the demand for those occupations.

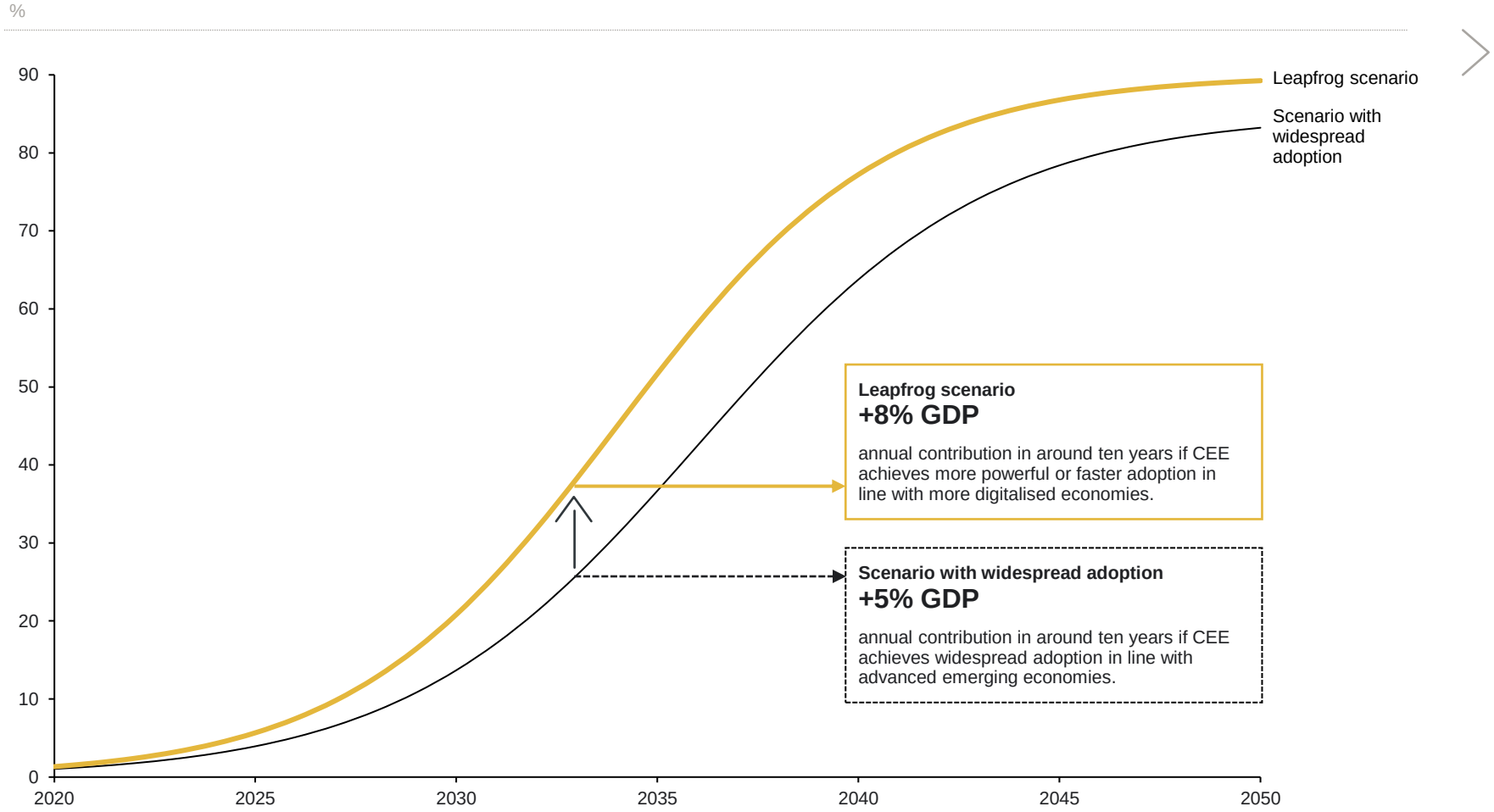
Even with accelerated and broad adoption of generative AI over a ten-year period, only around 120,000-240,000 people in highly exposed jobs are estimated to need re-employment per year, which is low compared to the 1.6 million expected future job openings each year towards 2035 according to CEDEFOP (an agency under the European Union).

- The job development in CEE over the next decades will depend on a range of factors.
- The isolated impact of generative AI depends on the speed of adoption and the size of the productivity boost relative to the size of the displacement effect for the jobs highly exposed to generative AI.
- This report assumes full re-employment of displaced workers. This means no net change in total employment or unemployment.
- This assumption is based on the large productivity boost compared to the relatively small share of displaced jobs. This suggests that the demand for new jobs will be sufficiently strong to create jobs for those exposed.
- Furthermore, economic theory suggests that long-term employment is determined by labour supply and skill mix of the workforce.
- The short-term job impacts will depend, among other things, on the flexibility of the labour market as well as re-training and skilling opportunities for workers.
- We estimate that widespread adoption of generative AI can lead to 120,000-240,000 annual job openings and closures over the coming ten years, corresponding to 8-15% of the expected future annual job openings in CEE.

Note: The assumption that labour supply predetermines employment is widely applied by economists. See, for example, *Principles Of Economics* by N. Gregory Mankiw (2020).
Source: Implement Economics based on based on Eurostat, O*Net, Briggs and Kodnani (2023a) and CEDEFOP.

A leapfrog scenario could increase CEE's potential from generative AI from 5% to 8%

Adoption of generative AI

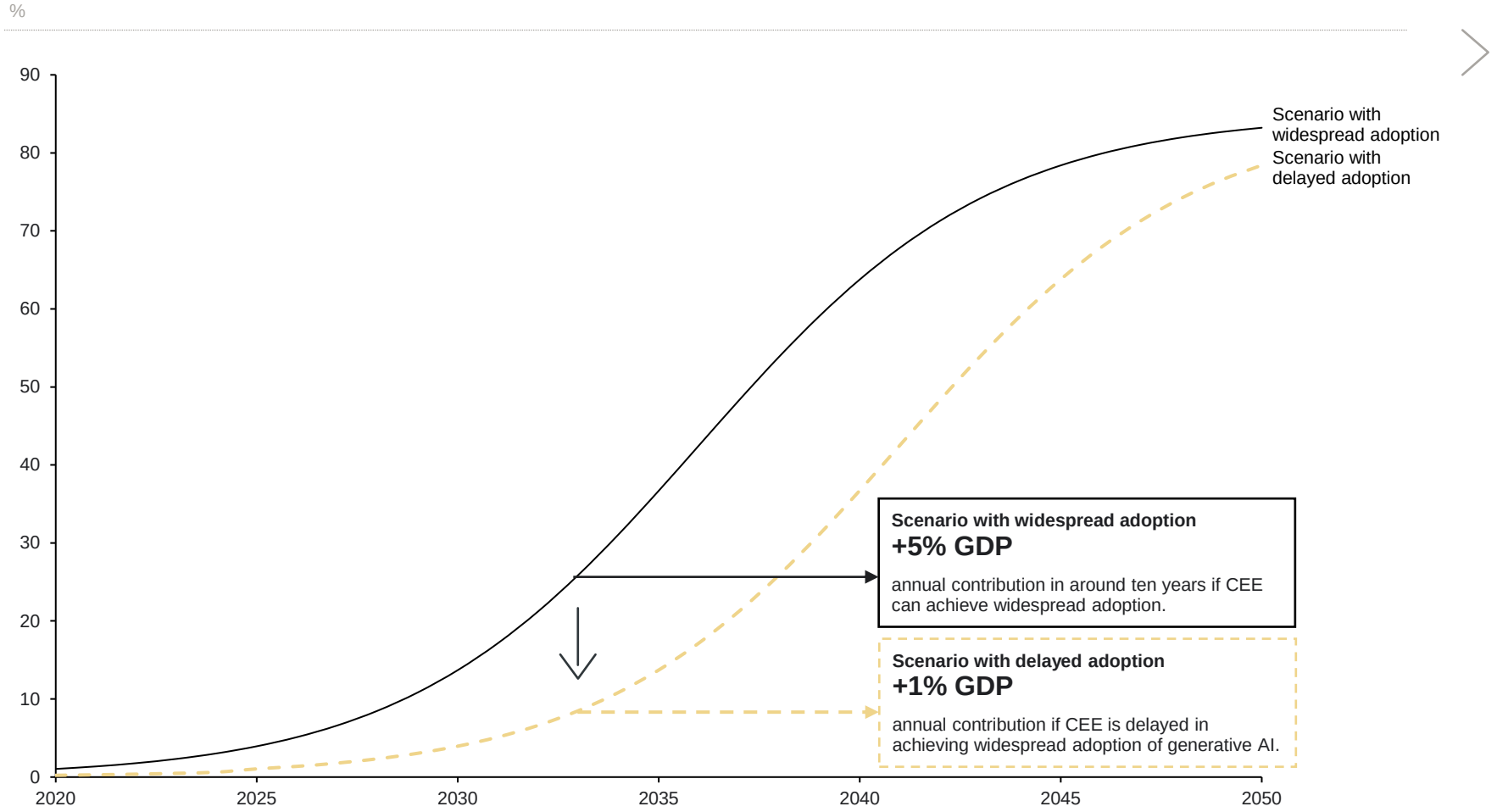


- Compared to other historical technological innovations, generative AI is more powerful, more user-friendly and easier to adopt.
- This presents a significant opportunity for less digitalised countries to leapfrog their digital development by skipping one generation of technology and going straight to the new generation of generative AI tools.
- To gauge the potential, we consider a *leapfrog scenario* where CEE succeeds in adopting generative AI with the same impact as most digitalised European economies.
- If CEE can capture the benefits of generative AI in line with frontrunner countries in Europe, the economic potential in ten years is estimated to increase from 5% (€90-100 billion) to 8% (€135-145 billion).
- The leapfrogging scenario may also mean that generative AI could not only be adopted faster but also provide more powerful boosts to productivity in industries in CEE that are lagging their more digitalised European peers. The boost could potentially be bigger than quantified here.
- Leapfrogging would require a focused effort to significantly elevate key AI drivers, such as talent and governmental strategy, in a short timeframe.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging markets", while the "leapfrog" scenario assumes adoption in line with "other developed markets" in Briggs and Kodnani (2023b).
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

A five-year delay in the adoption of generative AI could reduce CEE's annual potential GDP gains from 5% to 1%

Adoption of generative AI



- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of CEE's GDP potential from generative AI is reliant on gradual adoption and development of the new AI technology within the next ten years.
- A five-year delay in capturing the benefits of generative AI is estimated to reduce the annual GDP contribution in ten years from 5% (€90-100 billion) to only 1% (€10-15 billion).
- CEE can enhance the welfare and GDP contribution from generative AI by ensuring that policies are in place to capture the benefits as assumed in the widespread adoption scenario.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging economies" in Briggs and Kodnani (2023b). Note that the impact of generative AI may take longer than ten years before reaching its peak impact in less digitalised economies such as in CEE.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

Generative AI models have the potential to boost SME AI adoption to new levels, but regulatory challenges and lack of skills can slow down uptake

SMEs lag behind larger corporations on AI adoption

Central Eastern European SMEs account for
~70% of total employment

Like other European countries, Central Eastern European SMEs are slower to adopt AI compared to large enterprises.

21%
of large enterprises in CEE had adopted AI in 2023.

4%
of SMEs in CEE had adopted AI in 2023.

The gap in AI adoption between SMEs and large enterprises is not specific to CEE but reflects a **general challenge** among EU countries:

30%
of large enterprises in the EU had adopted AI in 2023.

7%
of SMEs in the EU had adopted AI in 2023.

Generative AI could boost SME AI adoption …

No or low data requirements for pre-trained public models such as Gemini and ChatGPT means that SMEs can readily use generative AI for many tasks without any further work needed.

Ease of use in plain language means that SMEs can use many generative AI models without the need for coding skills.

Free online availability means that SMEs do not need to invest in new computing power or new infrastructure to use generative AI.

… but SME uptake can be slowed down because …

Lack of both soft and digital skills required to fully leverage the potential of new generative AI technologies can hamper uptake.

Regulatory challenges around generative AI can increase implementation risks and compliance costs, notably for SMEs lacking in-house legal capabilities.

Note: According to the classification by the European Commission, SMEs are defined as enterprises with 1-249 employees, and large enterprises are defined as enterprises with 250+ employees. The percentage of total employment accounted for by SMEs is based on 2022 data.
Source: Implement Economics based on Eurostat and OECD (2024).

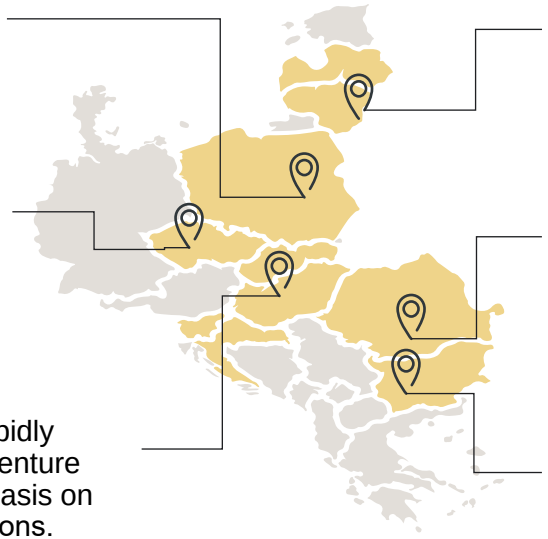
The AI startup scene in the CEE region is growing and vital for fostering AI innovation, poised for more impact with the right funding and talent

The CEE region is experiencing rapid AI innovation growth, marked by the emergence of diverse AI startups across various sectors and geographical hubs.

Warsaw
A significant hub for AI startups, particularly in fraud detection and financial technology.

Prague
A centre for AI innovation, particularly in healthcare and financial services, with startups like Aireen, focusing on AI-based medical devices.

Budapest
Budapest's AI startup scene is rapidly expanding, driven by significant venture capital activity and a strong emphasis on cybersecurity and fintech innovations.



Vilnius
A robust startup ecosystem fuelled by government support and strategic investments in tech education and infrastructure.

Bucharest
Bucharest has a growing number of startups focusing on AI, including e.g. UiPath – an automation and AI unicorn with a large global impact.

Sofia
Features a burgeoning AI startup ecosystem supported by tech incubators and accelerators.

National governments in the CEE region are taking means to support local AI startup ecosystems

- Governments in the CEE region employ a combination of direct support, such as financial grants and tax incentives, along with indirect support, like incubation and acceleration programmes, to nurture the AI startup ecosystem.
- The efforts to boost the AI and tech startup scene in the region are characterised by a strong emphasis on public-private partnerships, aiming to leverage both local and European resources to enhance innovation and global competitiveness.

Further action could bolster the AI startup scene in CEE even further

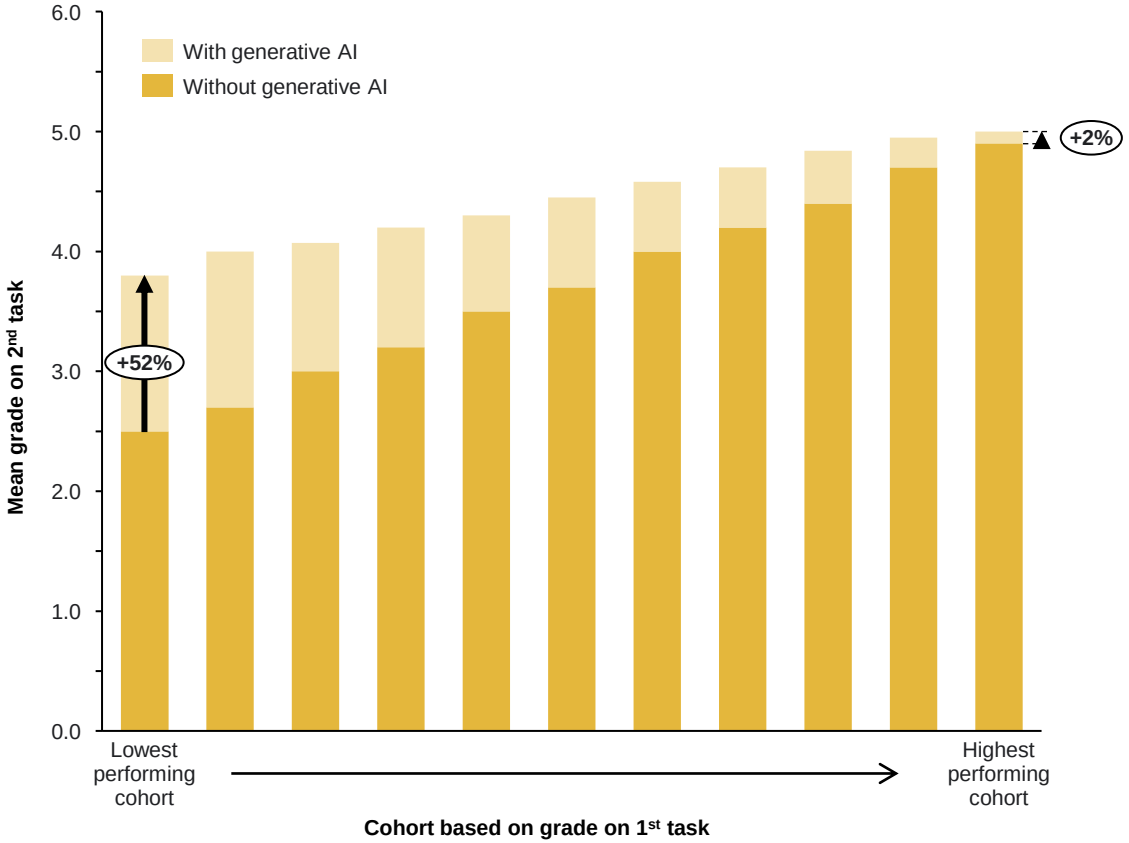
- **Funding for early-stage startups:** The startup landscape in CEE has boomed over the last decade, with valuations increasing 19-fold, investment projections tripling in 2021 and 34 unicorn companies emerging. The AI startup scene could be further bolstered by implementing policies that boost public-private investment initiatives aimed at providing crucial early-stage funding for AI startups.
- **AI talent:** Furthermore, CEE's robust engineering expertise provides an opportunity for policymakers to enhance AI education, thereby increasing the AI talent pool to further fuel the startup landscape.

Source: Implement Economics based on Google for Startups, The Recursive and Dealroom.co.

Early studies suggest that generative AI can help close the skills gap for those with the lowest skill levels – and give a boost to the middle class

Grades with and without generative AI

Estimated mean grade on 2nd task



"AI could help rebuild the middle class."

MIT economist David Autor argues that generative AI can help reduce the gap between the middle and elite classes.

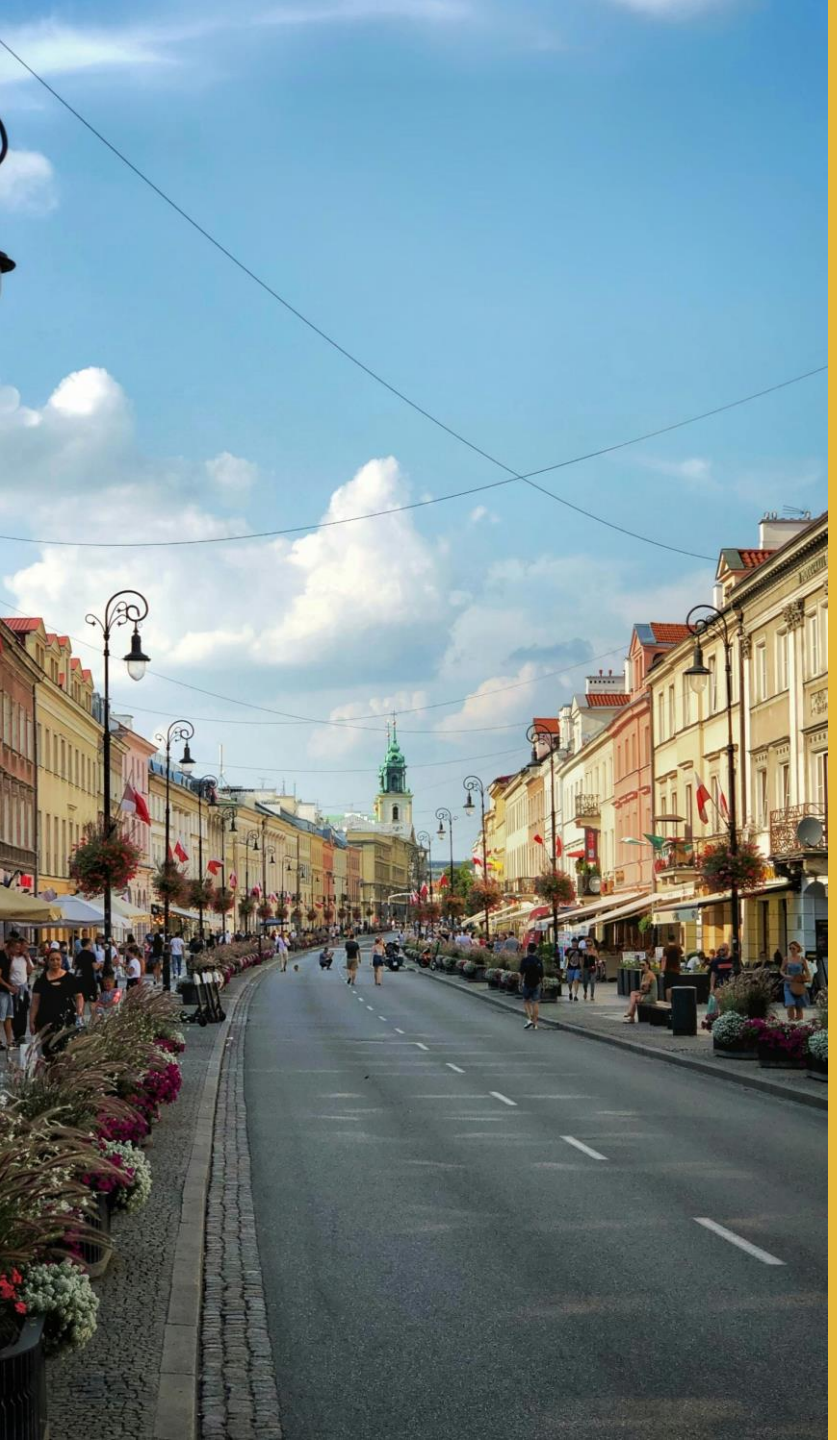
According to Autor, AI could equip a larger set of workers with complementary knowledge, enhancing their ability to make better decisions. This could **improve the quality of jobs** for workers without college degrees, **moderate earnings inequality** and **lower the cost of key services**, such as healthcare, education and legal expertise.

Article by David Autor published in February 2024 in Noema Magazine by the Berggruen Institute.

David Autor is a labour economist and professor of economics at the Massachusetts Institute of Technology who studies how technological change and globalisation affect workers.

- AI requires a broad skill set to reap the benefits However, AI as a tool can itself augment the performance of human skills.
- Furthermore, generative AI can help close the skills gap by increasing the performance of those with the lowest skill levels.
- An experimental study by Noy and Zhang (2023) tested candidates' writing skills with and without access to generative AI.
- The results showed that, on average, all candidates were able to boost their grades on a written task with the use of generative AI – in this case, a large language model.
- The AI augmentation effect was highest among those with the lowest performance on the first task.
- The lowest-performing group increased their average grade by more than 50% when allowed to interact with a large language model, whereas the best-performing group increased performance by 2%.
- This study is an early indication that generative AI has the potential to boost skills for everyone *and* reduce skill inequalities in the labour market.

Note: The graph shows mean estimates for cohorts.
Source: Implement Economics based on Noy and Zhang (2023), Brynjolfsson et al. (2023), Dell'Acqua et al. (2023) and Autor (2024).



03

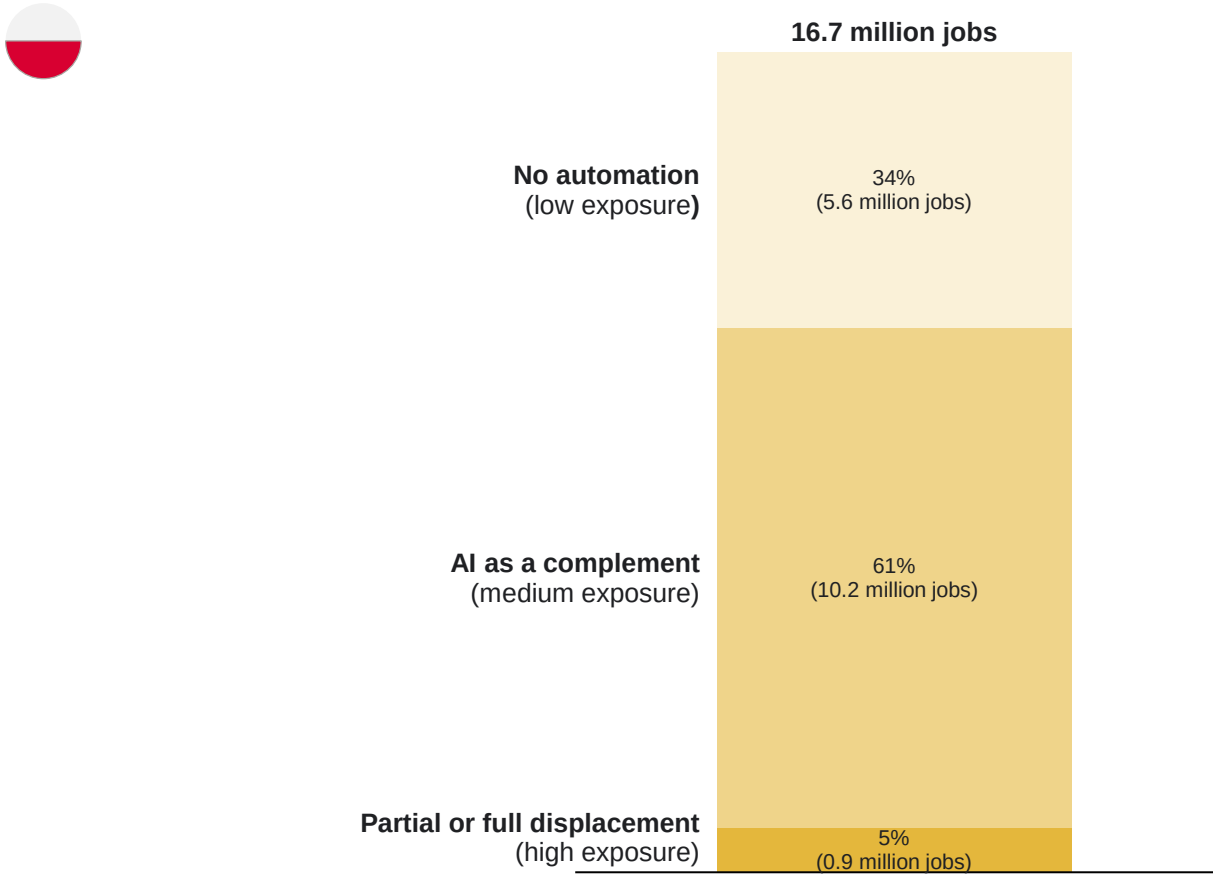
The opportunity of AI in Poland

AI presents significant economic potential for Poland.

Generative AI is estimated to augment most jobs in Poland

Share of Polish jobs exposed to automation by generative AI

% of total employment



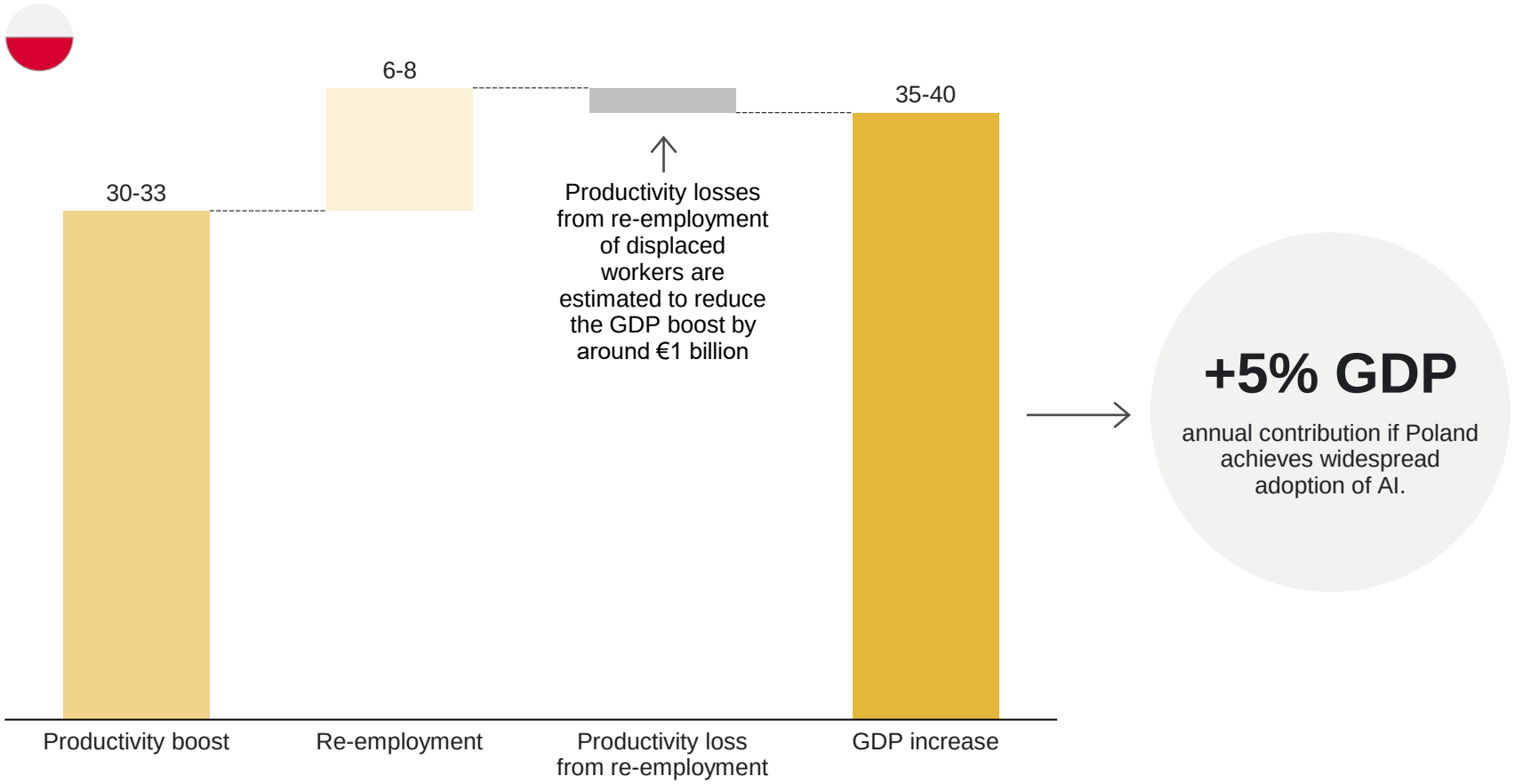
- Most jobs in Poland (61%) are expected to be augmented and complemented by generative AI by automating a limited share of their tasks and helping to create more value when working together with the machine using generative AI technology.
- Unlike previous waves of automation that mainly impacted manual workers, generative AI is expected to primarily affect office-based professionals. Poland has slightly more workers in these types of occupations compared to the CEE region as a whole.
- An estimated 34% of jobs in Poland are likely to remain largely unaffected by generative AI. These jobs include manual labour, outdoor tasks, such as construction and cleaning, and human-to-human tasks, such as personal care and food services.
- A small share of current jobs in Poland (5%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations. The share in Poland is the same as the CEE average.

Note: Based on 2022 employment data. In accordance with Briggs and Kodnani (2023a), "Low exposure" are occupations with less than 10% exposure, "Medium exposure" are occupations with 10-49% exposure and "High exposure" are occupations with exposure of or above 50%. Note that percentages and absolute numbers are rounded.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

Generative AI could increase Poland's annual GDP by €35-40 billion in ten years

GDP potential of generative AI in Poland

€ billion annual increase from baseline GDP after a ten-year adoption period



+5% GDP

annual contribution if Poland achieves widespread adoption of AI.

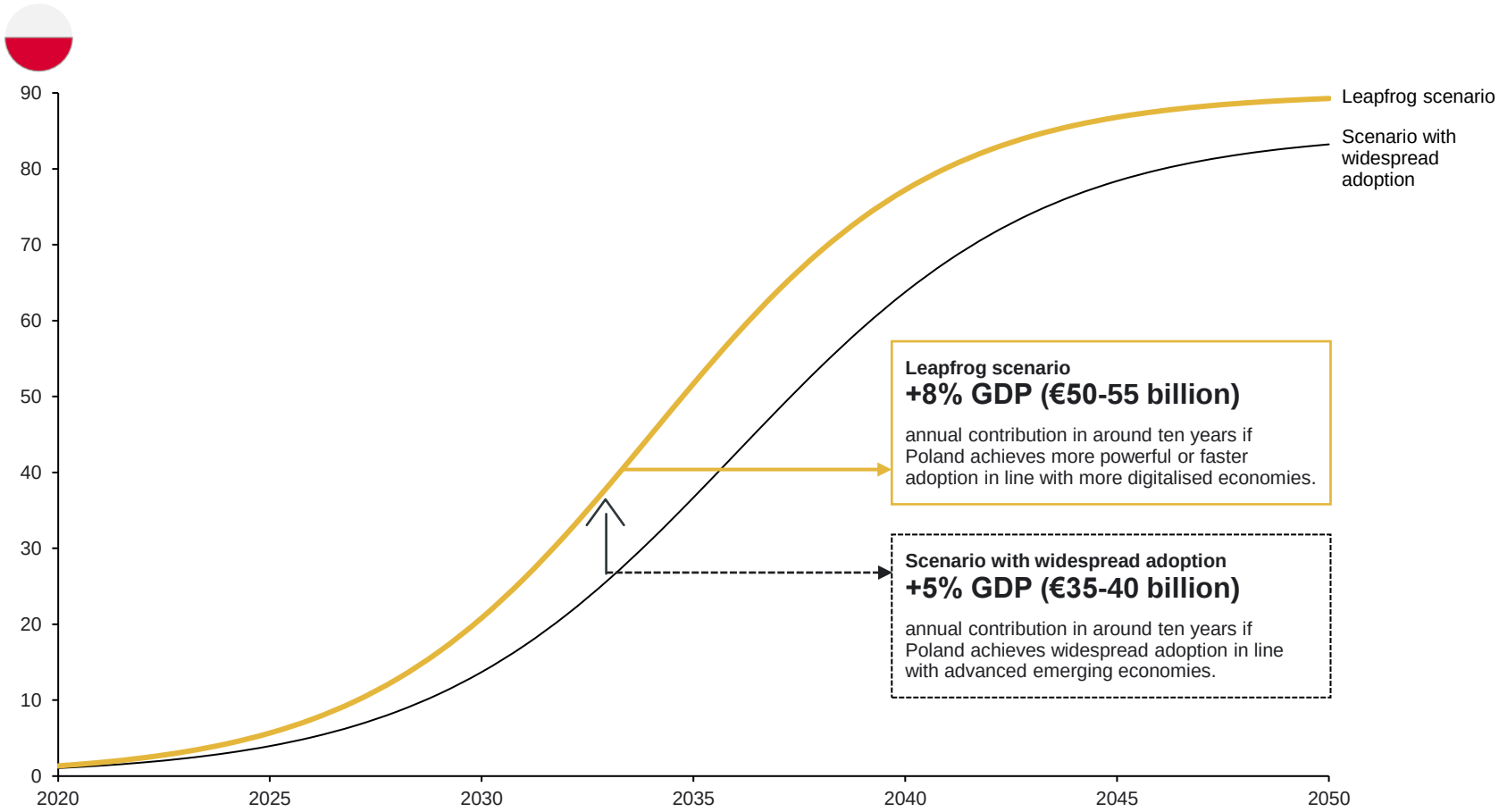
- We estimate a potential increase in GDP of €35-40 billion in around ten years from now, corresponding to 5% of Poland's GDP.
- The main impact of generative AI comes from a productivity boost to the majority of workers (61%) by augmenting their capabilities, quality and efficiency, which is estimated at €30-33 billion for Poland. This includes the value created with the small share of working time being re-prioritised for other value-creating tasks.
- There is also a value contribution from the re-employment of a small share of workers (5%), where generative AI is freeing up a significant share of work for other tasks. This contribution to GDP is estimated at €6-8 billion in Poland.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for Poland by around €1 billion.
- At its peak, the isolated productivity effect of generative AI in CEE is estimated to be equivalent to 1.2% annually.

Note: There is much uncertainty around the capability and adoption timeline of generative AI. The size of the productivity boost depends on the difficulty level of tasks that generative AI will be able to complete and the number of jobs it can automate. GDP is in 2022 levels. The average number of work activities that potentially can be performed by generative AI across all types of tasks for both complemented and highly exposed workers corresponds to 20-25%. Our estimate is the isolated potential of generative AI around ten years from now when the impact is assumed to peak in leading countries. The estimated boost from generative AI may not be fully additive to GDP trends, as the GDP forecast already assumes a growth contribution from new technologies and generative AI may substitute some of that. Also, the boost from generative AI may be partially offset by an underlying growth slowdown.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

A leapfrog scenario could increase Poland's potential from generative AI from 5% to 8%

Adoption of generative AI

%

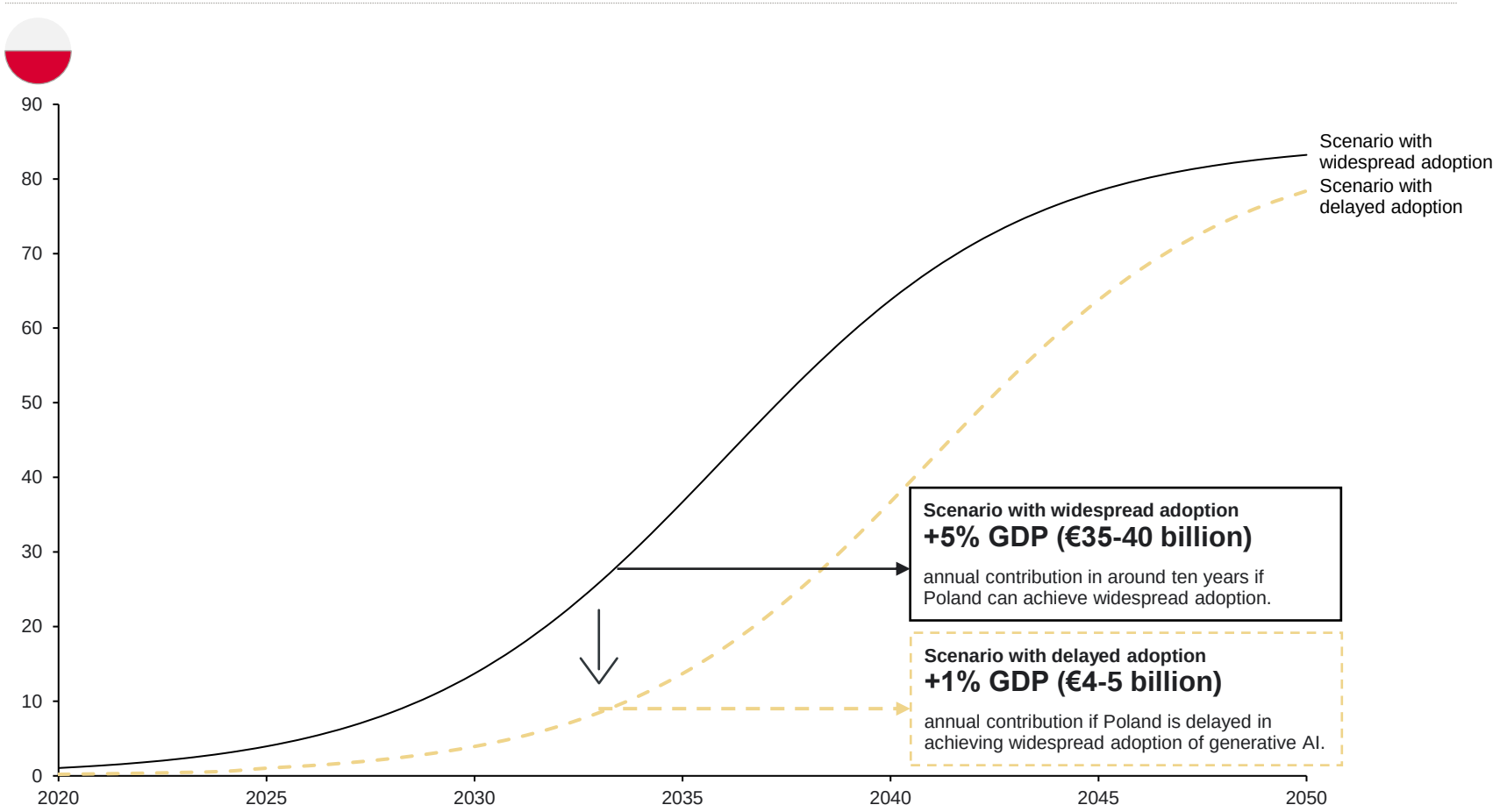


- Compared to other historical technological innovations, generative AI is more powerful, more user-friendly and easier to adopt.
- This presents a significant opportunity for less digitalised countries to leapfrog their digital development by skipping one generation of technology and going straight to the new generation of generative AI tools.
- To gauge the potential, we consider a *leapfrog scenario* where Poland succeeds in adopting generative AI with the same impact as most digitalised European economies.
- If Poland can capture the benefits of generative AI in line with frontrunner countries in Europe, the economic potential in ten years is estimated to increase from 5% (€35-40 billion) to 8% (€50-55 billion).
- The leapfrogging scenario may also mean that generative AI could not only be adopted faster but also provide more powerful boosts to productivity in industries in Poland that are lagging behind their more digitalised European peers. The boost could potentially be bigger than quantified here.
- Leapfrogging would require a focused effort to significantly elevate key AI drivers in a short timeframe.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging markets", while the "leapfrog" scenario assumes adoption in line with "other developed markets" in Briggs and Kodnani (2023b).
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b) .

A five-year delay in the adoption of generative AI could reduce Poland's annual potential GDP gains from 5% to 1%

Adoption of generative AI

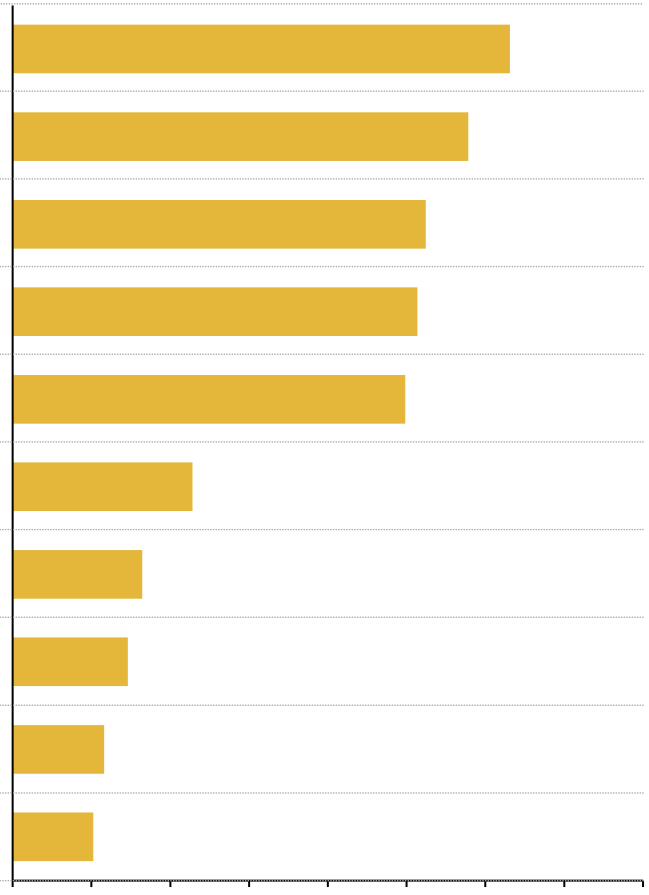


- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of Poland's GDP potential from generative AI is reliant on gradual adoption and development of the new AI technology within the next ten years.
- A five-year delay in capturing the benefits of generative AI is estimated to reduce the annual GDP contribution in ten years from 5% (€35-40 billion) to only 1% (€4-5 billion).
- Poland can enhance the welfare and GDP contribution from generative AI by ensuring that policies are in place to capture the benefits as assumed in the widespread adoption scenario.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging economies" in Briggs and Kodnani (2023b). Note that the impact of generative AI may take longer than ten years before reaching its peak impact in less digitalised economies such as in CEE.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b) .

Generative AI has large economic potential in public administration and business services – but it also affects the large manufacturing and trade sectors in Poland

	Sector gross value added (GVA) % of total baseline GVA	Peak productivity boost Percentage points annual productivity growth
Public administration, education and healthcare	15%	1.4 p.p.
Wholesale and retail trade	17%	1.1 p.p.
Business services and real estate	12%	1.4 p.p.
Manufacturing	19%	0.9 p.p.
Information and finance	11%	1.5 p.p.
Transport and storage	7%	1.0 p.p.
Tourism and other services	5%	1.1 p.p.
Construction	7%	0.7 p.p.
Utilities, raw materials and waste	4%	1.1 p.p.
Agriculture and primary sectors	3%	1.0 p.p.



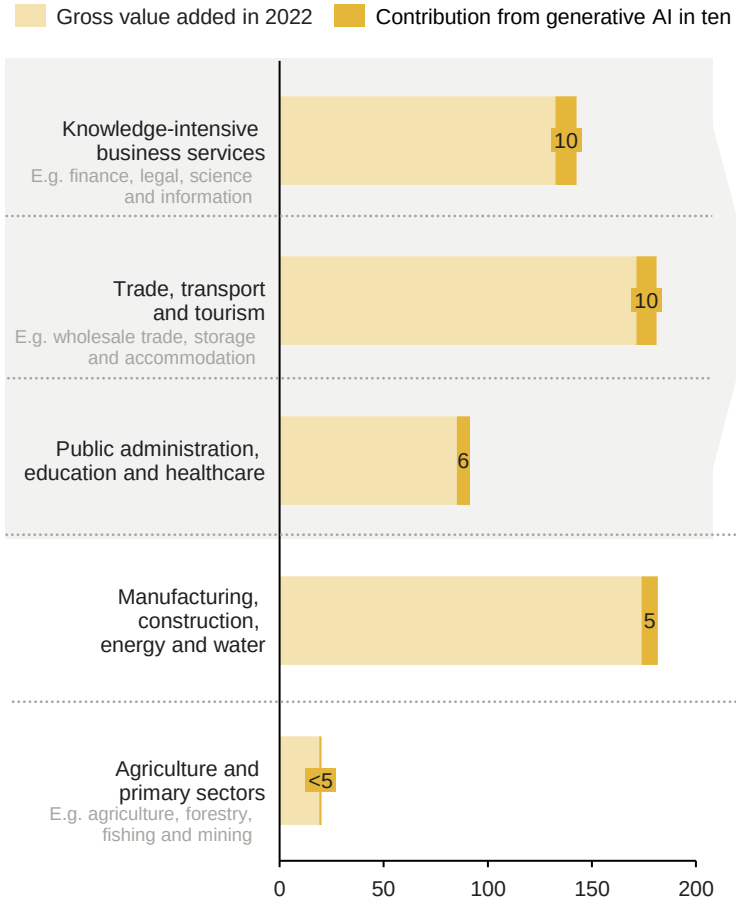
- Generative AI as a tool is most effective in automating knowledge-intensive tasks, such as those carried out in information, finance and business services.
- The largest productivity potentials are found in public administration, business services and information and finance, where the peak productivity increases range from 1.4-1.5% annually. In public administration and business services, generative AI is estimated to increase value added by around €6 and €5 billion, respectively.
- The economic potential is also large (around €5-6 billion) in trade and manufacturing despite a low peak annual productivity boost of 1.1% and 0.9%, respectively. This follows in part from the disproportionately large size of wholesale and retail trade (17% of Polish GVA) and manufacturing (19% of Polish GVA).
- In contrast to past automation, such as robots, generative AI has the ability to boost productivity in the service sector.
- This is estimated to provide a much-needed boost to service sector productivity, which has historically been difficult to increase.

Note: Sectors are aggregated according to NACE categorisation. "Information and Finance" is a combination of information, communication, financial and insurance activities. Labour productivity gains are mapped one to one to GDP if total employment (as here) is assumed constant and the capital stock increases to match productivity improvements. The estimates take into account that the growth impact of generative AI may not be fully additive to the current GDP trend. First, AI-related gains may substitute for growth that would otherwise occur in a non-AI baseline. Second, underlying productivity growth has slowed over the past decades. The estimated boost from generative AI may be partially offset by an underlying growth slowdown. The contributions from generative AI shown are based on sectoral gross value added and are scaled to reflect the total GDP increase from generative AI.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a).

75% of generative AI's economic potential lies in service sectors, while manufacturing and other sectors can also benefit from other types of AI

Gross value added by sector

€ billion



Generative AI has the potential to boost value added in knowledge-intensive business services of around **€10 billion** in ten years, e.g. by generating content, assisting in research and automating complex data processing. The impact of other types of AI in these sectors is limited to automating repetitive tasks.

Although the trade, transport and tourism sector has a small percentage impact from generative AI, it still presents a significant economic potential of an estimated **€10 billion** in ten years due to its large size. The sector can, for example, benefit from enhanced customer service through responsive chatbots and processing of legal documents or contracts.

Generative AI can benefit the public sector with an estimated **€6 billion** in ten years, e.g. through personalised tutoring in education, diagnostic support and patient interactions in healthcare, and automatic document handling and preparatory decision-making in public administration. Other types of AI also have potential in the public sector.

Generative AI has the potential to increase productivity in manufacturing and construction by around **€5 billion** in ten years, although the percentage impact is assessed to be smaller than in other sectors. Other types of AI are expected to have a significant impact on these sectors, e.g. through supply chain optimisation and automation of manual processes for specific tasks.

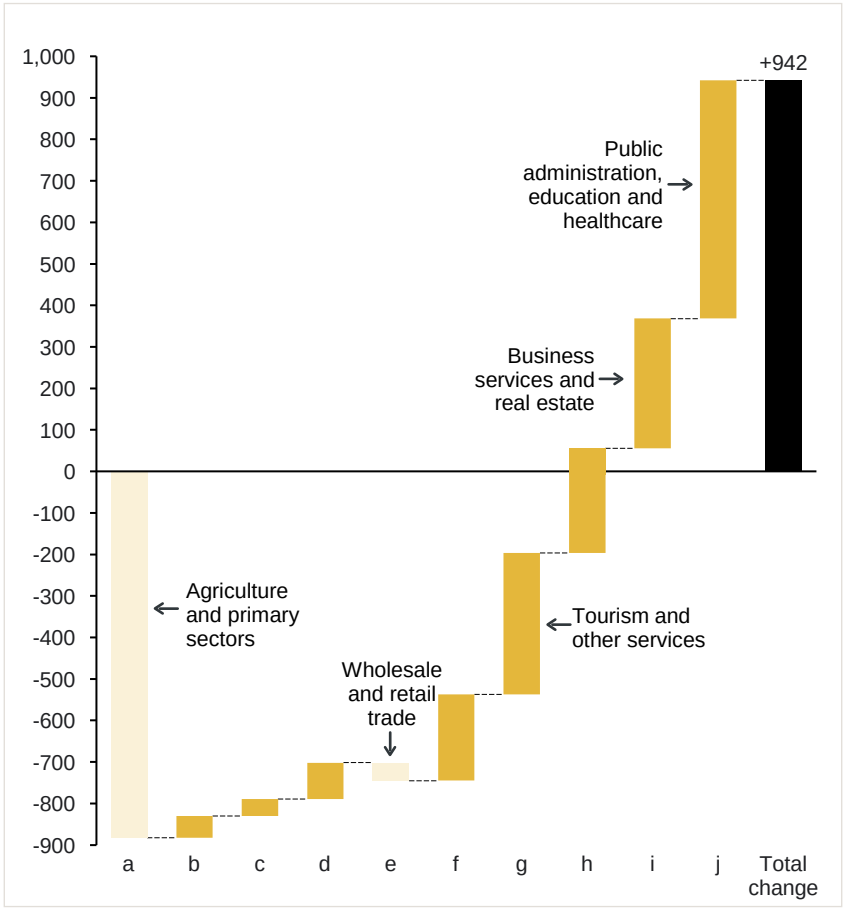
Generative AI can, for example, facilitate predictive maintenance by processing operational reports and predicting potential system failures, thereby supporting an estimated potential of less than **€5 billion** in ten years**.**

Note: Sectors are aggregated as follows: "Knowledge-intensive business services": NACE sectors J-M. "Public administration, education and healthcare": NACE sectors O-R, U. "Trade, transport and tourism": NACE sectors G-I, N, S-T. "Manufacturing, construction, energy and water": NACE sectors C-F. "Agriculture and primary sectors": NACE sectors A-B. The contributions from generative AI shown are based on sectoral gross value added and are scaled to reflect the total GDP increase from generative AI.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a).

Job changes from generative AI are small compared to expected future job openings

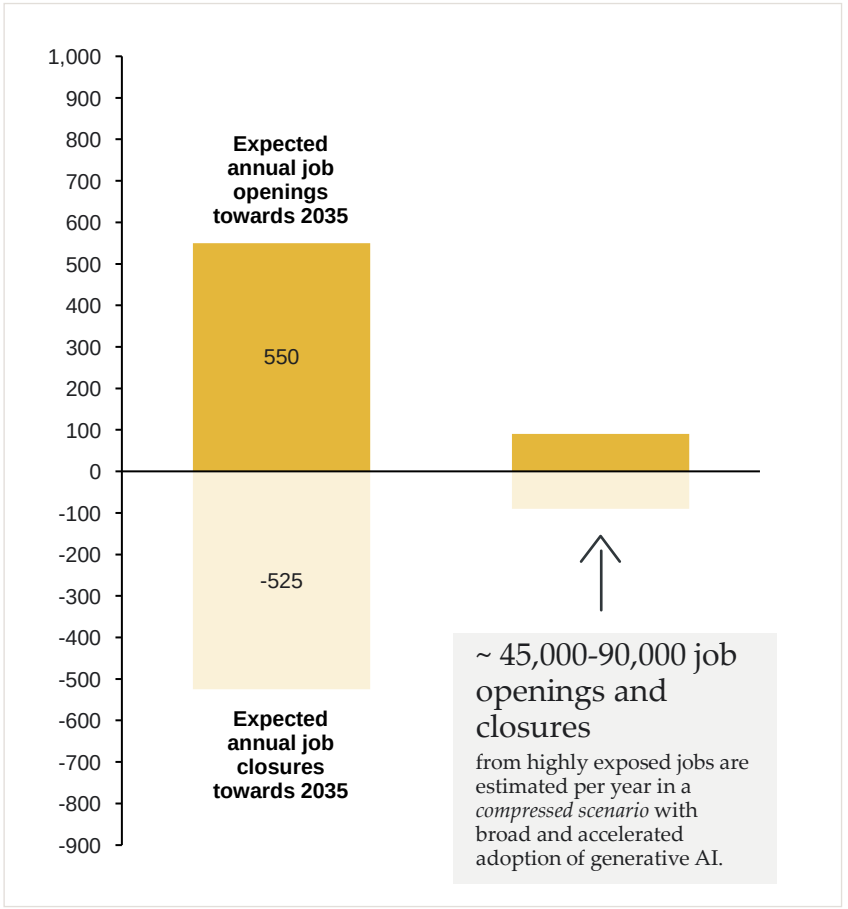
Change in employment across Polish sectors, 2008-2022

Thousand jobs



Estimated annual re-employment in Poland from generative AI

Thousand jobs



- The Polish economy has added over 940,000 jobs over the last 15 years. A few sectors such as agriculture and retail have contracted, while most other sectors have added significant amounts of new jobs, e.g. tourism, business services and the public sector.
- In addition, numerous new jobs are being created and closed each year *within* each sector to adapt to changing needs and demands.
- According to CEDEFOP, the Polish economy is expected to see around 550,000 job openings and 525,000 job closures each year towards 2035.
- We estimate that the jobs that are highly exposed to generative AI can lead to 45,000-90,000 annual job openings and closures over the coming ten years. This is approximately 8-16% of the expected future annual job openings in Poland.
- The labour market effects stemming from generative AI's impact on highly exposed jobs are thus small compared to historical levels of job changes.
- To avoid underestimating the possible job impacts of generative AI, these estimates are in a *compressed scenario* with broader and more accelerated adoption of generative AI than in our estimates of the GDP impacts.

Note: a. Agriculture and primary sectors; b. Manufacturing; c. Utilities, raw materials and waste; d. Construction; e. Wholesale and retail trade; f. Transport and storage; g. Tourism and other services; h. Information and finance; i. Business services and real estate; j. Public administration, education and healthcare. Our GDP estimate makes conservative assumptions around the scope of tasks for generative AI and the speed of adoption as in the base scenario in Briggs-Kodnani (2023a). The *compressed scenario* used to gauge the potential job market implications assumes faster adoption (full adoption over ten years) and/or more broad application of generative AI (as in the Briggs-Kodnani scenario with "more labour displacement").
Source: Implement Economics based on Eurostat and CEDEFOP.

04

The opportunity of AI in Czechia, Lithuania and Romania

Czechia, Lithuania and Romania show the diversity of the CEE region in terms of size and levels of digitalisation.

Generative AI could boost GDP by 5% in around ten years in Czechia, Lithuania and Romania

Summary of impacts from generative AI

	The boost to GDP from generative AI around ten years from now.		Share of jobs impacted by generative AI		
	EUR billion	Percent of GDP	No automation	Complemented	Partially or fully displaced
Czechia	**€14-16 billion**	**5%**	37%	57%	6%
Lithuania	**€3-4 billion**	**5%**	34%	62%	4%
Romania	**€14-16 billion**	**5%**	42%	54%	4%

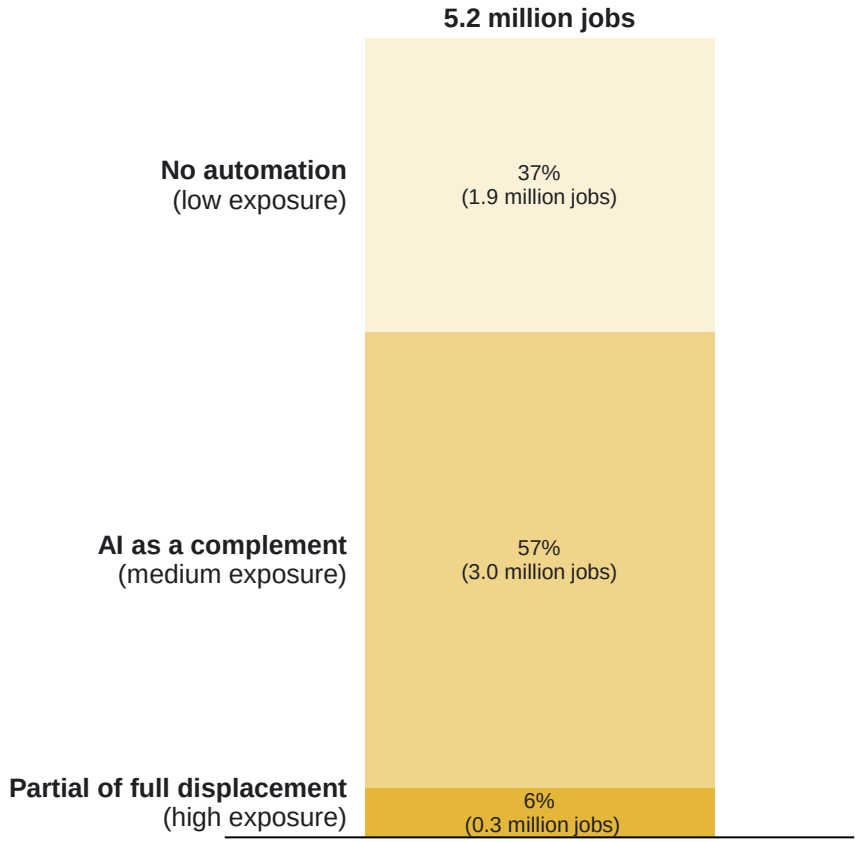
- In about ten years, we estimate a potential increase in GDP of €14-16 billion for Czechia, €3-4 billion for Lithuania and €14-16 billion for Romania.
- The increase is mainly driven by the productivity boost to the majority of jobs, ranging from 54% of jobs in Romania to 62% in Lithuania.
- Part of the value creation comes from the small share of jobs (4-6%), where generative AI is freeing up a significant amount of time for other tasks.
- Despite varying shares of job complementation and displacement, the total GDP impact in around ten years is estimated at 5% for all three countries.
- The similar productivity boost despite differing rates of exposure stems from variation in absolute productivity. For instance, although the share of jobs affected by generative AI is lower in Romania, average absolute productivity is higher than in both Lithuania and Czechia. Thus, the economic potential of generative AI per worker is larger in Romania.

Note: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a).

Generative AI is estimated to augment most jobs in Czechia

Share of jobs in Czechia exposed to automation by generative AI

% of total employment



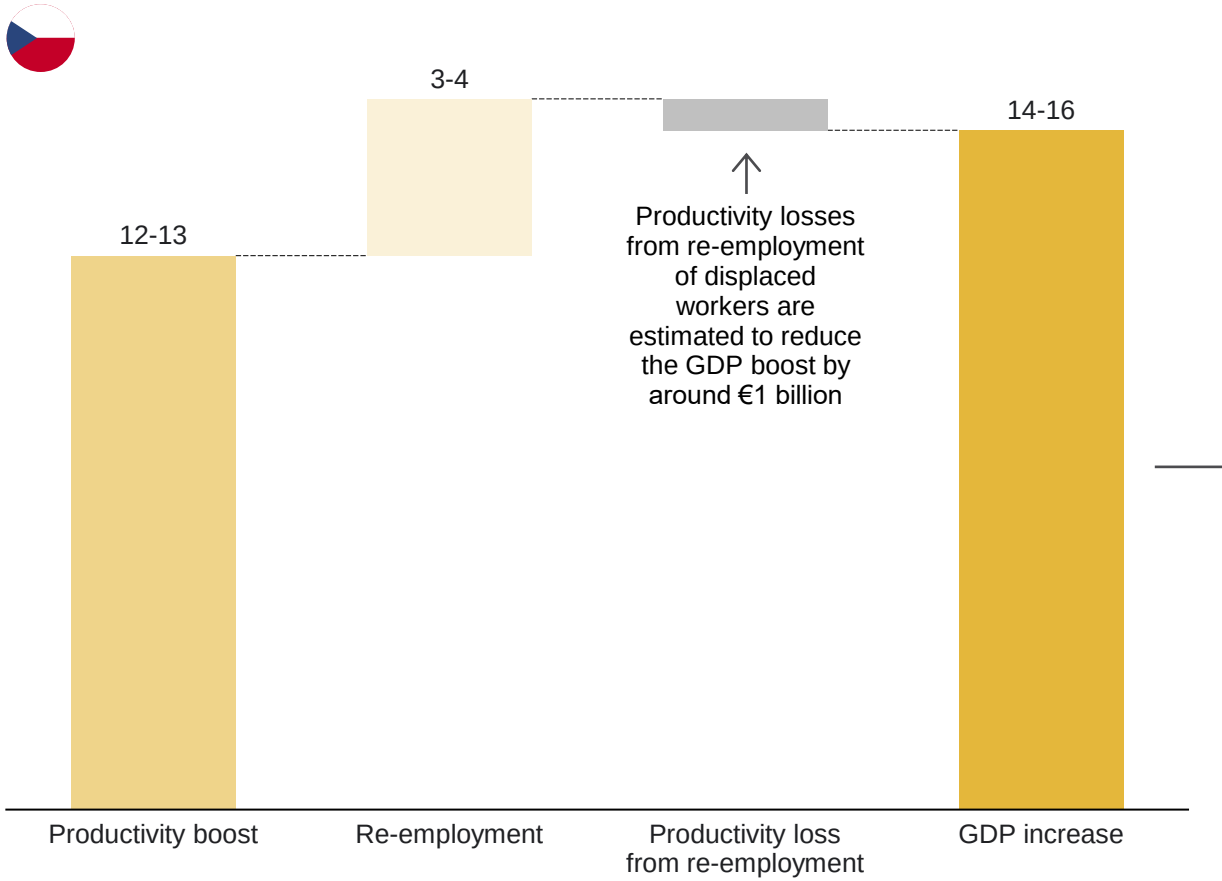
- Most jobs in Czechia (57%) are expected to be augmented and complemented by generative AI by automating a limited share of their tasks and helping to create more value when working together with the machine using generative AI technology.
- Unlike previous waves of automation that mainly impacted manual workers, generative AI is expected to primarily affect office-based professionals. Czechia has slightly fewer workers in these types of occupations compared to the CEE region as a whole.
- An estimated 37% of jobs in Czechia are likely to remain largely unaffected by generative AI. These jobs include manual labour, outdoor tasks, such as construction and cleaning, and human-to-human tasks, such as personal care and food services.
- A small share of current jobs in Czechia (6%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations. The share in Czechia is in line with the CEE average.

Note: Based on 2022 employment data. In accordance with Briggs and Kodnani (2023a), "Low exposure" are occupations with less than 10% exposure, "Medium exposure" are occupations with 10-49% exposure and "High exposure" are occupations with exposure of or above 50%. Note that percentages and absolute numbers are rounded.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

Generative AI could increase Czechia's annual GDP by €14-16 billion in ten years

GDP potential of generative AI in Czechia

€ billion annual increase from baseline GDP after a ten-year adoption period



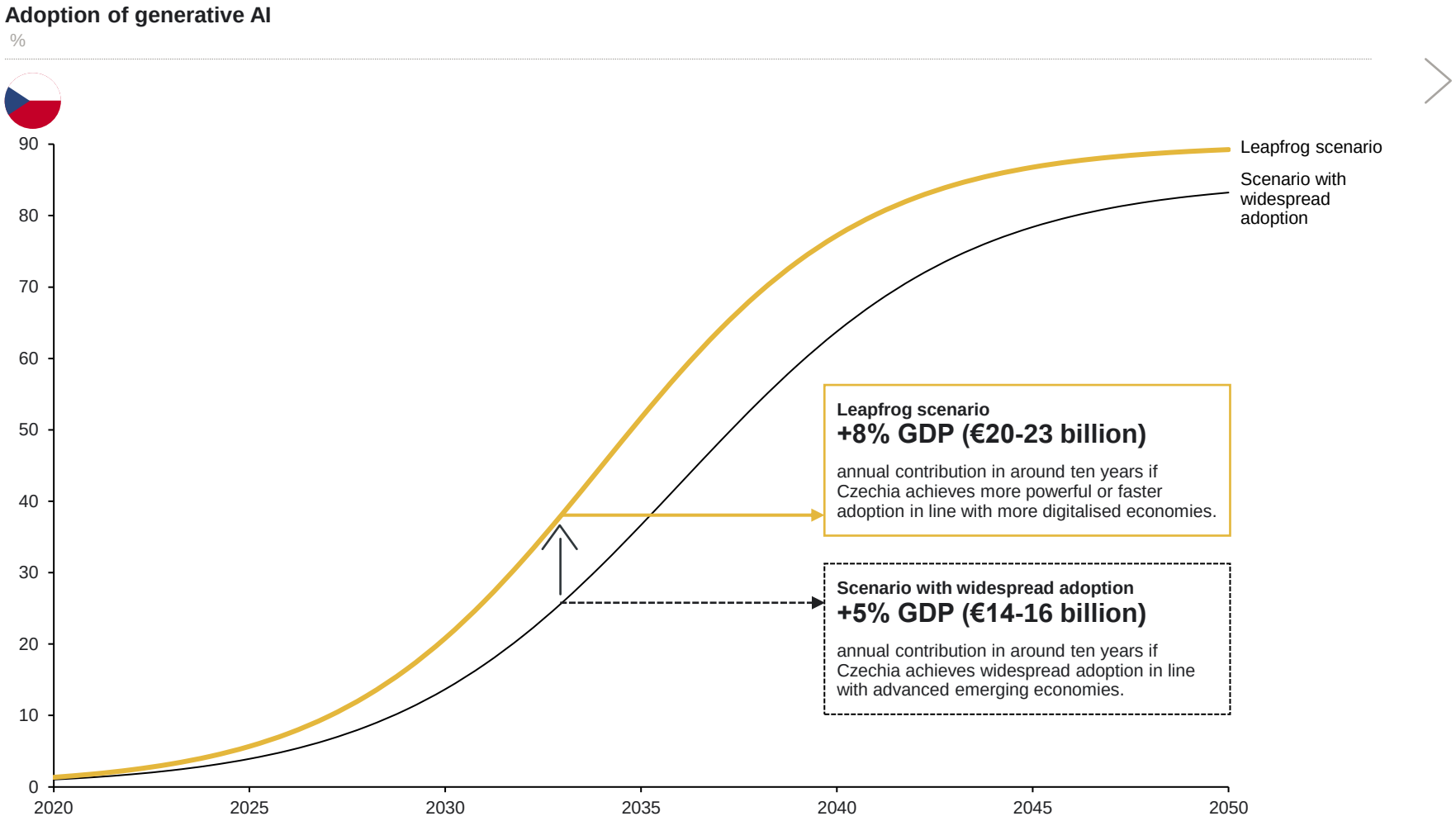
+5% GDP

annual contribution if Czechia achieves widespread adoption of AI.

- We estimate a potential increase in GDP of €14-16 billion in around ten years, corresponding to 5% of Czechia's GDP.
- The main impact of generative AI comes from a productivity boost to the majority of workers (57%) by augmenting their capabilities, quality and efficiency, which is estimated at €12-13 billion for Czechia.
- The estimate includes impacts of re-employment of a small share of workers (6%), where generative AI is freeing up a significant share of work for other tasks. This contribution to GDP is estimated at €3-4 billion in Czechia.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for Czechia by up to €1 billion.
- At its peak, the isolated productivity effect of generative AI in Czechia is estimated to be equivalent to 1.2% annually.

Note: There is much uncertainty around the capability and adoption timeline of generative AI. The size of the productivity boost depends on the difficulty level of tasks that generative AI will be able to complete and the number of jobs it can automate. GDP is in 2022 levels. The average number of work activities that potentially can be performed by generative AI across all types of tasks for both complemented and highly exposed workers corresponds to 20-25%. Our estimate is the isolated potential of generative AI around ten years from now when the impact is assumed to peak in leading countries. The estimated boost from generative AI may not be fully additive to GDP trends, as the GDP forecast already assumes a growth contribution from new technologies and generative AI may substitute some of that. Also, the boost from generative AI may be partially offset by an underlying growth slowdown.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

A leapfrog scenario could increase Czechia's annual GDP potential from generative AI from 5% to 8%

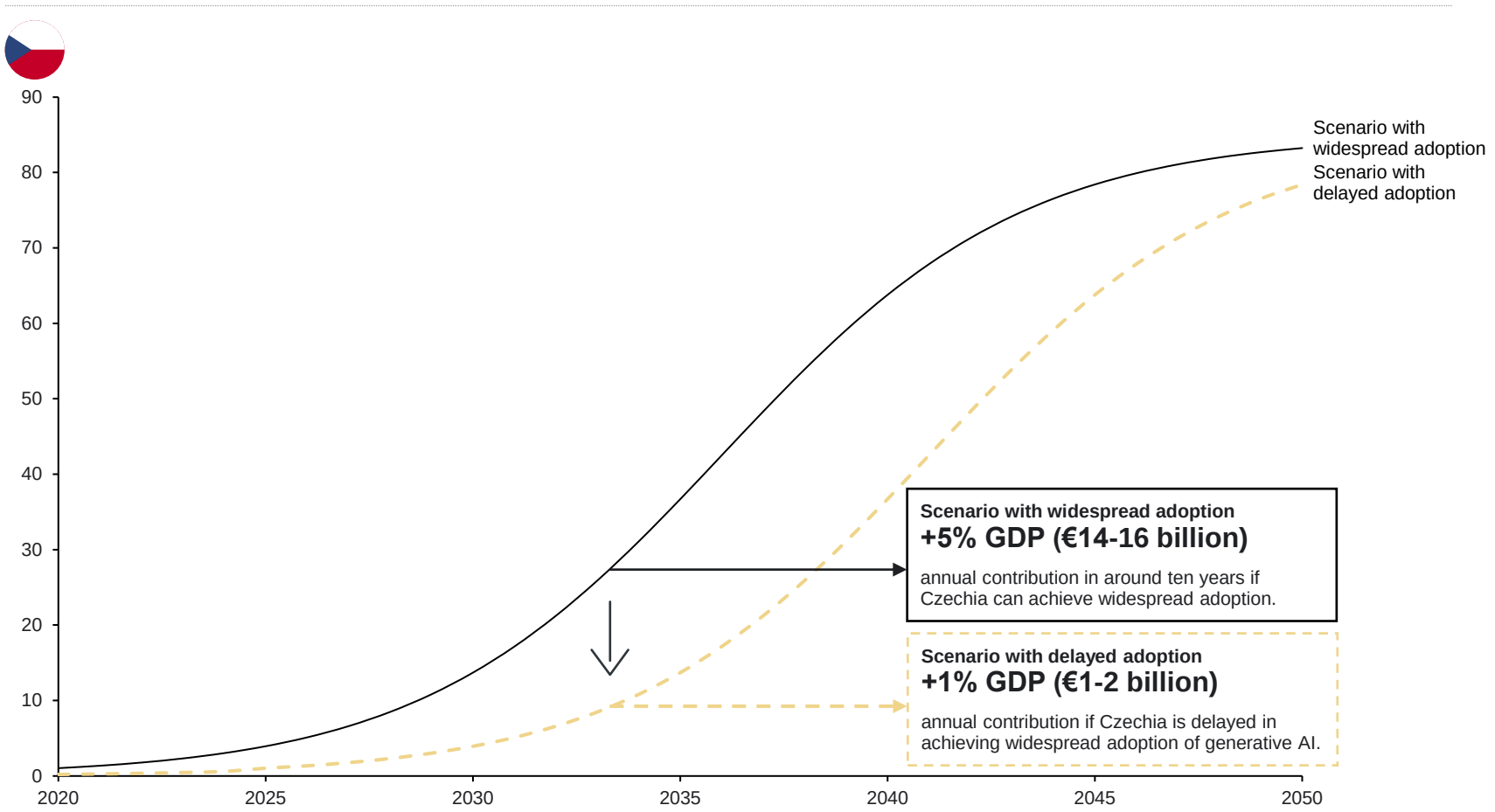


- Compared to other historical technological innovations, generative AI is more powerful, more user-friendly and easier to adopt.
- This presents a significant opportunity for less digitalised countries to leapfrog their digital development by skipping one generation of technology and going straight to the new generation of generative AI tools.
- To gauge the potential, we consider a *leapfrog scenario* where Czechia succeeds in adopting generative AI with the same impact as most digitalised European economies.
- If Czechia can capture the benefits of generative AI in line with frontrunner countries in Europe, the economic potential in ten years is estimated to increase from 5% (€14-16 billion) to 8% (€20-23 billion).
- The leapfrogging scenario may also mean that generative AI could not only be adopted faster but also provide more powerful boosts to productivity in industries in Czechia that are lagging their more digitalised European peers. The boost could potentially be bigger than quantified here.
- Leapfrogging would require a focused effort to significantly elevate key AI drivers in a short timeframe.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging markets", while the "leapfrog" scenario assumes adoption in line with "other developed markets" in Briggs and Kodnani (2023b).
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

A five-year delay in the adoption of generative AI could reduce Czechia's annual potential GDP gains from 5% to 1%

Adoption of generative AI



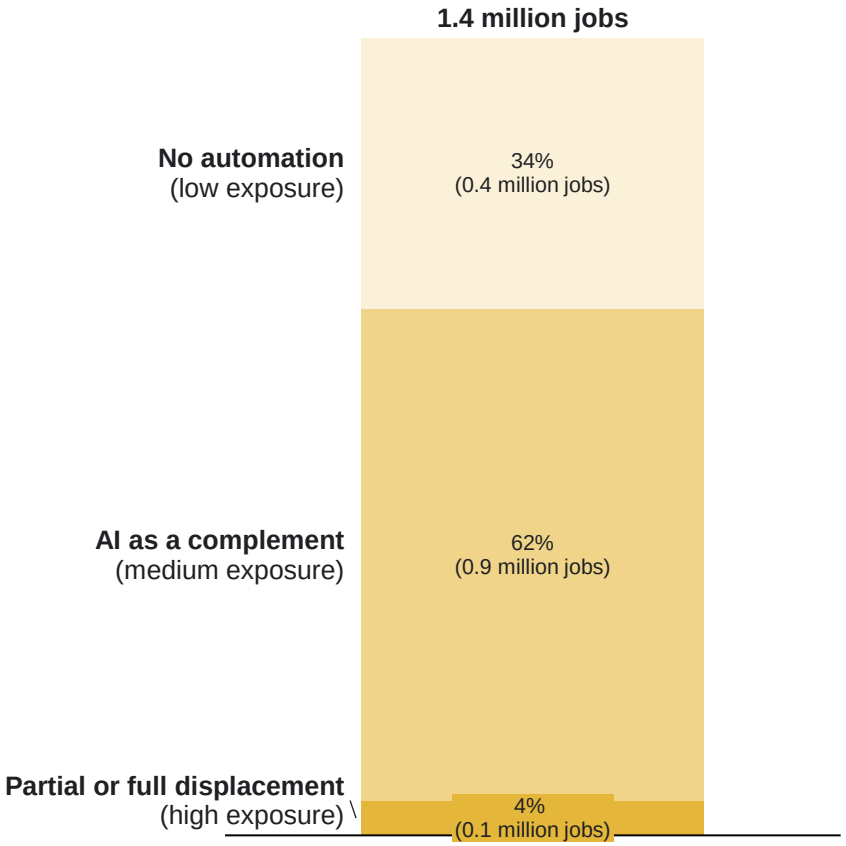
- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of Czechia's GDP potential from generative AI is reliant on gradual adoption and development of the new AI technology within the next ten years.
- A five-year delay in capturing the benefits of generative AI is estimated to reduce the annual GDP contribution in ten years from 5% (€14-16 billion) to only 1% (€1-2 billion).
- Czechia can enhance the welfare and GDP contribution from generative AI by ensuring that policies are in place to capture the benefits as assumed in the widespread adoption scenario.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging economies" in Briggs and Kodnani (2023b). Note that the impact of generative AI may take longer than ten years before reaching its peak impact in less digitalised economies such as in Czechia.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

Generative AI is estimated to augment most jobs in Lithuania

Share of jobs in Lithuania exposed to automation by generative AI

% of total employment



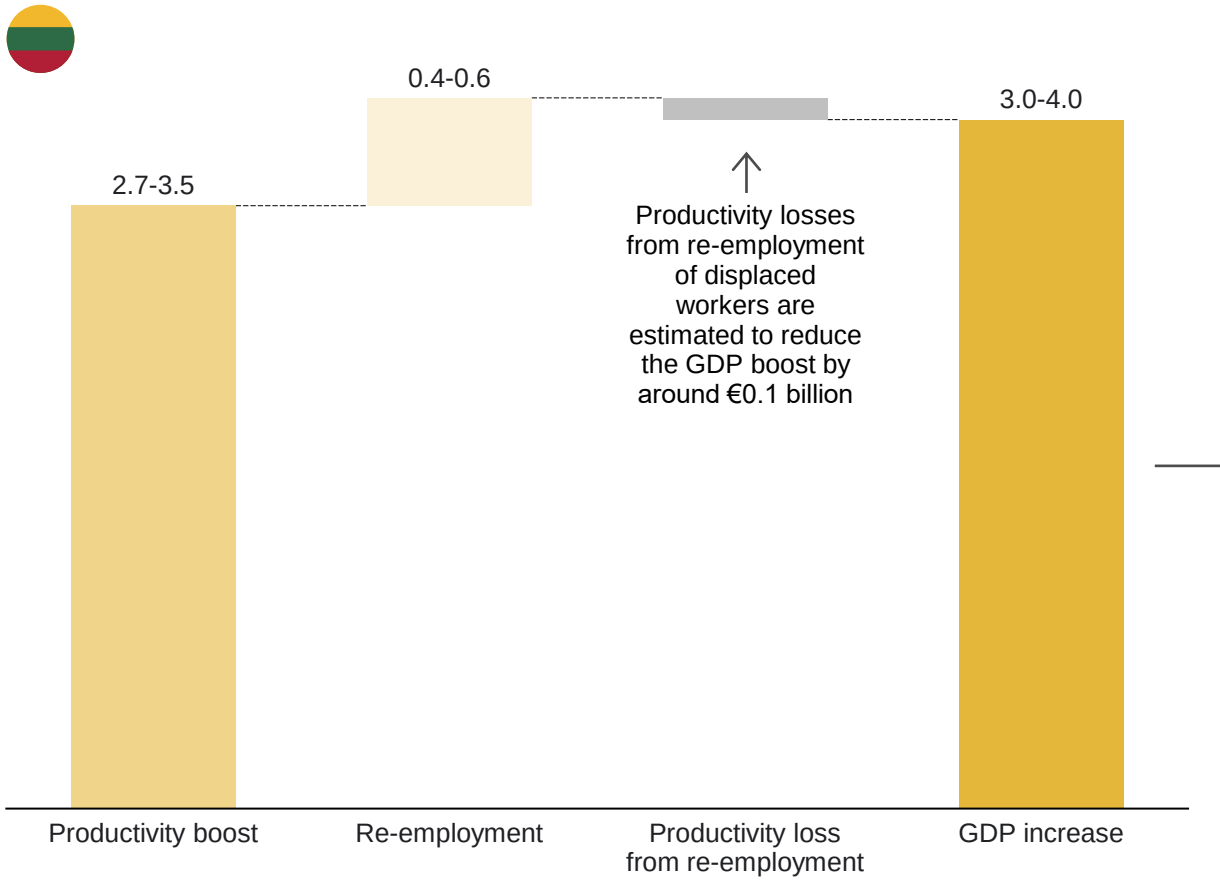
- Most jobs in Lithuania (62%) are expected to be augmented and complemented by generative AI by automating a limited share of their tasks and helping to create more value when working together with the machine using generative AI technology.
- Unlike previous waves of automation that mainly impacted manual workers, generative AI is expected to primarily affect office-based professionals. Lithuania has roughly the same share of workers in these types of occupations compared to the CEE region as a whole.
- An estimated 34% of jobs in Lithuania are likely to remain largely unaffected by generative AI. These jobs include manual labour, outdoor tasks, such as construction and cleaning, and human-to-human tasks, such as personal care and food services.
- A small share of current jobs in Lithuania (4%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations. The share in Lithuania is in line with the CEE average.

Note: Based on 2022 employment data. In accordance with Briggs and Kodnani (2023a), “Low exposure” are occupations with less than 10% exposure, “Medium exposure” are occupations with 10-49% exposure and “High exposure” are occupations with exposure of or above 50%. Note that percentages and absolute numbers are rounded.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

Generative AI could increase Lithuania's annual GDP by €3-4 billion in ten years

GDP potential of generative AI in Lithuania

€ billion annual increase from baseline GDP after a ten-year adoption period



+5% GDP

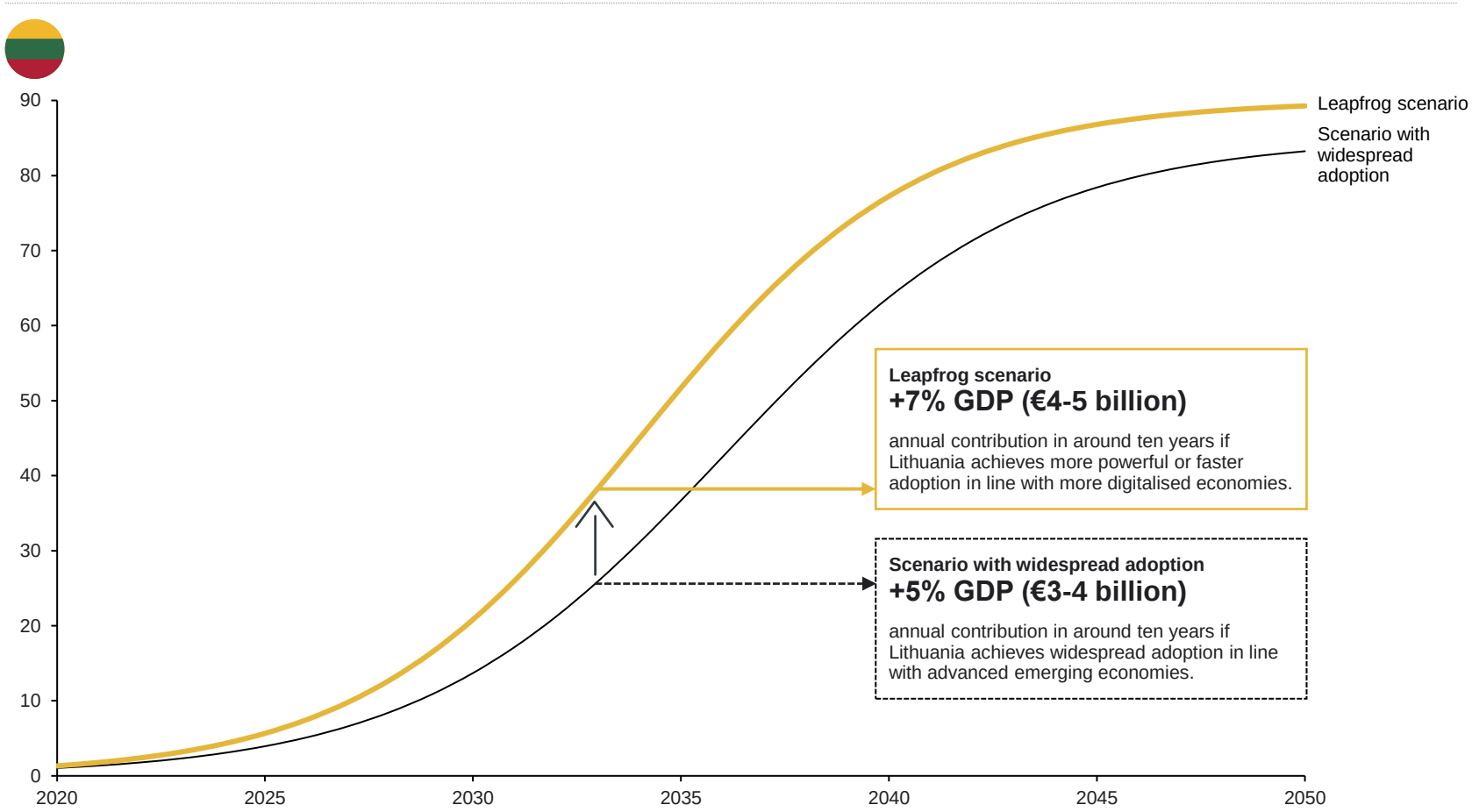
annual contribution if Lithuania achieves widespread adoption of AI.

- We estimate a potential increase in GDP of €3-4 billion in around ten years, corresponding to 5% of Lithuania's GDP.
- The main impact of generative AI comes from a productivity boost to the majority of workers (62%) by augmenting their capabilities, quality and efficiency, which is estimated at €2.7-3.5 billion for Lithuania.
- The estimate includes impacts of re-employment of a small share of workers (4%), where generative AI is freeing up a significant share of work for other tasks. This contribution to GDP is estimated at €0.4-0.6 billion in Lithuania.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for Lithuania by around €0.1 billion.
- At its peak, the isolated productivity effect of generative AI in Lithuania is estimated to be equivalent to 1.1% annually.

Note: There is much uncertainty around the capability and adoption timeline of generative AI. The size of the productivity boost depends on the difficulty level of tasks that generative AI will be able to complete and the number of jobs it can automate. GDP is in 2022 levels. The average number of work activities that potentially can be performed by generative AI across all types of tasks for both complemented and highly exposed workers corresponds to 20-25%. Our estimate is the isolated potential of generative AI around ten years from now when the impact is assumed to peak in leading countries. The estimated boost from generative AI may not be fully additive to GDP trends, as the GDP forecast already assumes a growth contribution from new technologies and generative AI may substitute some of that. Also, the boost from generative AI may be partially offset by an underlying growth slowdown.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023), BNP Paribas (2023), and Dell'Acqua et al. (2023).

A leapfrog scenario could increase Lithuania's annual GDP potential from generative AI from 5% to 7%

Adoption of generative AI

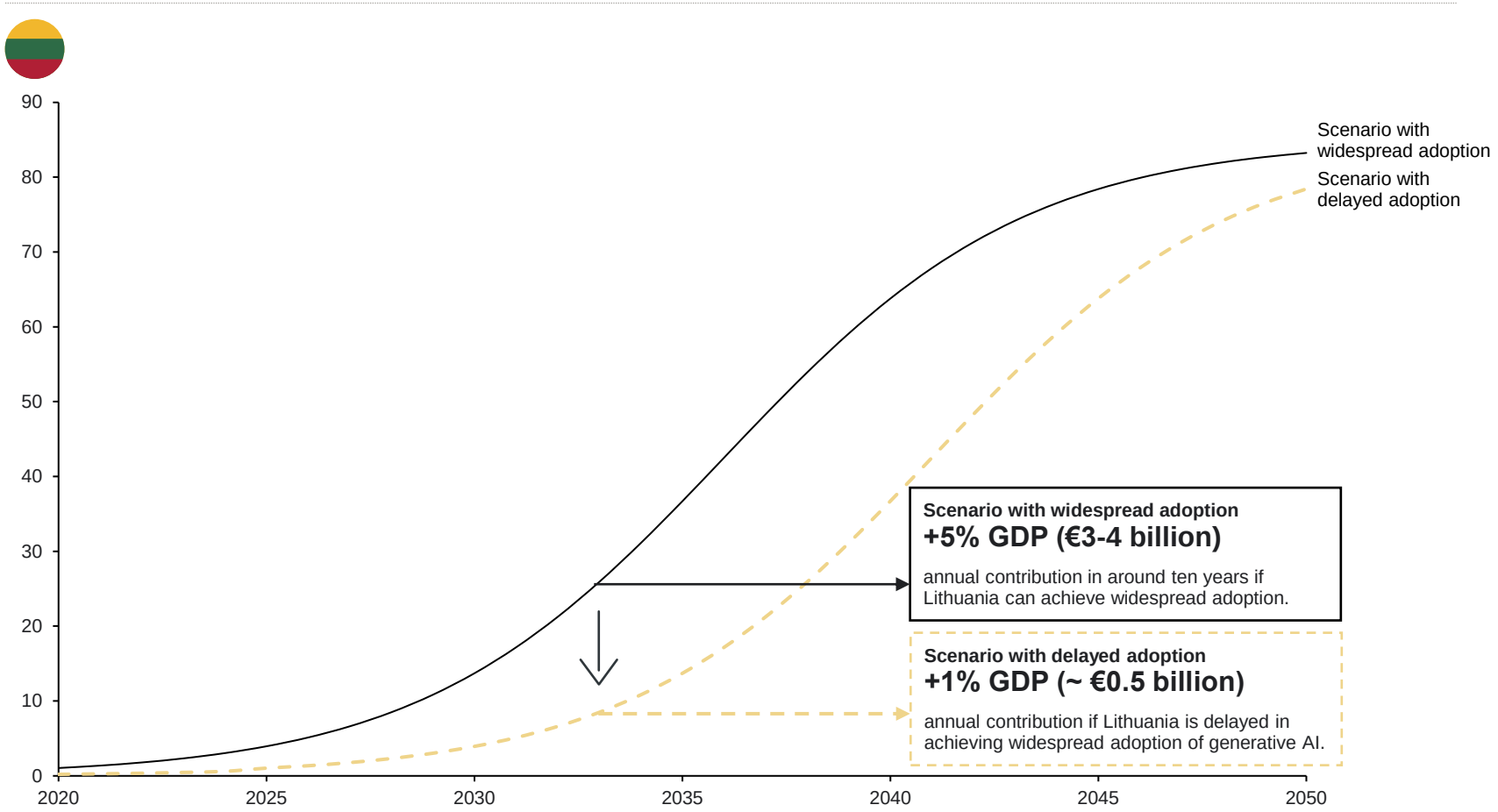


- Compared to other historical technological innovations, generative AI is more powerful, more user-friendly and easier to adopt.
- This presents a significant opportunity for less digitalised countries to leapfrog their digital development by skipping one generation of technology and going straight to the new generation of generative AI tools.
- To gauge the potential, we consider a *leapfrog scenario* where Lithuania succeeds in adopting generative AI with the same impact as most digitalised European economies.
- If Lithuania can capture the benefits of generative AI in line with frontrunner countries in Europe, the economic potential in ten years is estimated to increase from 5% (€3-4 billion) to 7% (€4-5 billion).
- The leapfrogging scenario may also mean that generative AI could not only be adopted faster but also provide more powerful boosts to productivity in industries in Lithuania that are lagging behind their more digitalised European peers. The boost could potentially be bigger than quantified here.
- Leapfrogging would require a focused effort to significantly elevate key AI drivers in a short timeframe.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging markets", while the "leapfrog" scenario assumes adoption in line with "other developed markets" in Briggs and Kodnani (2023b).
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

A five-year delay in the adoption of generative AI could reduce Lithuania's annual potential GDP gains from 5% to 1%

Adoption of generative AI



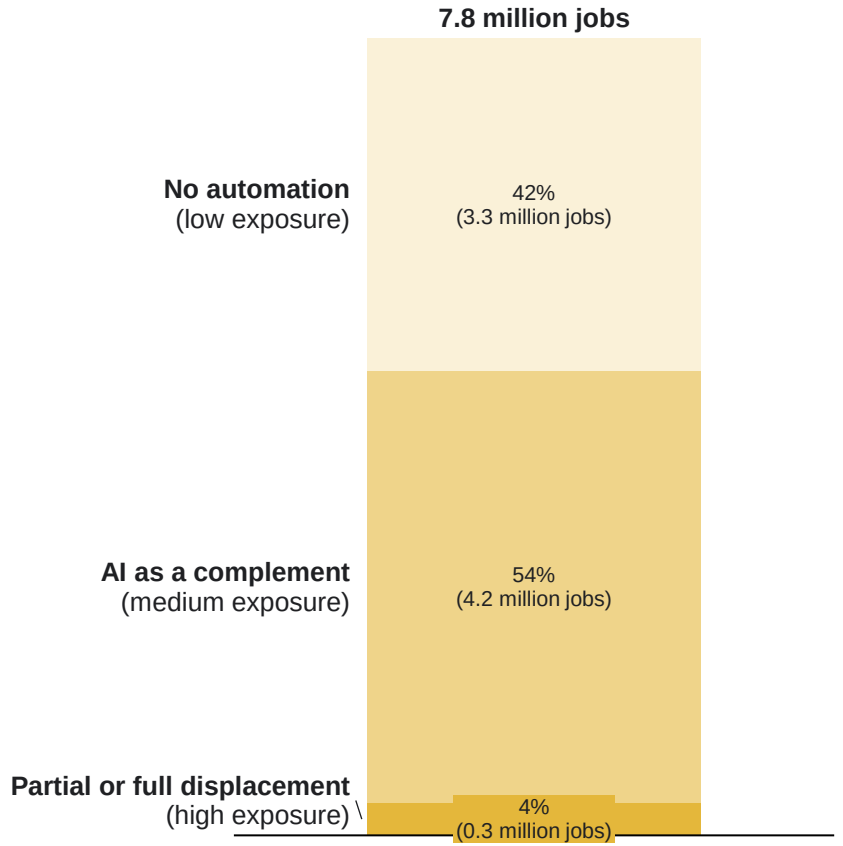
- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of Lithuania's GDP potential from generative AI is reliant on gradual adoption and development of the new AI technology within the next ten years.
- A five-year delay in capturing the benefits of generative AI is estimated to reduce the annual GDP contribution in ten years from 5% (€3-4 billion) to only 1% (~ €0.5 billion).
- Lithuania can enhance the welfare and GDP contribution from generative AI by ensuring that policies are in place to capture the benefits as assumed in the widespread adoption scenario.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging economies" in Briggs and Kodnani (2023b). Note that the impact of generative AI may take longer than ten years before reaching its peak impact in less digitalised economies such as in Lithuania.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

Generative AI is estimated to augment most jobs in Romania

Share of jobs in Romania exposed to automation by generative AI

% of total employment



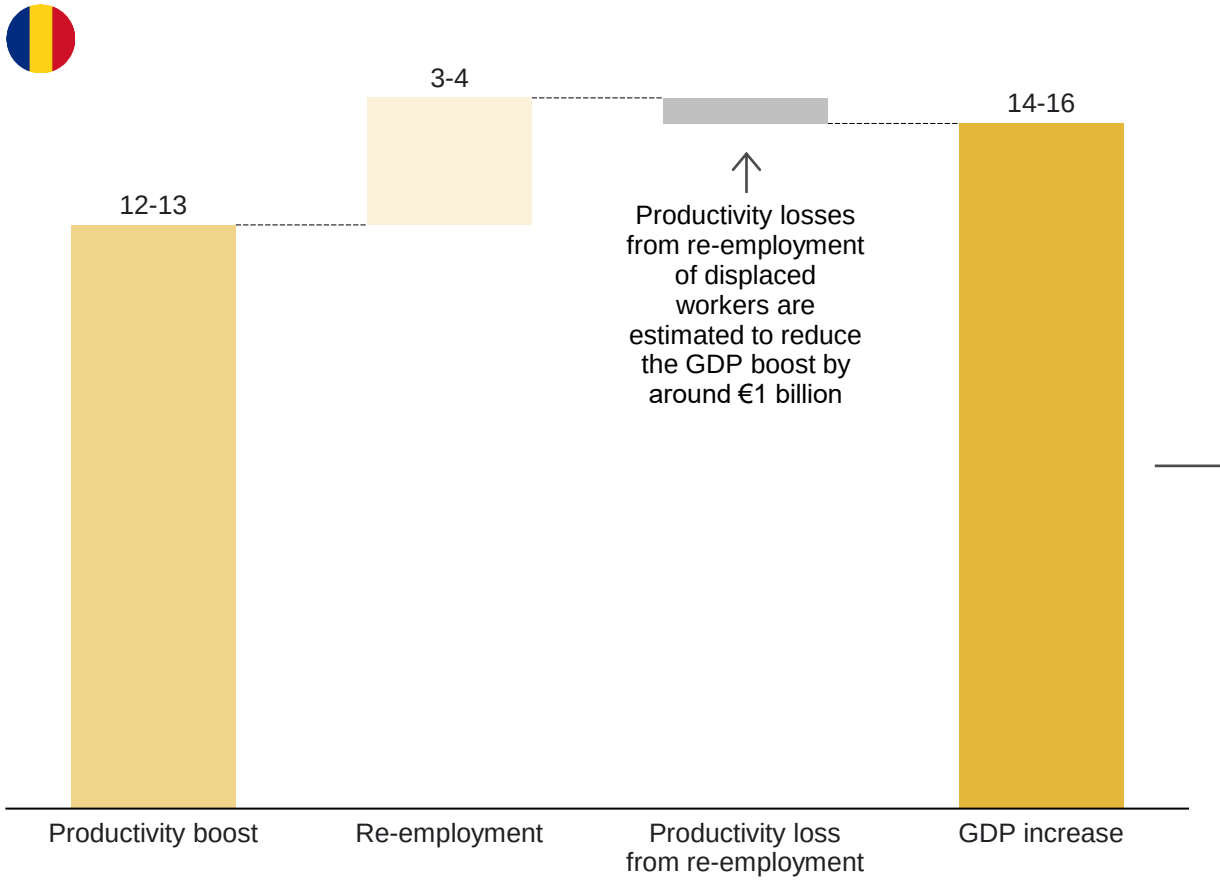
- Most jobs in Romania (54%) are expected to be augmented and complemented by generative AI by automating a limited share of their tasks and helping to create more value when working together with the machine using generative AI technology.
- Unlike previous waves of automation that mainly impacted manual workers, generative AI is expected to primarily affect office-based professionals. Romania has fewer workers in these types of occupations compared to the CEE region as a whole.
- An estimated 42% of jobs in Romania are likely to remain largely unaffected by generative AI. These jobs include manual labour, outdoor tasks, such as construction and cleaning, and human-to-human tasks, such as personal care and food services.
- A small share of current jobs in Romania (4%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations. The share in Romania is in line with the CEE average.

Note: Based on 2022 employment data. In accordance with Briggs and Kodnani (2023a), "Low exposure" are occupations with less than 10% exposure, "Medium exposure" are occupations with 10-49% exposure and "High exposure" are occupations with exposure of or above 50%. Note that percentages and absolute numbers are rounded.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

Generative AI could increase Romania's annual GDP by €14-16 billion in ten years

GDP potential of generative AI in Romania

€ billion annual increase from baseline GDP after a ten-year adoption period



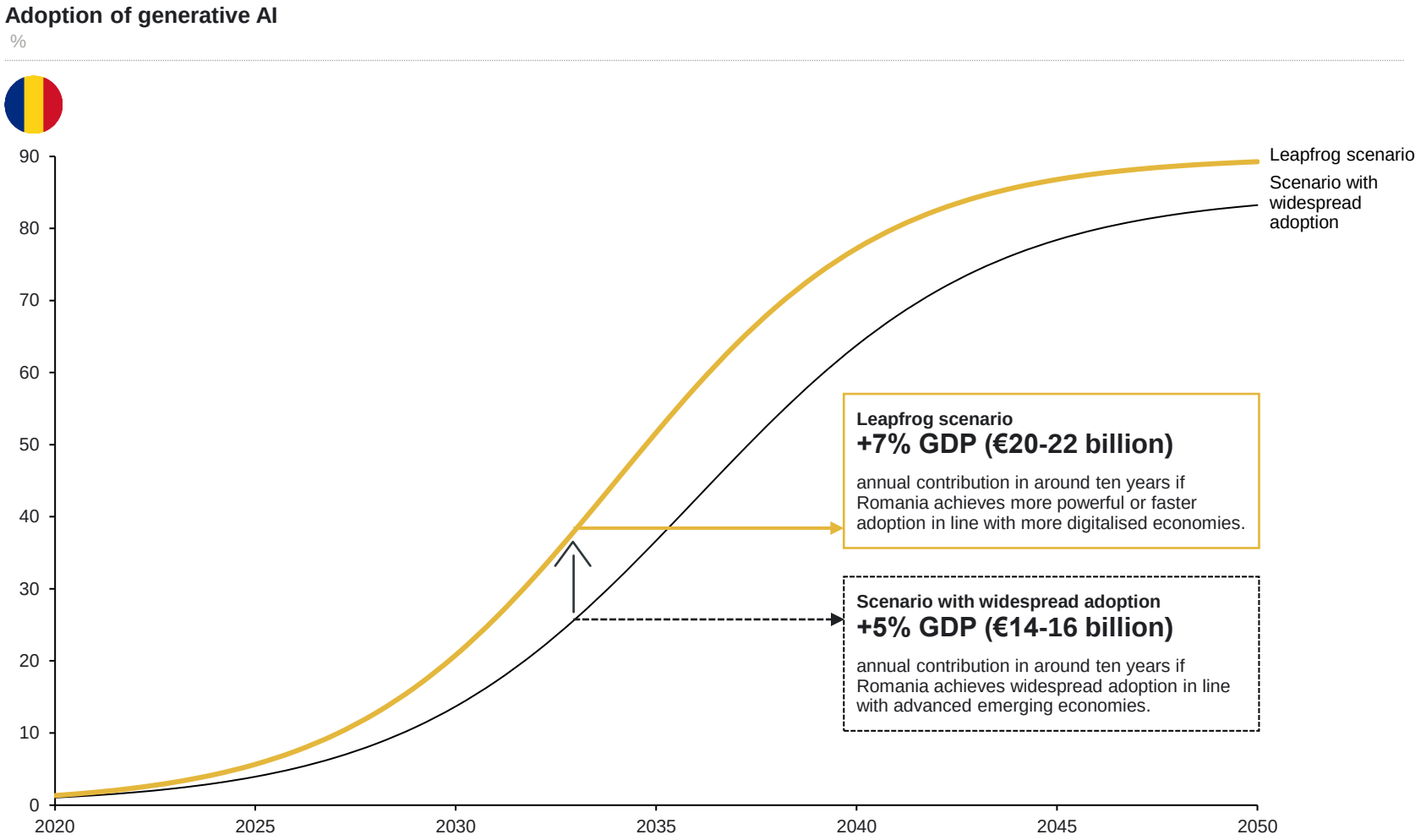
+5% GDP

annual contribution if Romania achieves widespread adoption of AI.

- We estimate a potential increase in GDP of €14-16 billion in around ten years, corresponding to 5% of Romania's GDP.
- The main impact of generative AI comes from a productivity boost to the majority of workers (54%) by augmenting their capabilities, quality and efficiency, which is estimated at €12-13 billion for Romania.
- The estimate includes impacts of re-employment of a small share of workers (4%), where generative AI is freeing up a significant share of work for other tasks. This contribution to GDP is estimated at €3-4 billion in Romania.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for Romania by around €1 billion.
- At its peak, the isolated productivity effect of generative AI in Romania is estimated to be equivalent to 1.1% annually.

Note: There is much uncertainty around the capability and adoption timeline of generative AI. The size of the productivity boost depends on the difficulty level of tasks that generative AI will be able to complete and the number of jobs it can automate. GDP is in 2022 levels. The average number of work activities that potentially can be performed by generative AI across all types of tasks for both complemented and highly exposed workers corresponds to 20-25%. Our estimate is the isolated potential of generative AI around ten years from now when the impact is assumed to peak in leading countries. The estimated boost from generative AI may not be fully additive to GDP trends, as the GDP forecast already assumes a growth contribution from new technologies and generative AI may substitute some of that. Also, the boost from generative AI may be partially offset by an underlying growth slowdown.
Source: Implement Economics based on Eurostat, O*Net, Briggs and Kodnani (2023a), BNP Paribas (2023), and Dell'Acqua et al. (2023).

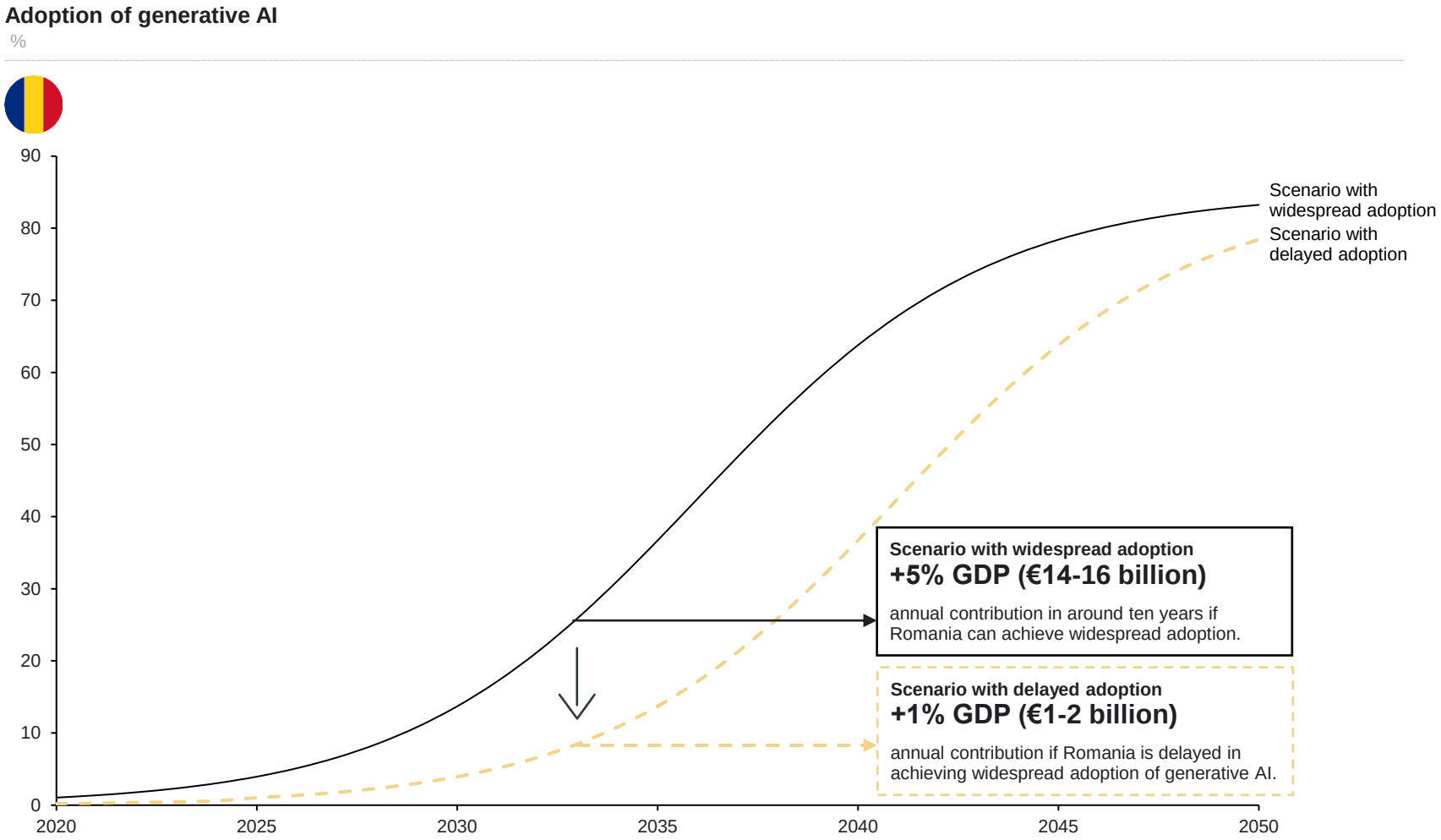
A leapfrog scenario could increase Romania's annual GDP potential from generative AI from 5% to 7%



- Compared to other historical technological innovations, generative AI is more powerful, more user-friendly and easier to adopt.
- This presents a significant opportunity for less digitalised countries to leapfrog their digital development by skipping one generation of technology and going straight to the new generation of generative AI tools.
- To gauge the potential, we consider a *leapfrog scenario* where CEE succeeds in adopting generative AI with same impact as most digitalised European economies.
- If Romania can capture benefits of generative AI in line with frontrunner countries in Europe, the economic potential in ten years is estimated to increase from 5% (€14-16 billion) to 7% (€20-22 billion).
- The leapfrogging scenario may also mean that generative AI could not only be adopted faster but also provide more powerful boosts to productivity in industries in Romania that are lagging their more digitalised European peers. The boost could potentially be bigger than quantified here.
- Leapfrogging would require a focused effort to significantly elevate key AI drivers in a short timeframe.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging markets", while the "leapfrog" scenario assumes adoption in line with "other developed markets" in Briggs and Kodnani (2023b).
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

A five-year delay in the adoption of generative AI could reduce Romania's annual potential GDP gains from 5% to 1%



- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of Romania's GDP potential from generative AI is reliant on gradual adoption and development of the new AI technology within the next ten years.
- A five-year delay in capturing the benefits of generative AI is estimated to reduce the annual GDP contribution in ten years from 5% (€14-16 billion) to only 1% (€1-2 billion).
- Romania can enhance the welfare and GDP contribution from generative AI by ensuring that policies are in place to capture the benefits as assumed in the widespread adoption scenario.

Note: GDP figures are expressed in 2022 levels. The figure shows generative AI adoption expressed as a share of economywide companies exposed to AI automation. The estimate is made for a ten-year adoption period to align with the time horizon for widespread adoption by the most advanced emerging markets. Thus, the "widespread adoption" scenario assumes adoption in line with "advanced emerging economies" in Briggs and Kodnani (2023b). Note that the impact of generative AI may take longer than ten years before reaching its peak impact in less digitalised economies such as in Romania.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a&b).

05

AI’s impact on societal challenges

AI can help with some of Central Eastern Europe’s most pressing societal challenges.

AI can optimise resources in the health sector and improve patient treatment across CEE

Across the CEE region, healthcare systems are faced with underfunding, staff shortages, an ageing population and an increase in chronic diseases.

More hands are needed

- Large parts of CEE face a severe healthcare professional shortage, exemplified by Romania halving its number of doctors between 2009-2015.
- Western EU countries had a life expectancy of 81 in 2009 compared to 75 in Central Eastern EU states, indicating a health disparity.
- The CEE region experiences high healthcare costs, with Bulgaria's out-of-pocket expenses amounting to 34% of total health spending in 2021, heavily burdening lower-income families.

Better treatment and care is required

- An ageing population requires more healthcare services and specialised care.
- Growing living standards drive up societal expectations for healthcare services.
- Chronic diseases are becoming more challenging and rare diseases more common.

AI has the potential to mitigate resource scarcity and enhance care quality and access.

Leveraging AI for healthcare purposes in the region requires a strong emphasis on maintaining patient data privacy and adhering to ethical standards.

AI can help free up and optimise critical resources

- Automating tasks in healthcare administration, e.g. appointment scheduling.
- Recording and synthesising appointment notes, referral information and care plans.
- Enabling faster and more accurate screening and decision-making by physicians and nurses.
- Enabling physicians to undertake remote consultations.
- Enabling a higher degree of patient self-service.

AI can improve how we treat patients

- Analysing and enhancing medical images as well as earlier and more accurate detection of diseases and injuries.
- Improving detection of complex and rare diseases with training data sets and smarter diagnostic tools.
- Predicting individual treatment responses by analysing different patient data.
- Improving the development of targeted therapies.
- Tracking health issues and accidents through wearable devices and sensors.

Lithuania is a regional frontrunner, showcasing dedicated efforts for utilising AI in healthcare.

Growth hotspot for digital health

Lithuania is becoming a growth hotspot for digital health with a strong life sciences sector and a strong government-backed AI ecosystem. In Lithuania, several health-focused AI startups have been supported by the country's AI ecosystem.

An example is Ligence working on an AI programme to make heart ultrasounds faster and more accurate. This tool will help doctors do their job twice as fast and with fewer mistakes. It works online, uses smart tech to understand heart pictures and fills in reports by itself.

Source: Implement Economics based on WHO (2021), Eurostat (2021), Politico (2017) and OECD/European Observatory on Health Systems and Policies.

AI could improve the daily lives of people with disabilities by enhancing overall accessibility and learning experiences

	Enhancing accessibility	Facilitating communication	Improving mobility and navigation	Enabling personalised learning
Potential	• AI can interpret and translate visual content into alternative formats like audio descriptions and Braille for those with visual impairments. • It can also generate accurate and context-aware captions for images and videos, improving the understanding of digital media.	• For individuals with hearing impairments, AI can transcribe speech in real time and translate it into text or sign language, enabling more accessible communication. • Additionally, AI can aid those with speech impairments by facilitating alternative communication methods, such as converting text or gestures into synthesised speech.	• AI could enhance mobility for people with physical disabilities by optimising route planning with accessibility in mind and controlling assistive devices like robotic prosthetics with nuanced and adaptive responses.	• For those with cognitive disabilities, AI can tailor educational content to fit individual learning styles and needs. • It can adapt difficulty levels, provide interactive aids and create engaging, game-like educational activities.
Example	• Devices like Google Nest enable users with mobility or visual impairments to control home appliances, access information on the internet, manage schedules etc. through voice commands without needing to physically interact with a device.	• Google's Live Transcribe app offers real-time speech-to-text services that allow users with hearing impairments to follow along with conversations as they happen, with high accuracy and low latency.	• AI-driven robotic prosthetics, such as those from Open Bionics, use sensor data to provide responsive movement that adapts to the user's environment and intentions, enhancing the user's ability to perform daily tasks independently.	• Grammarly offers writing assistance to people with dyslexia by not only correcting spelling and grammar but also explaining the reasons behind these corrections, thereby supporting the learning process.

- Disabilities manifest in a multitude of ways, impacting various aspects of life and functioning, including physical, sensory, cognitive and social domains.
- Across the CEE region, an average of 20% of the population report facing disability-related activity restrictions, including 7% with severe limitations, impacting workforce and social engagement.
- AI technologies offer transformative opportunities for people with various disabilities by enabling greater accessibility and personalised support.
- Numerous organisations are already utilising AI to enhance accessibility, and the advent of new AI capabilities could potentially lead to even more extensive benefits.

Source: Implement Economics based on Harvard Business Review.

Generative AI offers a promising solution to narrow the digital divide across age, gender and urbanisation

The digital divide in …

Age

In CEE, the digital divide often manifests through a significant age gap in digital literacy and internet usage.

A study across the EU shows that less than 60% of people aged 65-74 have reported to have used the internet within three months across CEE, with less than 30% in Bulgaria and Croatia.

Gender

Women and girls frequently have lower rates of digital participation and skills compared to their male counterparts, influenced by socio-cultural norms and barriers that limit their access to STEM education and careers.

In 2022, women accounted for only 10-30% of employment in ICT across CEE countries.

Rural vs urban regions

The digital landscape in CEE reflects a notable contrast between urban and rural areas in terms of digital skills.

Across the EU, people residing in cities exhibit higher digital skills, with 33% of city dwellers in the EU demonstrating above-basic overall digital skills, compared to only 20% in rural areas. Within the CEE, some of the largest gaps are found in this regard.

Generative AI can help due to …

Accessible resources

By automating complex tasks and offering user-friendly interfaces, generative AI lowers the barrier to digital engagement for those with minimal technical skills or resources, fostering inclusivity in the digital economy and enabling broader participation across various demographics.

Personalised learning

Generative AI could further democratise digital literacy by creating personalised learning experiences tailored to diverse demographics, making digital education accessible to all ages, genders and educational levels. This personalisation could bridge existing digital gaps, offering everyone a pathway to enhance their digital skills going forward.

Which can be enabled by …

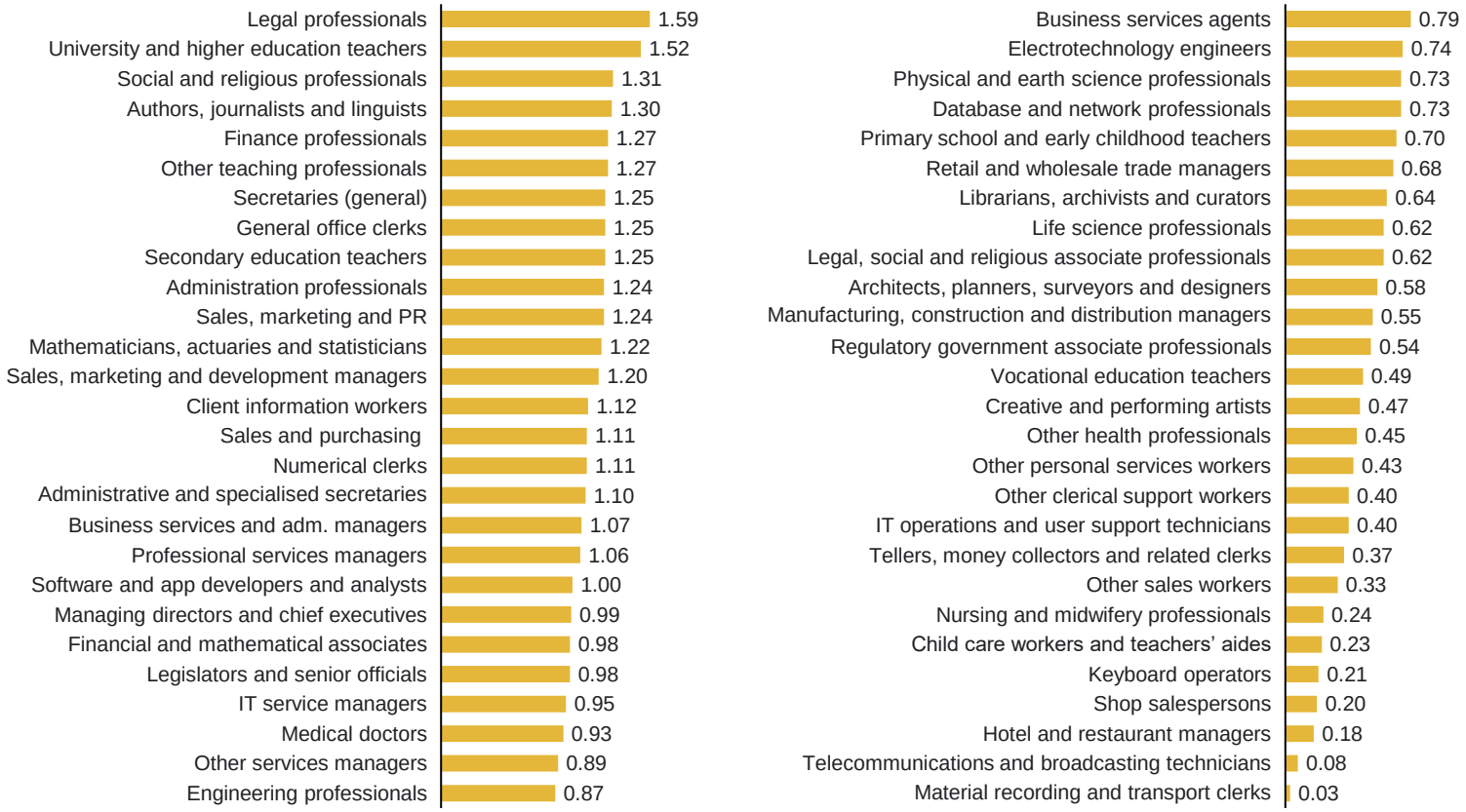
- Equal and widespread access to high-speed internet and free online AI tools across the population.
- Widespread AI literacy and encouragement to use and explore it, facilitated i.e. by school curriculums.

Source: Implement Economics based on European Commission, Eurostat., Statista and Brynjolfsson et.al.

Building an AI-empowered workforce should focus on areas where AI enhances and augments the capabilities of workers

AI Occupational Exposure

LLM scores for all occupations with a positive score



- Training and upskilling of workers is key to an AI-empowered workforce.
- Training and upskilling should focus on workers in occupations where AI enhances and augments the capabilities of workers so that workers are trained to work together with the new technology.
- The aim should be to foster innovation and improve the productivity of workers rather than replace them.
- The occupations listed here are the occupations that have above-average exposure to generative AI and hence represent a gross list of occupations where increased training and reskilling could be helpful in emphasising and accelerating the economic opportunities from generative AI.

Note: The scores are from Felten et al. (2023). Felten et al. (2023) developed a method to assign so-called AI Occupational Exposure (AIOE) scores to different occupations. The score (called LLM score) differs from the exposure measure used in the economic modelling in this report. It gives a broader perspective on the exposure to large language models and represents an estimate of the relatedness between human abilities and different AI applications. The score is agnostic to whether AI will complement, change or replace human labour. It can be understood as a measure for potential economic impact without specifying the nature of the effect (human augmenting vs human displacing). The scores are standardised and expressed relative to the average of all officially recognised American occupations.
Source: Implement Economics based on Felten et al. (2023) and Teutloff, Einsiedler and Møller (2024).

06

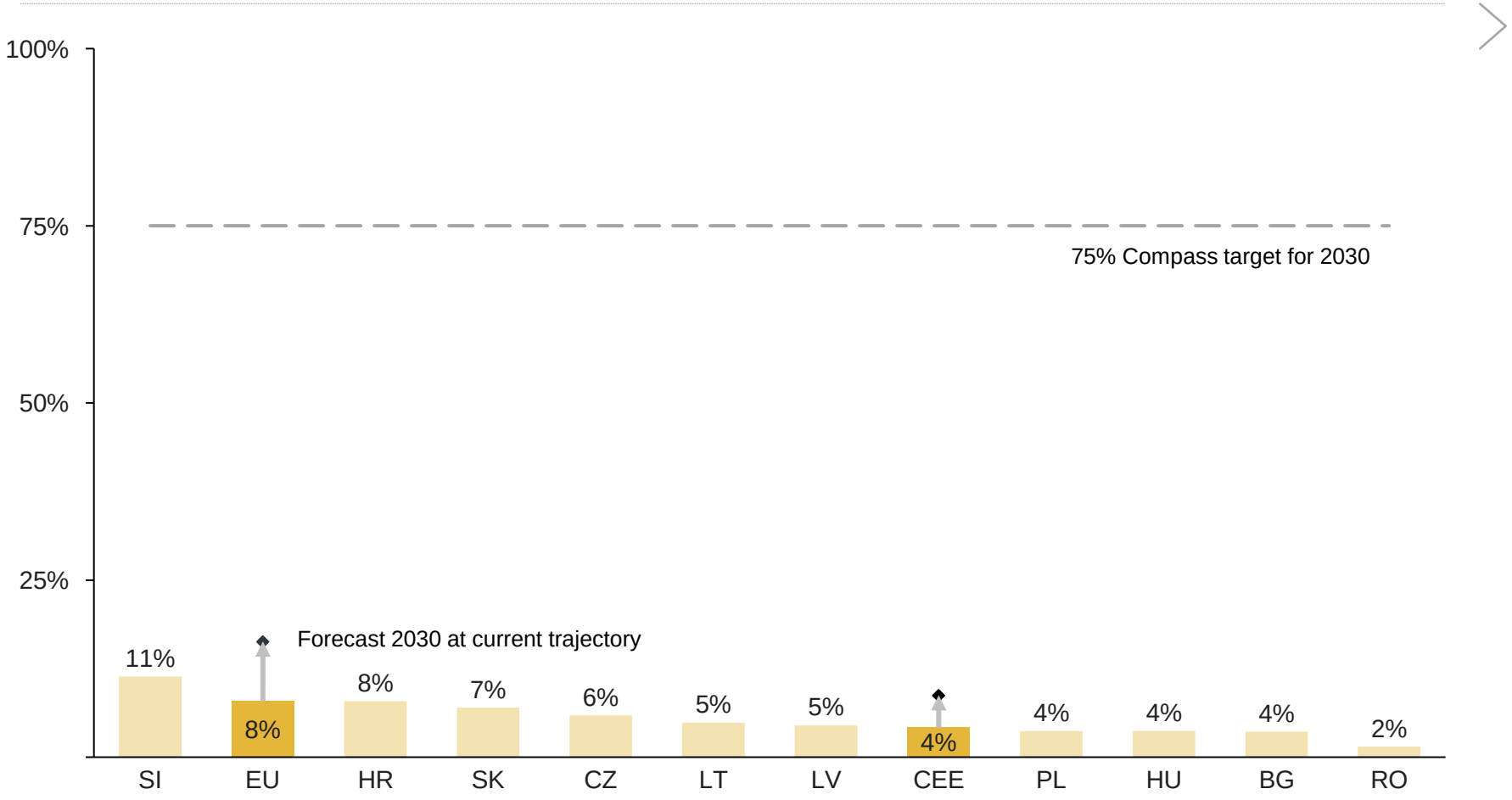
AI readiness in Central Eastern Europe

CEE’s capacity to leverage the potential of AI can be evaluated based on several factors and compared to European and global frontrunners.

AI adoption in CEE, like in the rest of the EU, should accelerate to meet the 2030 targets

Adoption of AI, 2023

% of enterprises using at least one type of AI technology



- 4% of CEE companies had adopted at least one type of AI technology in 2023 against the 8% EU average.
- Slovenia is the forerunner in AI adoption among the CEE countries. 11% of Slovenian companies had adopted at least one type of AI technology in 2023.
- In its most recent assessment, the European Commission concluded that the EU is set to fall significantly short of its target on AI adoption for 2030.
- If we assume the same pace of adoption as the EU average, the CEE is likely to fall short of the 2030 target.

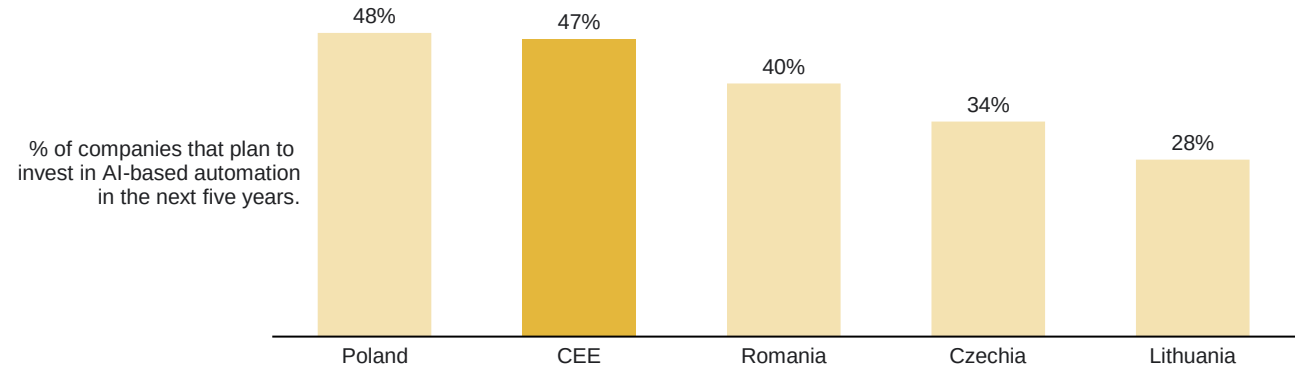
Note: Current adoption is from 2023 and includes enterprises with ten or more employees, excluding financial services. Forecast for 2030 is based on European Commission-forecasted AI adoption.
Source: Implement Economics based on Eurostat and the European Commission.

Adoption is accelerating with almost half of all CEE companies planning to invest in AI

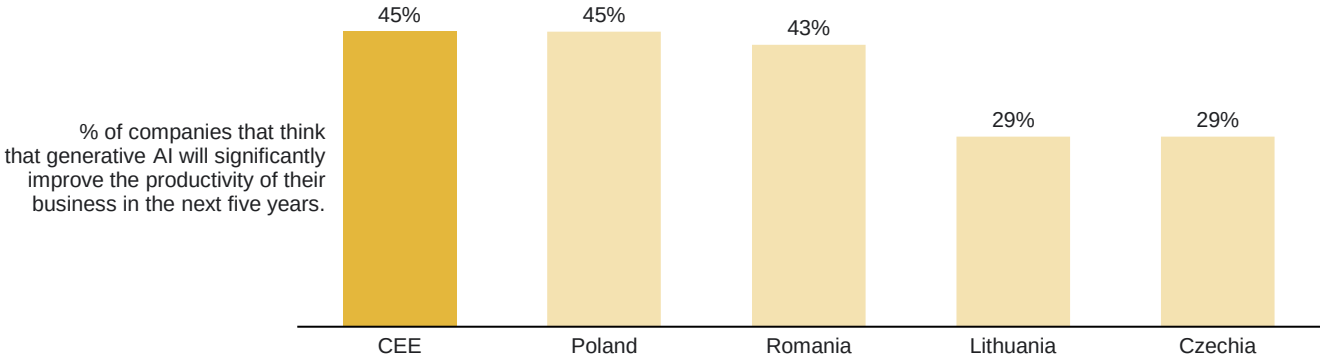
Survey responses from companies on their five-year outlook on generative AI

% weighted average of enterprises

Planned firm-level adoption of AI automation



Expected productivity boost from generative AI



- According to survey data by Public First, 47% of companies in CEE claim that they plan to invest in AI-based automation in the next five years. Adaptation expectations vary by country in CEE, with Poland leading at 48% and Lithuania at 28%.
- 45% of CEE companies anticipate significant productivity impacts from generative AI on their business in the next five years. Polish and Romanian companies are more optimistic about generative AI's productivity gains than their Lithuanian and Czech counterparts, with only 29% of the latter expecting similar benefits.
- While this generally suggests a fast pace of adoption, AI adoption is still in an early phase, and more complementary innovations, investments and commercial ventures in AI are needed to capture the full economic potential.

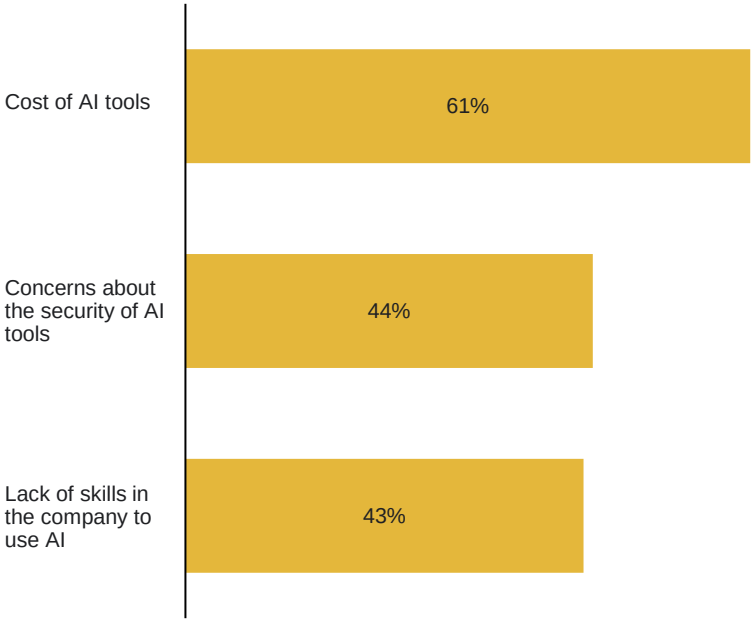
Note: Public First survey conducted in Q3 2023 for Czechia and Romania and in Q1 2024 for Poland, Lithuania and CEE. CEE result covers respondents across the region.
Source: Implement Economics based on Public First country surveys.

61% of CEE companies point to costs as a barrier to AI adoption, and 31% say that they need enhanced general digital skills to leverage the full potential of AI

The cost of AI tools is the most frequently cited barrier to AI adoption among CEE companies

What are the barriers to your business making more use of AI?

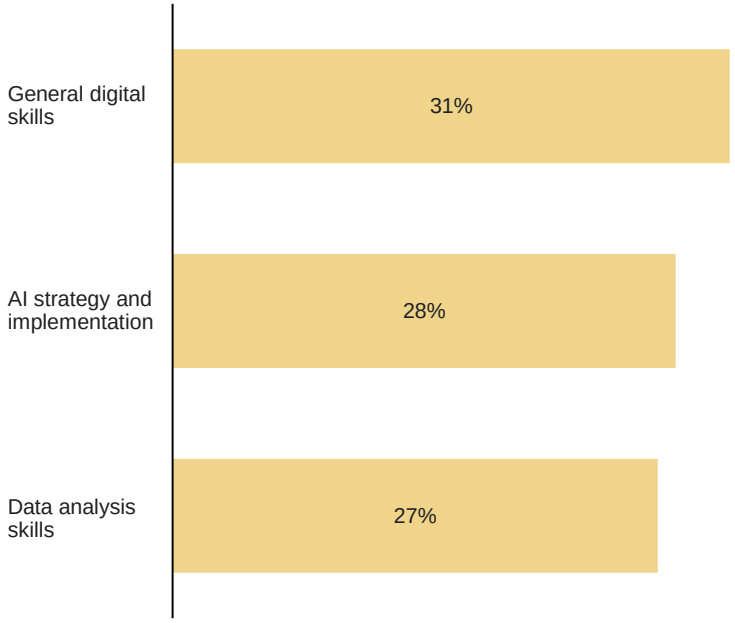
% weighted average of enterprises, 2024



CEE companies believe that they need more specific skills to fully leverage AI's potential

Which skills would you say your business needs more of to take full advantage of AI?

% weighted average of enterprises, 2024



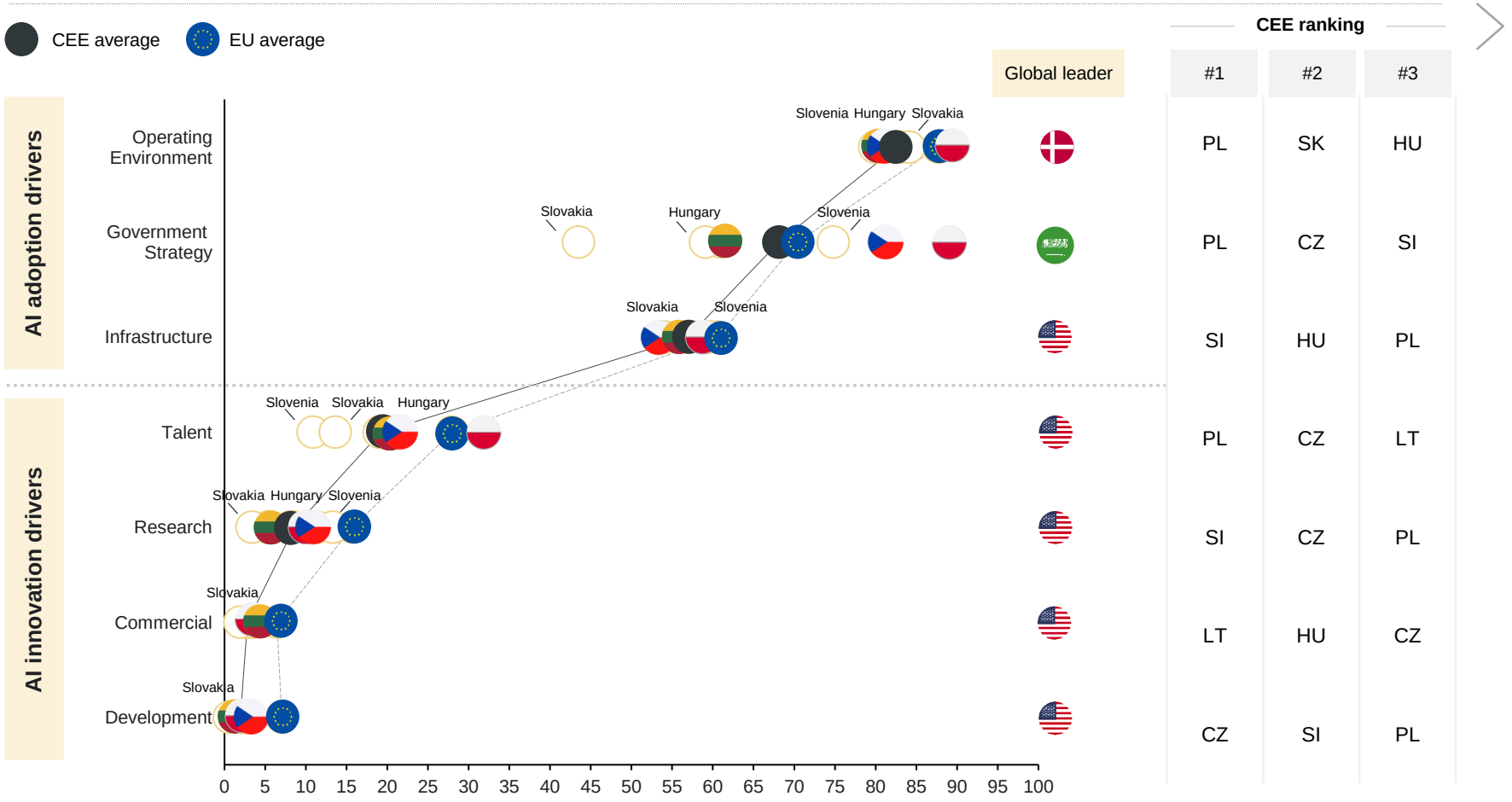
- Polling conducted by Public First shows that 61% of CEE companies see the costs of AI tools as a barrier to AI adoption. As additional adoption barriers, CEE companies point to concerns about the security of AI tools as well as a lack of internal skills to use AI.
- 31% of CEE companies believe that they need enhanced general digital skills to take full advantage of AI. CEE companies also cite a greater need for specialised AI strategy and implementation skills as well as data analysis skills.
- To overcome the cost barriers and skill gaps hindering AI adoption, companies in CEE are seeking supportive measures from both the private and public sectors.
- Public First polling shows that companies in CEE want technology companies to offer upskilling programmes to enhance digital and AI-specific skills. From the government, companies in CEE seek access to AI funding, such as through resilience funds and technology grants, to alleviate cost concerns and strengthen internal AI capabilities.

Note: Public First survey for CEE conducted in Q1 2024.
Source: Implement Economics based on Public First country survey.

CEE can capture the benefits of AI with targeted government strategies, investment in skills and by supporting local innovators and commercial ventures in AI

CEE's AI capacity according to the Tortoise Global AI Index

Global AI Index, score out of 100 (global leader).



	Global leader	CEE ranking #1	#2	#3
Operating Environment		PL	SK	HU
Government Strategy		PL	CZ	SI
Infrastructure		SI	HU	PL
Talent		PL	CZ	LT
Research		SI	CZ	PL
Commercial		LT	HU	CZ
Development		CZ	SI	PL

- CEE performs best on the early foundational drivers of AI adoption that ensure a safe and reliable AI-ready environment: operating environment (e.g. trust, data governance), government strategy and infrastructure. However, they lag behind the EU average and global leaders across all adoption drivers.
- Poland and Slovenia perform best across indicators – ranking first place among the CEE countries in operating environment, government strategy, and talent as well as infrastructure and research, respectively.
- More specialised AI applications and the realisation of full productivity gains will additionally require a cohesive and competitive innovation ecosystem that is conducive to development and commercial uptake.
- CEE should invest in AI-related R&D activity and skills required for AI development and innovation.
- Present gaps means that CEE risks falling behind EU peers and needs to ramp up its efforts.

Note: The Global AI Index looks at seven sub-pillars for AI capacity: talent (availability of skilled practitioners in AI solutions, including IT and STEM graduates, data scientists, AI professionals etc.), infrastructure (download speed, supercomputing capabilities etc.), operating environment (regulation, cybersecurity etc.), research (AI publications and citations etc.), development (fundamental platforms and algorithms etc.), government strategy (national funding commitments to AI etc.) and commercial ventures (AI startup activity, investments etc.). The CEE score is based on the CEE average, excluding Romania, Bulgaria, Latvia and Croatia, for which data is unavailable.
Source: Implement Economics based on Tortoise Media.

07

The way forward to capture the benefits of AI

CEE can consider several choices to capture the benefits and navigate the dilemmas of AI.

Potentials, pitfalls and paradoxes

Artificial intelligence (AI) has the potential to be the most powerful technology in decades

- AI enables us to do things better and work more efficiently. It also enables us to do better things. With AI, we can focus on the best parts of our jobs and leave the rest to AI. Yet, AI is still in its infancy and how it is applied is highly uncertain.
- To make AI benefit humans and society as a whole will require pursuing the potentials, avoiding the pitfalls and navigating the paradoxes.
- The future of AI should *not* be reduced to a simple one-dimensional question: Should we have more AI or less AI – or even ban AI?
- AI is not a fixed technology with a predetermined future that can come quickly or slowly. AI is new, **uncertain** and malleable and will require wise choices by all stakeholders across business, governments and civil society.

Potentials

- The estimated economic potential assumes **widespread adoption** of generative AI within ten years.
- The estimate includes both narrow **labour-saving** impacts and broader **value-creating** impacts that enable workers to do something novel or powerful.
- It assumes that AI lives up to its promise of being the most radical **technological breakthrough** in decades.
- Moreover, we estimate that AI will **complement the majority of workers** and free up time to spend on non-routine, creative and inventive tasks.
- The result is an economy not simply at a higher level of productivity, but at a **permanently higher growth rate**.

Pitfalls

- Displaced workers might end up in **less productive jobs** (than already assumed).
- AI may end up being **less promising** or less ready to bring to market than initially hoped.
- Time to market may be **challenged by a legal regime** not designed for AI.
- Companies may **miss out on the benefits** of AI by failing to change organisations and habits.
- National regulators, driven by any number of concerns, may **impose strict regulations** that slow the speed of AI development.
- **Regulatory uncertainty** and lack of clarity on future rules may delay the uptake.

Paradoxes

- How can policies encourage the types of AI that complement human labour and best prepare those at risk of losing a job to AI?
- What choices will encourage the development of AI that companies of all sizes can access instead of just the largest ones?
- What kind of investment in AI research and development might unleash the most interesting new ideas, innovations and applications in support of overall societal value?
- What kind of high-performance computer infrastructure is needed to power the new technology, and how is that best provided?

For more background on AI policies and principles, see: OECD AI principles, IMF and Google's AI principles

Unlocking the AI opportunity by creating trust *and* preserving the incentive to invest

Benefits from new waves of technology do not come automatically. As with past waves of technology, it takes time for people to trust the technology. Regulators across the world are set to ensure the safety of the technology while achieving its benefits. In the urgent efforts to achieve broad-based trust, regulators may create fragmentation, misalignment and uncertainty about future rules, which can hamper investment and adoption.

Developers and early technology adopters will need clarity on future rules. Clarity is needed regarding, for example, the requirements for transparency in the functioning of the generative AI models, the data used to train them, issues of bias and fairness, potential intellectual property issues, possible privacy violations as well as security concerns.

To navigate these choices, this report offers five perspectives:

Enable **innovation** and invest in AI **research and development**

- Invest in long-term public AI research and encourage private investment in basic and applied research at national and EU level.
- Foster industry, government and university innovation partnerships to undertake pre-commercial AI research projects.
- Support innovation on top of already developed foundational models and findings, e.g. by leveraging the new EU AI innovation package.
- Make AI tools available to entrepreneurs and scientists so they can use AI in support of other discoveries and innovations.
- Support international research collaboration, technology transfer and international movement of researchers.

Create a conducive and aligned AI **regulation**

- Avoid siloed approaches to AI regulation to minimise the risk of misalignment and fragmentation by increased international co-operation.
- Ensure copyright rules that support innovation and creativity and preserve the incentive to generate new content.
- Adopt a risk-based approach to AI regulation to provide clarity to developers, adopters and users about which uses are disallowed.
- Encourage privacy and security principles so that individuals' personal data is safeguarded.

Promote widespread **adoption** and universal accessibility

- Promote widespread adoption and universal accessibility by helping governments, small businesses and all sectors of the economy adopt and use AI.
- Lead with the public sector adoption of AI solutions, which may require overcoming procurement roadblocks that often appear when public entities aim to adopt new technologies.
- Create a national strategy to spur AI adoption across all industries and all sizes of businesses.
- Give small businesses an "AI jumpstart" through technical assistance, training and guidance to help them understand and leverage AI for their businesses.

Build **human capital** and an AI-empowered workforce

- Build an AI-empowered workforce by investing in human capital, education and training systems. This means treating AI as a core component of the education system.
- Focus training and upskilling on areas where AI enhances and augments the capabilities of workers so that workers are trained to work together with the new technology. The aim should be to improve the marginal productivity of workers rather than replace them.
- In those selected types of jobs where AI risks displacing workers, efforts should be devoted to reskilling workers for other jobs.
- Ensure a flexible labour market and continuous lifelong training enabling new opportunities in the labour market.

Invest in AI **infrastructure** and compute power

- Ensure the right incentive and regulation for public and private entities to invest in AI infrastructure and compute capacity such as graphics processing and supercomputers needed to drive the powerful AI models.
- Enable trusted cross-border data flows in trade agreements and ensure regulatory interoperability and non-discrimination in the EU.
- Support the building of cross-border AI infrastructure and subsea cables through initiatives such as the G7 partnership for global infrastructure and investment.
- Reduce electricity emissions from data centres by promoting ambitious decarbonisation strategies such as 24/7 Carbon-Free Energy.

Note: For more details on policies, see OECD AI principles, OECD AI Observatory, EU's ethic guidelines for trustworthy AI, EU's AI innovation package, Google's AI principles and paper on "An Opportunity Agenda for AI". For more details on carbon-free energy and digital decarbonisation, see European perspective and global perspective.

Countries within the CEE can draw on policy choices of regional frontrunners

CEE countries can draw on best practice initiatives from regional frontrunners

Indicator	Operating environment	Infrastructure	Talent	Research	Development	Commercial
CEE leaders						
Best practice	Slovakia's AI initiatives reflect a commitment to ethical AI, strategic innovation and EU regulation adherence, particularly through the National Strategy for Artificial Intelligence and collaborative platforms. **Example:** Action plan for the digital transformation of Slovakia for 2019-2022 • Development of an ethical framework and reforming of data sharing law • Introduction of innovation laboratories in public administrations. • Regulatory sandboxes and pilot projects for learning and experimentation.	Slovenia is making significant strides in developing a robust digital and AI infrastructure for national businesses, institutions and research facilities. **Example:** Strategy for the Digital Transformation of the Economy (2021-2030) • Focuses on advanced digital technologies, including AI, big data and high-performance computing. • It supports digital transformation projects and establishes a hybrid cloud to simplify business procedures, directly enhancing the digital infrastructure.	Poland's AI talent, upskilling and reskilling efforts are multifaceted, with a strong focus on integrating AI into industries through public-private partnerships and ensuring that workers are equipped to thrive in an AI-enhanced economy. **Example:** Perspektywy educational partnership • The Educational Foundation "Perspektywy", a leading educational organisation, engages in industry partnerships and initiatives, encouraging young people to pursue careers in the technology sector and supporting professional development for over 200,000 young people annually.	Slovenia has been progressively establishing itself as a hub for AI research and innovation in Europe. The nation has leveraged its historical strengths in education and technology to create a supportive environment for AI development. **Example:** International Research Centre for Artificial Intelligence (IRCAI): • The hosting of UNESCO's AI research centre is considered a significant achievement for Slovenian science. • This initiative is expected to benefit both the scientific and economic sectors, with Slovenia leading the way in establishing a global standard for AI research.	Czechia's AI development efforts are focused on creating a robust ecosystem for innovation. Collaboration between government, industry and academia is key. **Example**: prg.ai • An initiative that leverages AI as a key factor in business, supported by the city of Prague, Czech Technical University, Charles University and the Academy of Sciences. • prg.ai aims to transform Prague into a European AI centre, encouraging the implementation of AI across various industries for optimal benefits of companies and their clients.	The AI ecosystem in Lithuania is a rapidly growing sector, characterised by innovative startups, strong academic research and supportive government policies aimed at fostering technological advancement and digital transformation. **Example:** GovTech Lab • Focuses on matching public sector challenges with innovative tech solutions, accelerating GovTech teams and building a strong community around GovTech. • It facilitates the GovTech Challenge Series and supports startups and SMEs in creating MVPs.

CEE can also draw on policy choices of European digital frontrunners

CEE can draw on best practice initiatives from European frontrunners

Indicator	Operating environment	Infrastructure	Talent	Research	Development	Commercial
Northern European leaders						
Best practice	Denmark is a **pioneer in enforcing transparency and ethical use of AI** and has introduced principles and tools to ensure responsible AI deployment. The tools are aimed at building trust in AI technologies. **Example**: Guide for responsible use of generative AI • Formal ethics and safety guidelines for using and implementing AI publicly and privately. • *Datavejviseren:* A platform that provides access to all public data sources. • *Sprogteknologi:* Supports the development of AI solutions in Danish.	Finland is home to one of the **fastest supercomputers** in the world called LUMI. Up to 20% of the LUMI supercomputer's capacity is reserved for European industry and SMEs, including access to the LUMI user support team, enabling companies to take advantage of high-performance computing for innovation and development activities. **Example:** Poro LLMs • A family of open LLMs built and trained on the LUMI supercomputer. • With its advanced capabilities with low-resource languages, Poro will be built to handle all 24 languages of the EU.	The Netherlands is nurturing and growing AI **talent through targeted and joint undertakings by industry and research institutions.** **Example:** Kickstart AI • Host AI superchallenges to solve societal issues and promote talent globally. • Create joint industry-academia appointments, adding 25 new positions to enhance education and training. • Promote a national AI course, aiming to reach 170,000 people.	Finland's long track record in AI research is a testament to its **world-renowned universities** offering a variety of AI courses/programmes, active industry-academic collaboration and innovative startups with roots in universities and research. **Example:** AI for Business programme (2018-2021) • Funding targeted for all-sized companies and research institutions for AI R&D projects. • Aimed to increase AI expertise and build global ecosystems and research collaborations.	Ireland attracts global tech companies for its **competitive, pro-business environment and strong industry-academic research credentials**, ensuring that innovative researchers, companies and entrepreneurs that are developing and using AI are connected to each other. **Example**: Lero, The SFI Research Centre for Software • Brings together 200 researchers in Ireland, covering a wide range of software development related to AI.	Estonia recognises itself as being an **implementation leader** for startups and AI applications. The national AI strategy (2019) outlines 12 initiatives to accelerate AI uptake in companies, incl. different funding measures and 9 initiatives to increase R&D. **Example:** AI & Robotics Estonia (AIRE) • Supports Estonian industrial companies in adopting smart digital solutions in the field of AI and robotics. • Provides funding and expertise through training and consulting as well as by connecting companies with service providers.

Note: European digital frontrunners refers to nine digitally advanced Northern European countries (Denmark, Finland, Sweden, Netherlands, Norway, Luxembourg, Ireland, Belgium and Estonia)

The large potential from generative AI can be captured with the right policy choices

Grow R&D by local innovators

Enable **innovation** and invest in AI **research and development**

Dilemma

Ensuring performance of AI technology in a CEE context

and

Driving application of leading global AI technology

Recommendation

- The CEE region is already very active in AI-related R&D, and to capture the potential for the region, the region will need further research funding and even more collaboration across academia, industry and government sectors.
- Regional frontrunners are taking an international and partnership-based approach to AI research, e.g. **Slovenia's UNESCO-partnered International Research Centre** and the INSAIT in Bulgaria, partnering with world-leading technical universities.
- To boost R&D across CEE, it is vital to increase collaborative research, like joint projects on regional language models. Moreover, participation in **EU** programmes like **Horizon Europe** could help access wider talent, secure funds and enhance global competitiveness through innovation.

Accelerate commercial uptake

Promote widespread **adoption** and universal accessibility

Dilemma

Encouraging AI-based business models in tech-focused startups

and

Facilitating AI adoption in traditional, established companies

Recommendation

- The CEE region's AI adoption is growing and will need to accelerate even more to capture the potential, including for SMEs.
- The AI ecosystem in **Lithuania** is a prime example of rapid growth and innovation, with initiatives like **GovTech Lab** demonstrating the positive impact of cohesive government and industry collaboration on AI development and adoption.
- Developing national AI innovation hubs and fostering cross-border corporation between hubs could enhance AI commercialisation across the CEE region, i.e. as part of the **EDIH Network**. Moreover, business-friendly environments, simple regulations and favourable IP regimes are essential for boosting AI adoption. Inspiration could be drawn from **Denmark**.

Retrain and upskill workforce

Build **human capital** and an AI-empowered workforce

Dilemma

General AI upskilling across population

and

Targeted re-skilling of groups affected by AI

Recommendation

- 31% of CEE companies believe that they need enhanced general digital skills to take full advantage of AI.
- The CEE region can achieve the potential with an AI-ready workforce, with good basic IT skills and an ample supply of AI experts. The boost will also need lifelong learning in new tech and upgrading the educational curricula in digital skills.
- To accelerate the essential talent development and reskilling that is essential for CEE countries to succeed in the AI-driven future, inspiration could be drawn from the **Netherlands' Kickstart AI program.**

Note: For more details on policies, see OECD AI Observatory and Google's policy paper on "AI Opportunity".

Conclusion and key takeaways

Conclusion

Artificial Intelligence (AI) is expected to profoundly change the global economy. The recent emergence of generative AI has significantly increased the capabilities and ease of use of AI models.

In this study commissioned by Google, Implement Consulting Group estimates a €90-100 billion potential of generative AI for GDP across the CEE region. Capturing the full potential of generative AI requires accelerated commercial uptake, more R&D by local innovators and investment in new skills.

Key takeaways

- **Around ten years from now, generative AI alone could boost CEE's annual GDP by €90-100 billion, equivalent to 5% of CEE's GDP.**
- **CEE has a strong foundation to adopt AI but must catch up to European peers on areas like talent and research development to drive further AI innovation.**
- **A leapfrog scenario would increase the annual GDP potential of generative AI in CEE from 5% to 8% of GDP, i.e. from around €100 billion to around €140 billion.**
- **A five-year delay in adoption will reduce the annual GDP potential of generative AI in CEE from 5% to 1% of GDP, i.e. from around €100 billion to only around €15 billion.**
- **To seize the economic benefits of generative AI, CEE must focus on a cohesive policy involving R&D enhancement, workforce education and commercial uptake.**

Note: This report covers all types of AI with a particular focus on generative AI, as generative AI is a new and largely unexplored technology and leveraging the potential of this technology still lies ahead. The study builds on work by Briggs and Kodnani (2023)..

08

Annex

Modelling the impacts of generative AI in CEE.

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Modelling the economic opportunity for CEE

Overview of the methodological approach to calculating economic growth and productivity impact from generative AI

The economic effects are calculated in the following steps

1. **Automation potential of work activities:** First, the exposure to generative AI is calculated by breaking down the automation potential of 39 different work activities/tasks in the occupational task database O*NET. The database includes an estimate of the share of each activity (e.g. getting information, performing administrative activities etc.) that can be automated by generative AI (if the activity is above level 4 on an O*NET-defined scale of difficulty 1-7, no automation potential is assumed).

2. **Mapping automation potential of work activities to occupations:** The automation potential of the work activities is mapped in ten European industry aggregates in two sub-steps. First, the 39 work activities for 900 US occupations are mapped using importance-average activities for each occupation, providing an estimate of the share of each occupation's total workload that AI has the potential to automate. Secondly, this number is projected from US to European occupations through the European Commission's crosswalk between ESCO and O*NET and finally compiled into aggregated occupations (using the sub-occupation employment). This leaves us with the three shares that describe how big a share of the work activates for each occupation is expected to see: No automation, AI complement and Likely replacement.

3. **Quantifying productivity gains in each sector:** Generative AI is assumed to affect the productivity of the work activities for each occupation as follows (see section 3 for further details). The "No automation" share of work activities is assumed to be unaffected by generative AI. "AI complement" work activities experience a productivity boost from automation. "Likely replacement" is the share of work activities in a sector that is expected to be entirely automated/replaced. These workers are expected to be re-employed in slightly less productive jobs. The three effects are calculated across sectors and scaled by each sector's value added to determine the full productivity potential/generation of new jobs from generative AI across the economy, once the technology adoption peaks.

4. **Aggregate GDP impact:** Based on the estimated increase in labour productivity resulting from AI adoption, the result is aggregated to an overall GDP. Only part of the total long-run productivity increases from generative AI is expected to materialise in the economy during the initial ten-year period of technology adoption following an S-curve adoption trajectory.

- The method used to calculate productivity and GDP effects of generative AI in this paper is in line with the methodology developed by Briggs and Kodnani (2023) in "The Potentially Large Effects of Artificial Intelligence on Economic Growth".

Note: Methodology is based on Briggs and Kodnani (2023).
Source: Implement Economics based on the European Commission, Eurostat, O*Net and Briggs and Kodnani (2023).

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