IMPLEMENT
CONSULTING GROUP_

The economic opportunity of AI in Austria

Capturing the next wave of benefits from *generative* AI

An Implement Consulting Group study commissioned by Google
July 2024

The economic potential of AI can be boosted further by generative AI

To capture the next wave of AI benefits across society, Austria needs to invest in skills, promote innovation and accelerate commercialisation.

The economic opportunity

Generative AI technology is developing faster than previously anticipated, and the peak economic contribution could come sooner than expected, in as little as ten years.

At the peak of adoption, in around ten years from now, generative AI alone could boost Austria's GDP by

€35-40 billion

+8% GDP
annual contribution in the peak year if Austria achieves widespread adoption.

Gains come from three sources …

Productivity boost from people working with generative AI.

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

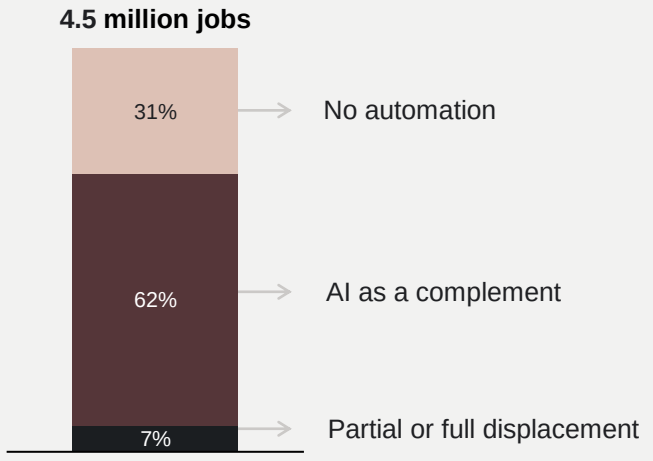
Re-prioritised and re-employed time for other value-creating activities.

The job implications

62% of jobs in Austria are estimated to work **together with** generative AI.

34% of Austrian companies expect **significant productivity impacts** from generative AI in the next five years.

Share of jobs exposed to automation by generative AI
% of total employment in Austria



Austria is well placed to manage the job changes from generative AI.

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 10-20% of the expected future annual number of job openings in Austria.

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

SUMMARY

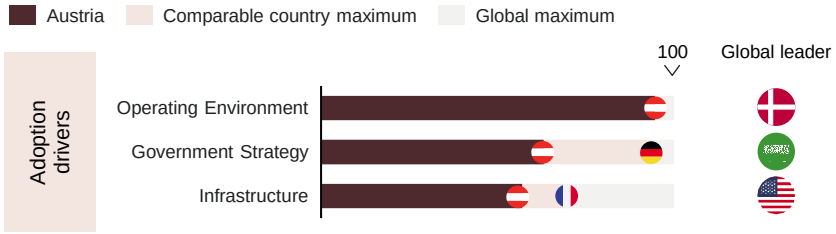
Harnessing the gains from generative AI in Austria requires enhanced efforts on AI adoption and innovation drivers

AI readiness in Austria

Austria generally performs well on foundational adoption drivers but falls behind peers on strategy and infrastructure ...

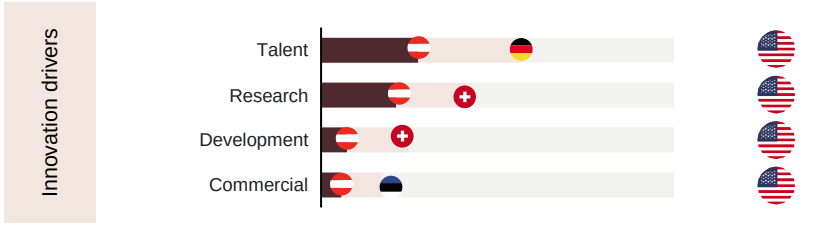
Austria's AI capacity according to the Tortoise Global AI Index

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



Austria scores high on operating environment for AI but lags behind neighbours on government strategy due to lack of funding and measurable AI targets.

… and, like peers, lags significantly behind on AI innovation capabilities



Austria lags behind global leaders and regional peers on AI-related talent, commercial ventures and other innovation drivers.

Conclusions and policy implications

Austria's future economic growth could exceed current long-term GDP forecasts. Leading banks are raising euro area growth forecasts from as early as 2028.

The 8% boost to annual GDP at peak assumes that Austria achieves widespread adoption in line with leading countries.

A five-year delay in adoption will reduce the annual GDP potential of generative AI in Austria from 8% to 2% of GDP, i.e. from €35-40 billion to €6-8 billion.

Capturing the full economic gains requires skills, innovation and a conducive regulatory framework.

Retrain and upskill workforce

Grow R&D by local innovators

Accelerate commercial uptake

Note: The Tortoise Global AI Index is underpinned by 111 indicators collected from 28 different public and private data sources and 62 governments. The comparison group for Austria includes Spain, Estonia, France Germany, Italy, Belgium, Czech Republic, Hungary, Slovakia and Switzerland.

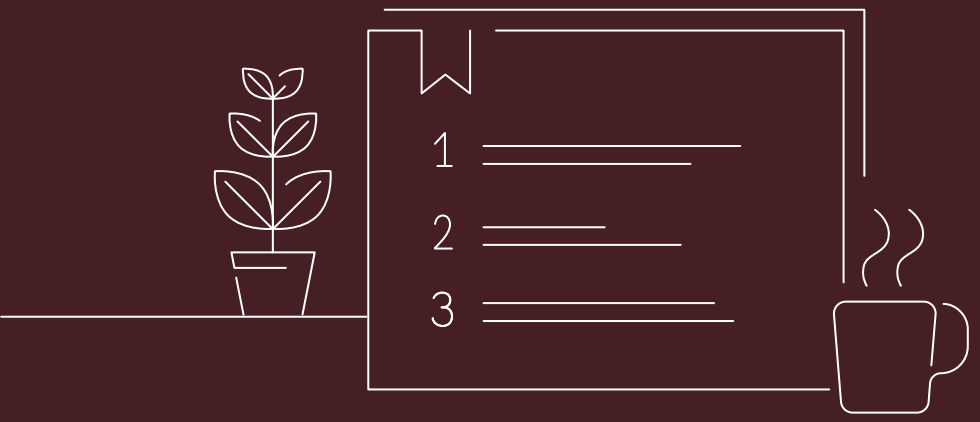
Foreword

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 decision-makers will need to navigate.

AI has evolved rapidly with the breakthrough of generative AI in 2022 and its fast adoption in 2023. This report estimates the economic potential of generative AI in Austria while recognising the significant economic potential of other types of AI.



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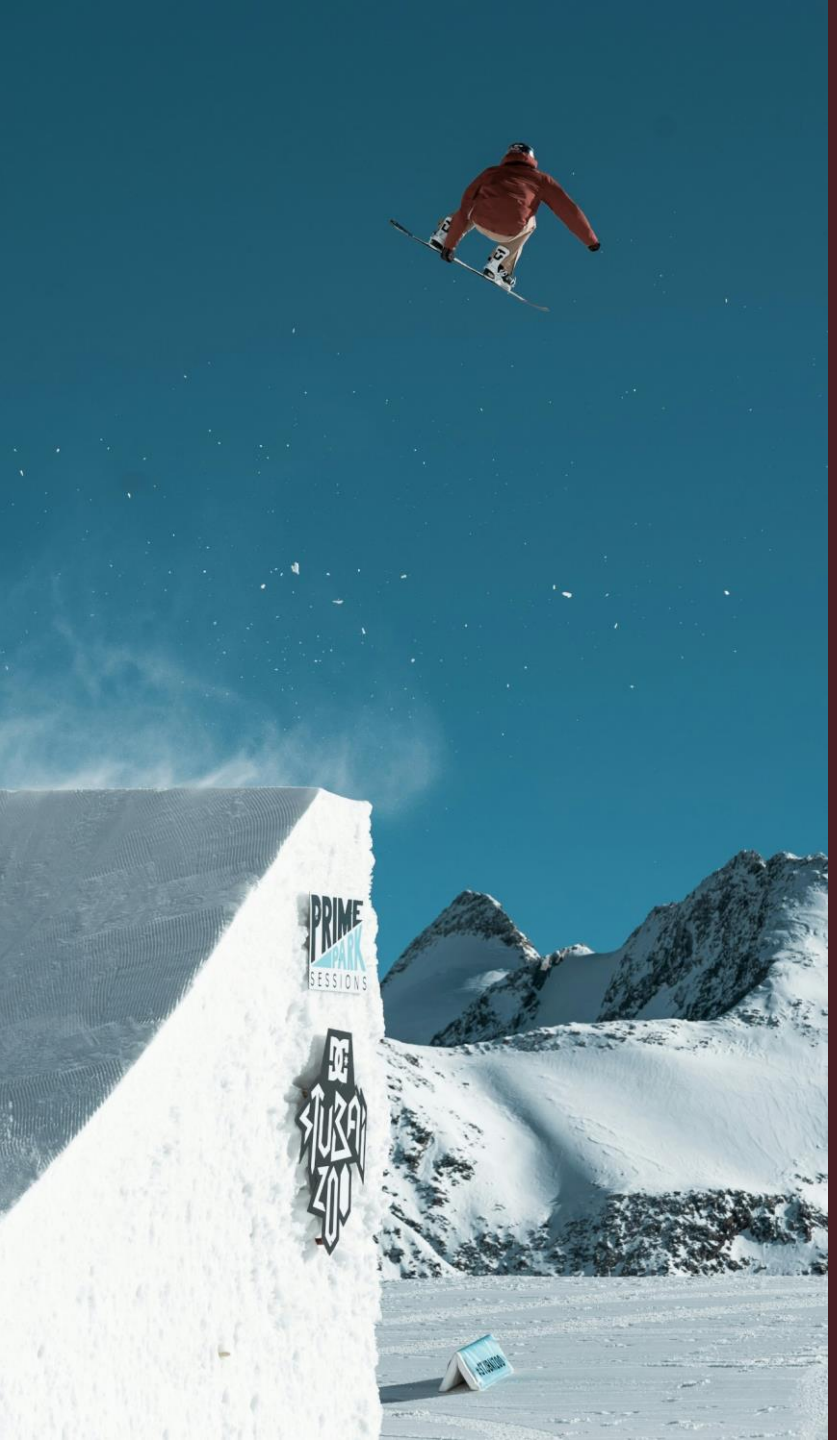


01

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

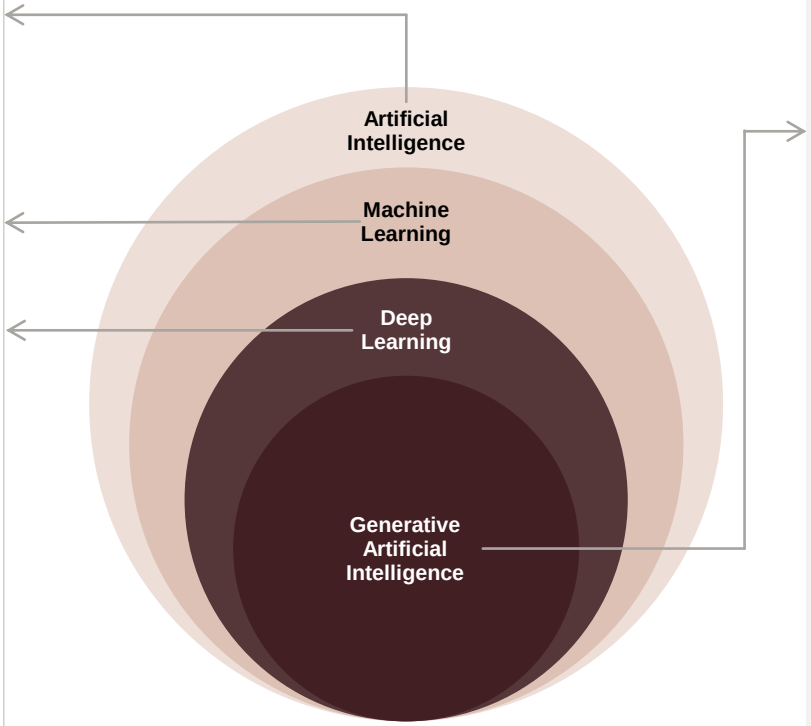
In addition to weather forecasting, similar predictive models are employed in managing warehouse inventories.

Categorisation and recognition

In addition to email spam filtering, AI can be utilised to categorise and recognise patterns in legislative documents.

Optimisation

When it comes to optimisation, AI not only aids navigation via GPS but also plays a crucial role in enhancing the efficiency of energy consumption in data centres.



Generative AI

- Generative AI is a new form of AI made publicly available in 2022. It can analyse text, code, images, sound and video and 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.

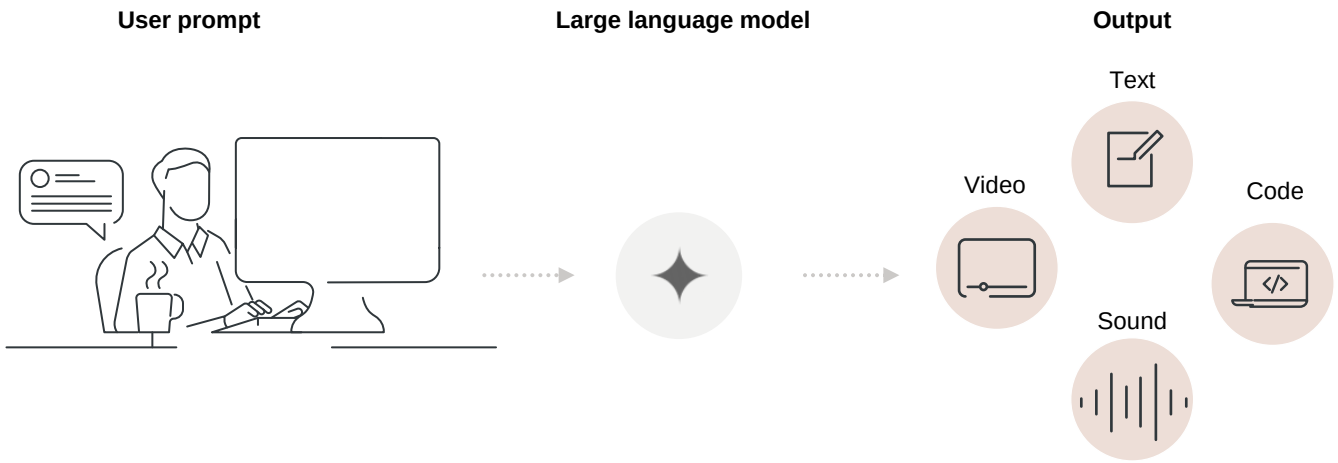
Do research and analyse data

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.

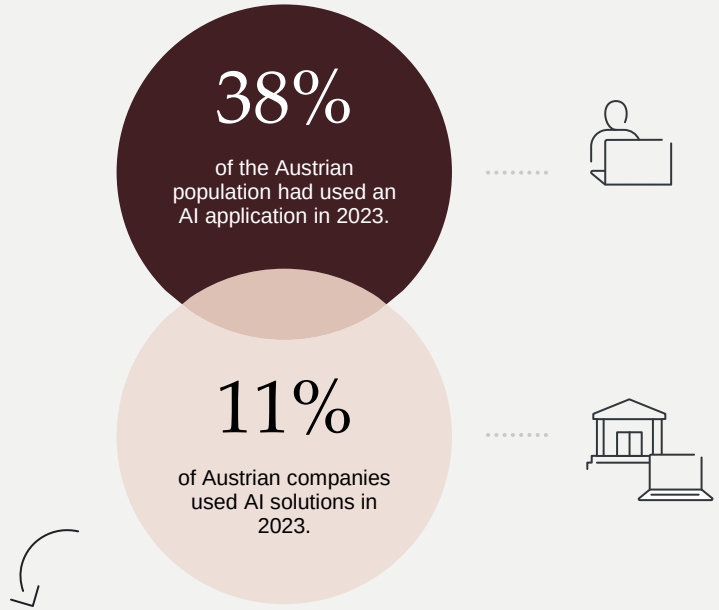
Easy to use in plain language

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, Statistics Austria and survey by Ipsos.

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. gaBERT*
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 opportunities from AI

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

AI has great economic potential which can be further boosted by generative AI

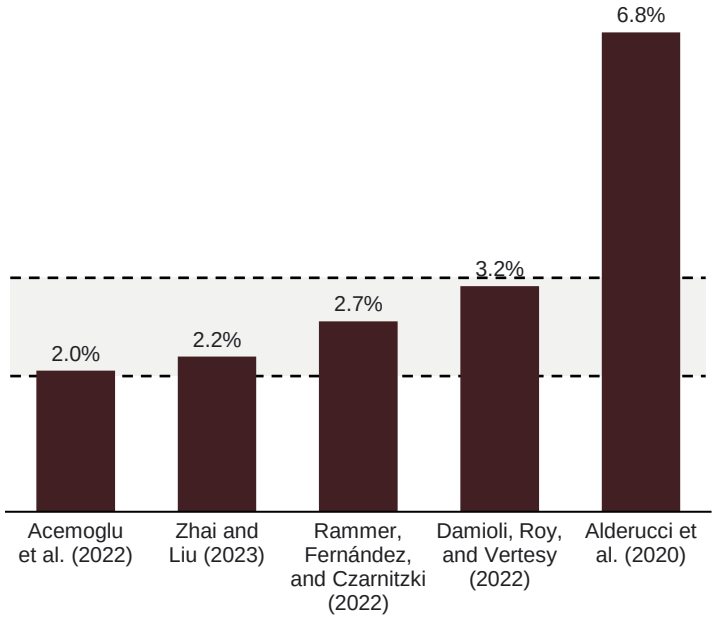
How to think about generative AI:

"What would you do if you had 1,000 well-trained interns ready to work for you day and night?"

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.

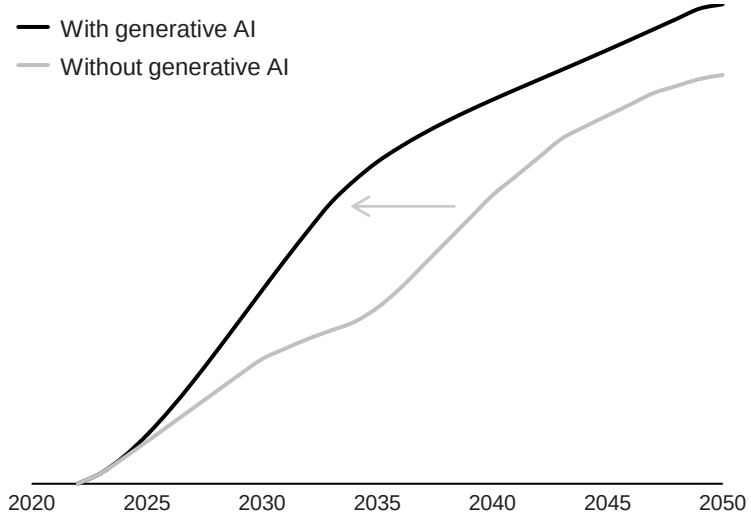
Growth in labour productivity from AI adoption
Percentage points



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 remain.

Automation potential
Adoption of AI technology



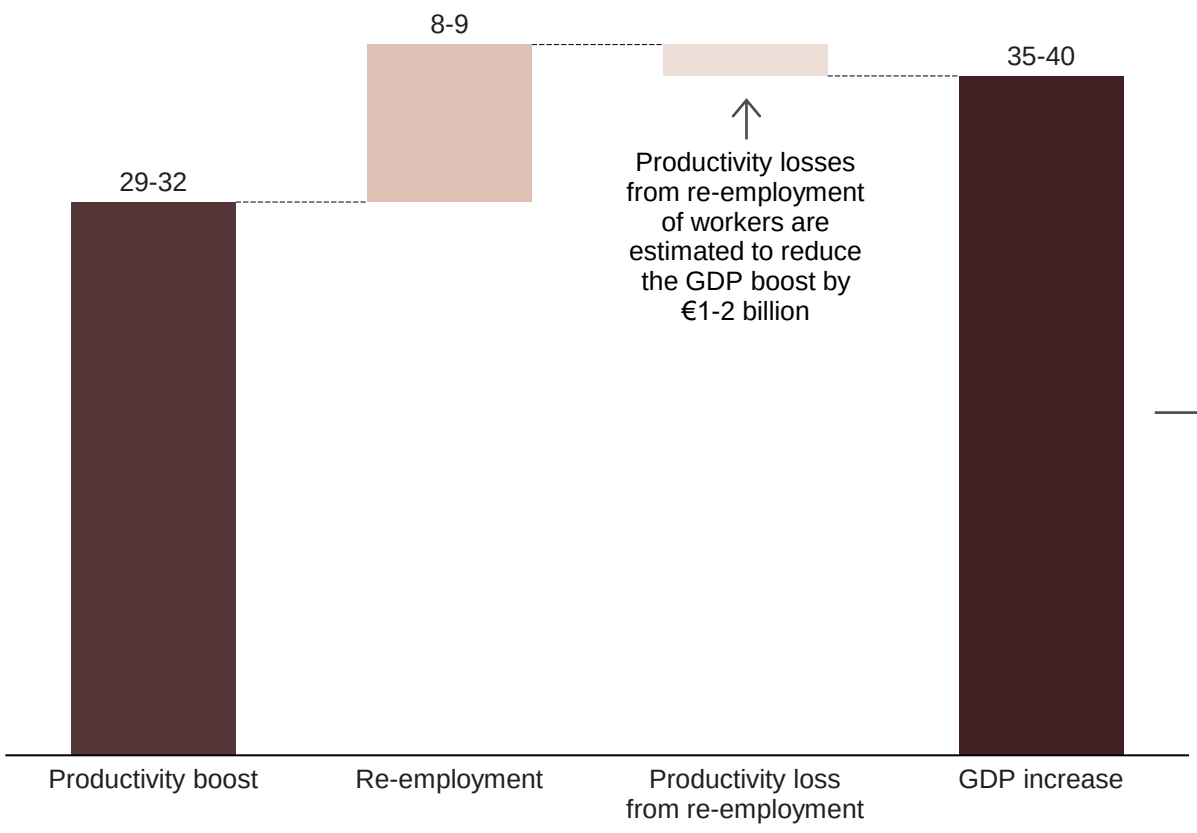
- AI has evolved rapidly with the recent breakthrough of generative AI. Due to its user-friendly nature, generative AI is expected to greatly accelerate the potential of AI to create economic impacts.
- Generative AI is only a part of AI's overall economic potential. Some studies estimate with some uncertainty 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.

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 Austria's GDP by 8% in ten years

GDP potential of generative AI in Austria

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



+8% GDP

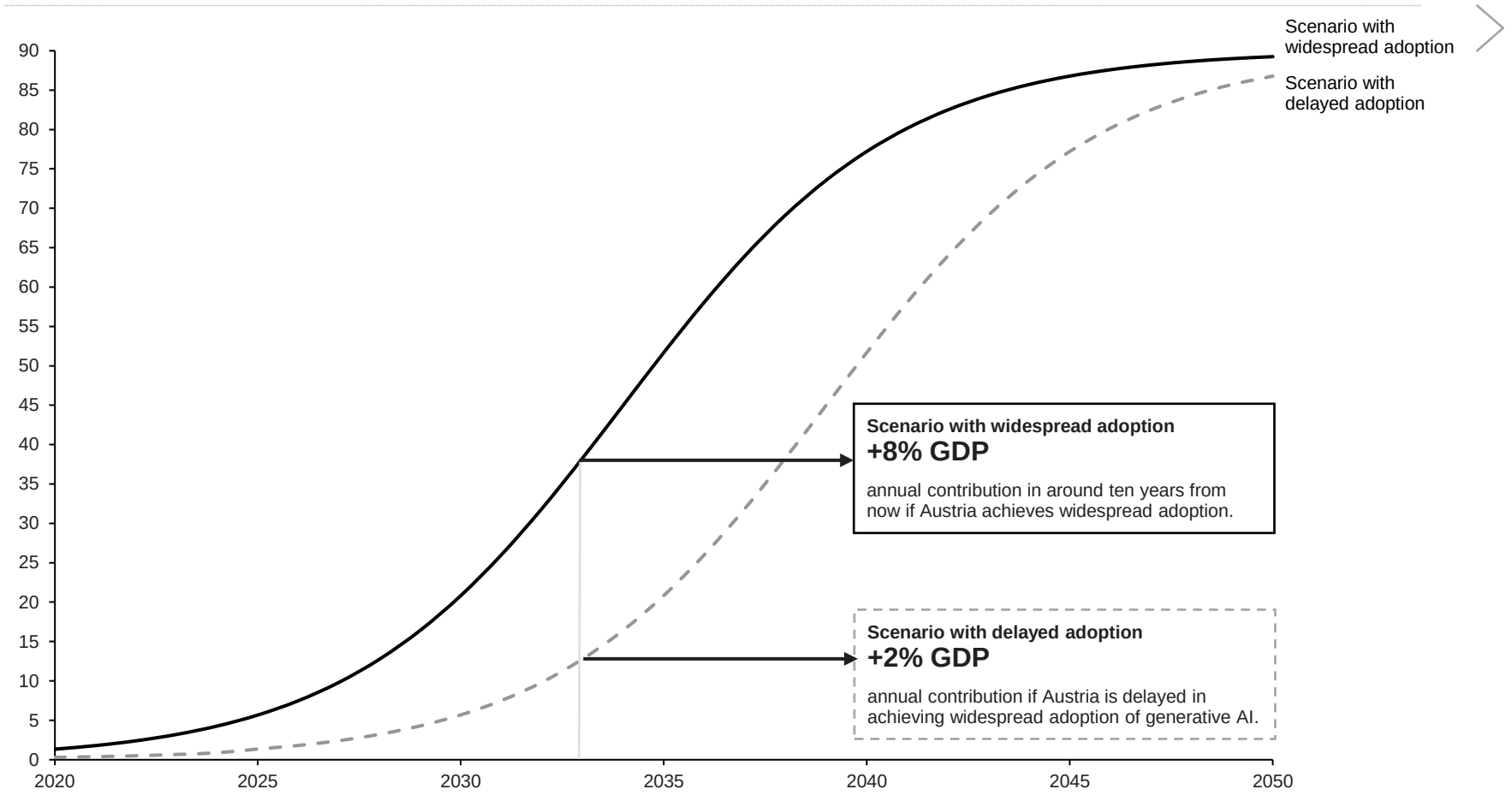
annual contribution in the peak year if Austria achieves widespread adoption.

- If Austria achieves widespread adoption of generative AI, we estimate an annual GDP potential of €35-40 billion in the peak year, which could be as early as ten years from now.
- The dominant impact of generative AI is a productivity boost to the majority of workers (62%) by augmenting their capabilities, quality and efficiency, which is estimated at €29-32 billion for Austria.
- The estimate includes impacts of re-employment of a small share of workers (7%), where generative AI can free up a significant share of work for other tasks. This is estimated at €8-9 billion for Austria.
- The estimate accounts for the possible productivity loss associated with re-employment to other occupations. This reduces the estimate for Austria by €1-2 billion.
- At its peak, the productivity effect of generative AI in Austria is estimated to be equivalent to 1.4% annually.
- Generative AI is so powerful that Austria's future economic growth could exceed current long-term GDP forecasts, and leading banks are raising euro area growth forecasts from as early as 2028.

Note: GDP figures are expressed in 2022 levels. The estimate assumes widespread adoption of generative AI over a ten-year period. 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. 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 the widespread adoption scenario (see next page). 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 five-year delay in the adoption of generative AI could reduce Austria's potential GDP gains from 8% to 2%

Adoption of generative AI



- Generative AI is a new general-purpose technology and will take time to adopt.
- Our estimate of Austria's GDP potential from generative AI is reliant on the widespread 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 potential at peak from 8% (€35-40 billion) to only 2% (€6-8 billion).
- Austria 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 as a share of economy-wide 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 countries apart from the US. The "widespread adoption" 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) .

Generative AI models have the potential to boost SME AI adoption to new levels, but regulatory uncertainty and lack of skills can stand in the way

SMEs lag behind larger corporations on AI adoption

Austrian SMEs account for
~66% of total employment

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

35%
of large Austrian enterprises adopted AI in 2023.

10%
of Austrian SMEs adopted AI in 2023.

The gap in AI adoption between SMEs and large enterprises 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 …

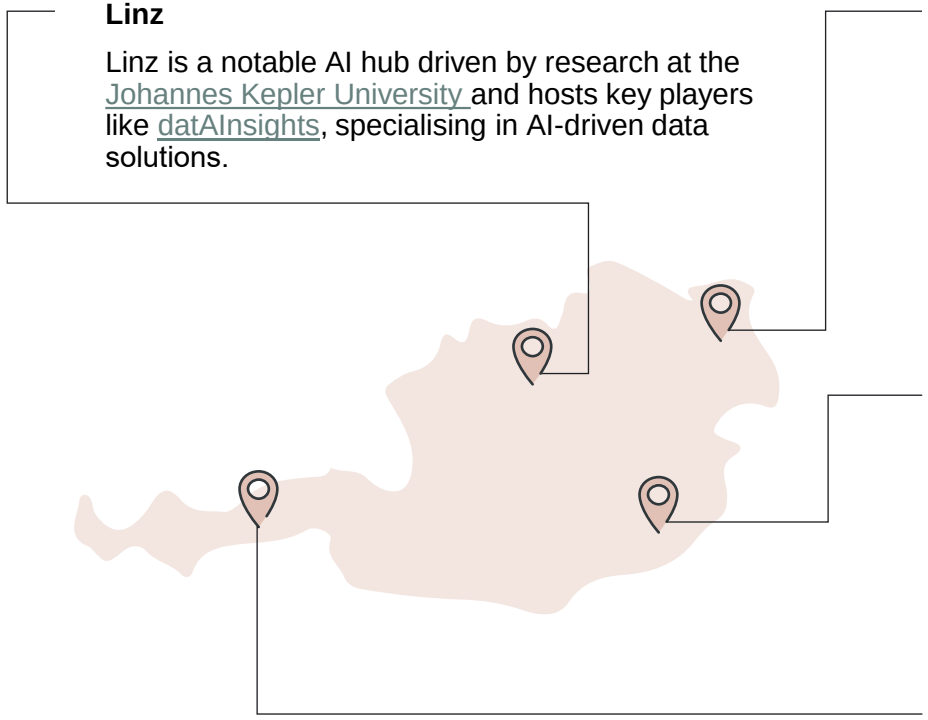
Lack of both soft and digital skills required to fully leverage the potential of new generative AI technologies can hamper uptake.

Regulatory uncertainty 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 the European Commission and OECD (2024).

The AI landscape in Austria is characterised by several prominent AI innovation hubs

AI startups are found across the country with a dominant presence in four regional AI hubs.



Linz

Linz is a notable AI hub driven by research at the Johannes Kepler University and hosts key players like datAInsights, specialising in AI-driven data solutions.

Vienna

Vienna serves as Austria's primary AI startup hub, driven by its vibrant ecosystem supported by institutions like the Impact Hub Vienna, a strong investor presence, and notable unicorns such as Bitpanda and Mostly AI.

Graz

Graz contributes significantly to Austria's AI landscape with a focus on research and development supported by the TU Graz and the Know-Center, dedicated to AI and data-driven innovation.

Innsbruck

Innsbruck supports AI innovation with a growing start-up scene, highlighted by companies like Crqlar and bolstered by research at the University of Innsbruck.

- Austria's AI start-up ecosystem thrives due to strong government and private sector initiatives like the Austrian Research Promotion Agency (FFG), Austrian Wirtschaftsservice (AWS) and AustrianStartups, which provide essential funding and mentorship.
- Dynamic industry collaborations and events, like the ViennaUp festival, foster a dynamic environment for AI innovation through knowledge exchange and partnerships.
- The ecosystem has produced several significant AI unicorns with ongoing efforts to cultivate more high-growth startups.
- Common challenges include scaling operations, securing late-stage funding and intense competition for skilled talent.

Source: Implement Economics based on Landscape Austria 23 and 180 Tech news (2024).

03

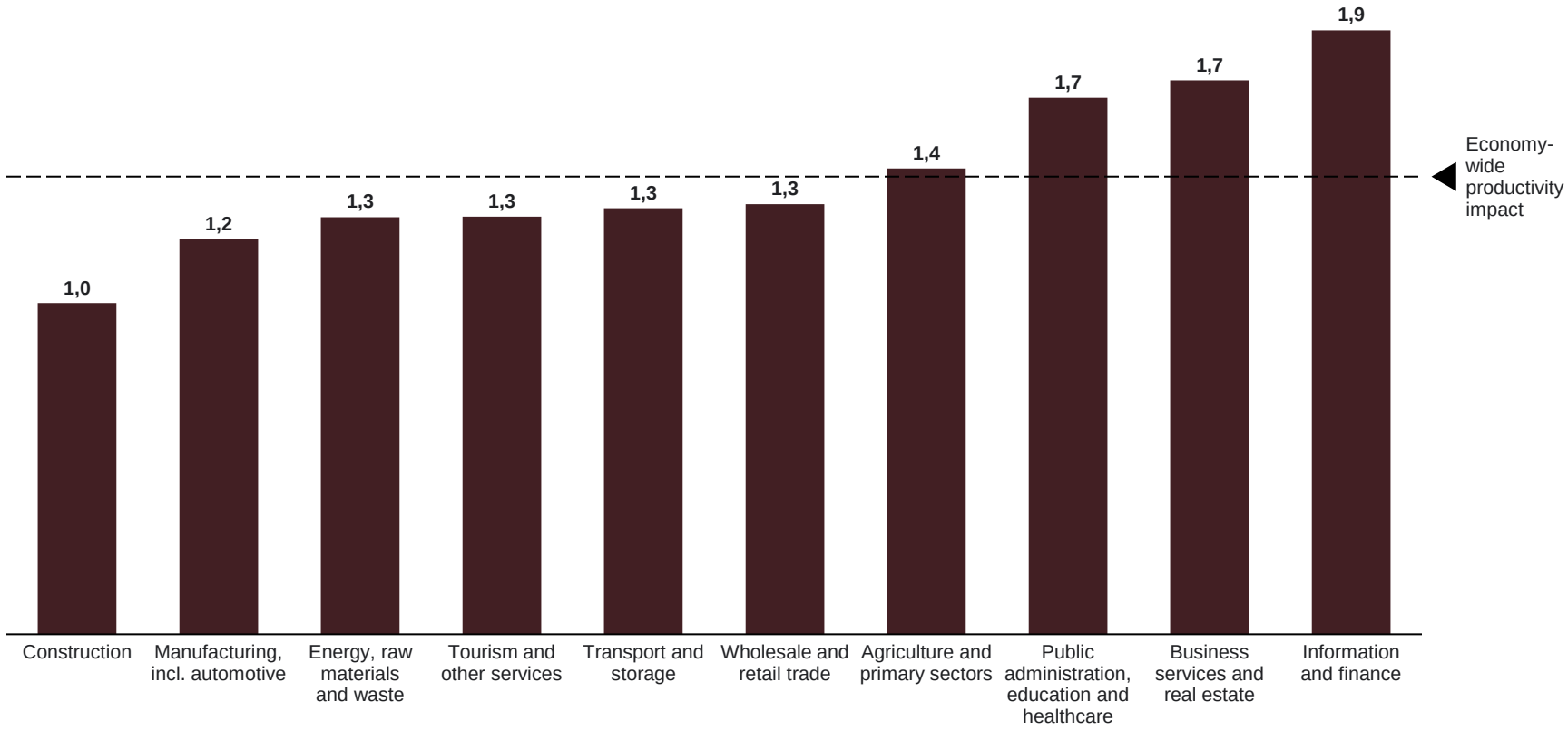
Key sectors benefitting from AI

Some sectors are expected to gain more from generative AI, mostly owing to the types of tasks performed.

AI can boost productivity across all sectors

Productivity boost from generative AI after a ten-year adoption period

Percentage points productivity growth p.a.



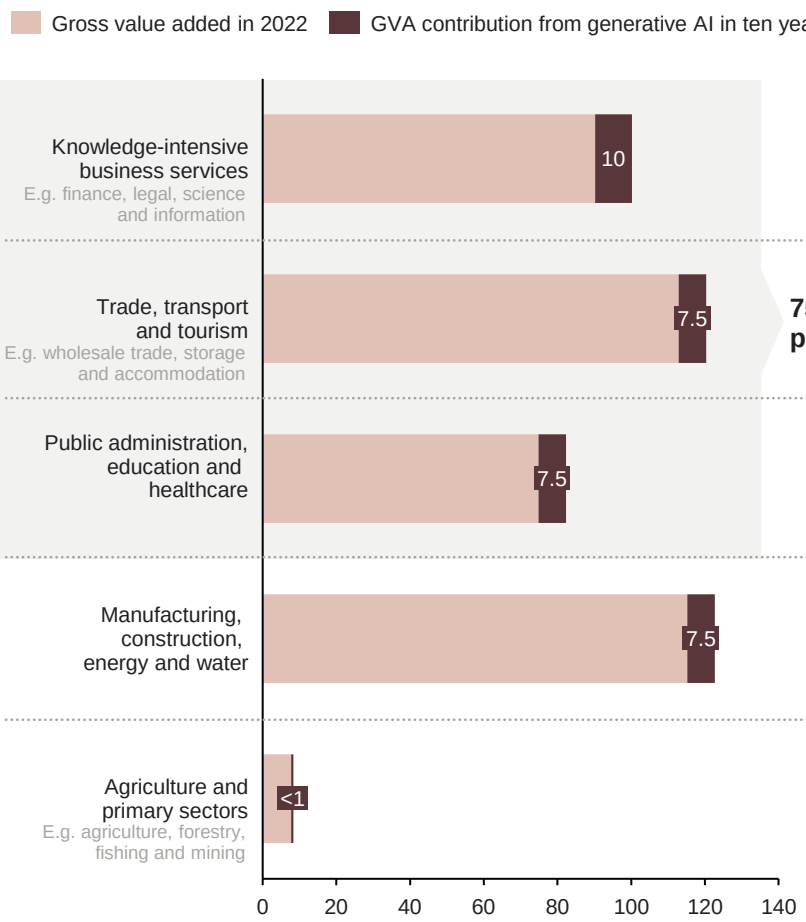
- The complementary role of generative AI prevails in most industries, meaning that most occupations are estimated to use AI to augment and improve human capabilities.
- In contrast to past automation, such as robots, generative AI has the ability to boost productivity in the service sector.
- Displacement mainly occurs where administrative and repetitive knowledge-based tasks make up a large part of the work activities.
- Overall labour productivity growth in Austria has experienced a slowdown over the previous two decades, declining steadily from about 2% p.a. to little or no productivity growth in recent years.
- Generative AI can play a key role in raising productivity growth across all sectors.

Note: Sectors are aggregated according to NACE categorisation. “Information and finance” is a combination of information, communication, financial and insurance activities. “Tourism and other services” comprises accommodation, food and other services. Gains in labour productivity 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.
Source: Implement Economics based on Eurostat, Austrian Productivity Board, OECD, 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



75% of potential

Generative AI has the potential to boost value added in knowledge-intensive business services by around **EUR 10 billion**, 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 **EUR 7.5 billion** 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 **EUR 7.5 billion**, 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, construction, energy and water by around **EUR 7.5 billion**, 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.

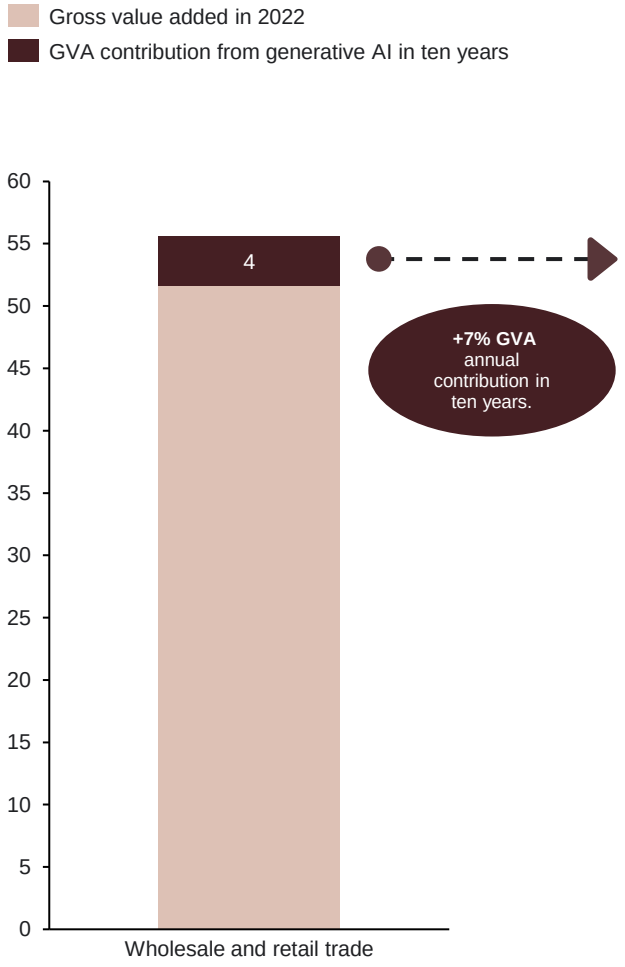
Generative AI can, for example, facilitate predictive maintenance by processing operational reports and predicting potential system failures, thereby supporting an estimated potential of up to around **EUR 1 billion.**

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

The large wholesale and retail trade sector in Austria can leverage generative AI to improve customer engagement and operational efficiency

Value added in wholesale and retail

€ billion



How generative AI can help the **wholesale and retail trade sector** …

… and contribute to the economic impact

Personalised product discovery

- Predictive product recommendations
- Behavioural analysis and purchase history
- Personalised product descriptions

→ Higher customer satisfaction through improved personalisation and relevance, increased conversion rates and e-commerce sales.

Enhanced operational efficiency

- Supply chain optimisation
- Demand forecasting
- Process and warehouse management automation

→ Reduced operational costs and improved supply chain stability, leading to higher profit margins and optimised inventory levels.

Innovative customer engagement

- Virtual shopping assistants
- AI-generated content marketing

→ Lower support costs, more effective campaigns and higher brand awareness.

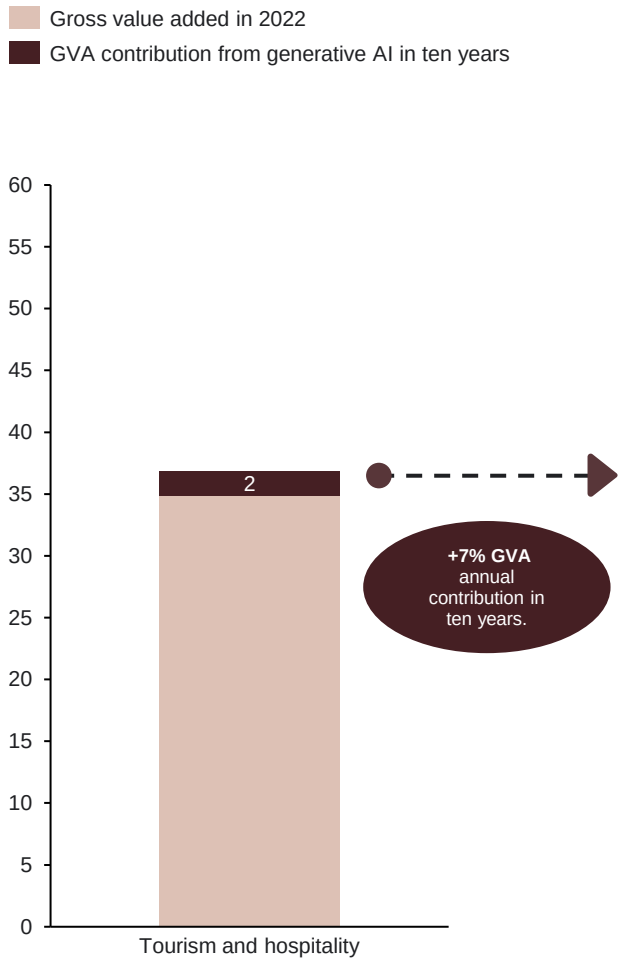
- Wholesale and retail trade is one of the largest sectors in Austria, constituting 13% of GVA in 2022.
- The economic potential of generative AI in wholesale and retail trade is estimated at €4 billion.
- Utilising generative AI can enhance customer satisfaction and loyalty through personalised recommendations and product descriptions, leading to increased conversion rates and e-commerce sales.
- Generative AI can also help the sector to streamline supply chain processes and warehouse management, reducing operational costs and improving profit margins.
- Additionally, innovative customer engagement tools, such as virtual shopping assistants and AI-generated marketing, can help lower support costs while boosting brand awareness through targeted, effective campaigns.
- At its peak, the productivity effect of generative AI in the wholesale and retail sector is estimated to be 1.3% annually.

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

The tourism sector can benefit from operational efficiencies and higher quality of services

Value added in tourism and hospitality

€ billion



How generative AI can help **tourism** … … and contribute to the economic impact

Optimisation and preservation

- Demand forecasting and crowd management
- Optimise energy and waste management

→ Better capacity use, higher volume of tourists, improved cost competitiveness and/or GVA contributions.

Personalisation and marketing

- Personalised recommendations
- Marketing and targeting

→ Higher quality services, repeat tourism and increased demand from niche and high-value visitors.

Accessibility and audience adaptation

- Chatbots and customer service
- Translation and audio explanations

→ Improved tourist experiences and increased demand from diverse audiences.

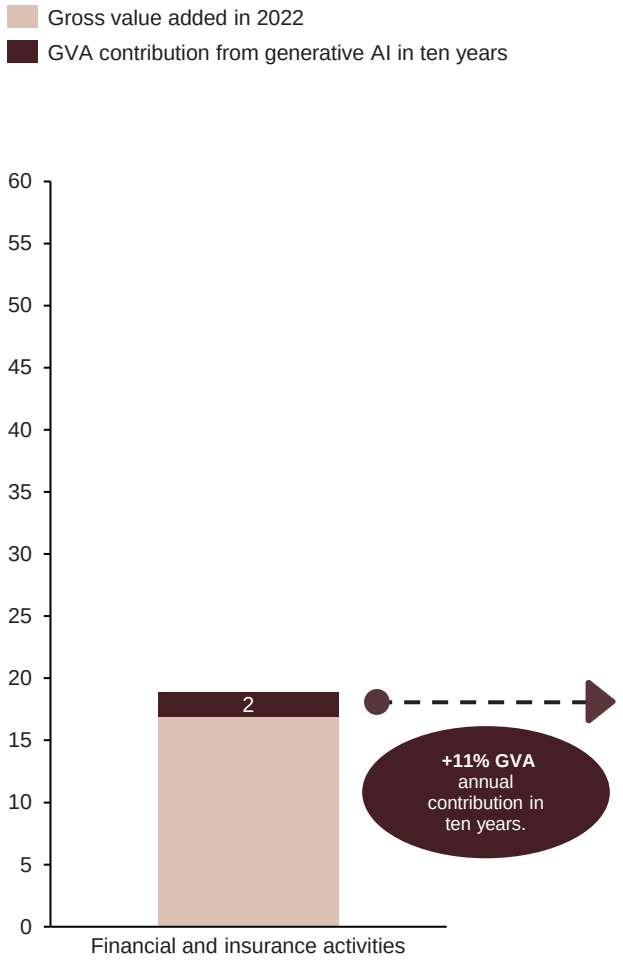
- The economic potential of generative AI in the tourism and hospitality sector is estimated at €2 billion.
- This potential covers the sector's accommodation and food services, travel agencies, tour operators, reservation services and other administrative support services.
- At its peak, the productivity effect of generative AI in the tourism and hospitality sector is estimated to be 1.3% annually.
- By employing generative AI, the sector can enhance on-site operational efficiency, which contributes to improved preservation efforts and more strategic resource distribution.
- Furthermore, the application of generative AI can serve to engage new demographics and enrich the travel experiences of individuals by offering customised recommendations and readily available assistance.

Note: "Tourism and hospitality" comprises accommodation and food services, travel agency, tour operator, reservation service and related activities and other administrative and support service activities. This sectoral definition does not include *all* the activities captured in the Tourism Satellite Account definition like direct demand for services, e.g. transport, and retail products as well as indirect effects, e.g. activity from tourism-driven income generation. According to Statistics Austria, this contribution of tourism to GDP was 5.5% in 2019 prior to the COVID crisis.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a).

Generative AI can benefit the financial sector by increasing efficiency, enhancing risk assessments and personalising customer services

Value added in finance and insurance

€ billion



How generative AI can help the **financial and insurance sector** …

… and contribute to the economic impact

Automation and efficiency

- Process automation
- Enhanced decision-making
- Cost reductions

→ Higher efficiency and productivity, lower operational costs and improved profit margins.

Enhanced risk assessment

- Predictive risk modelling
- Regulatory compliance
- Fraud detection and prevention

→ Reduced financial losses, improved capital efficiency, increased system stability and fewer regulatory penalties.

Personalised customer services

- Personalised financial advice
- Customer interactions and support

→ Higher customer retention rates, reduced service costs and promotion of Austria as a financial innovation hub.

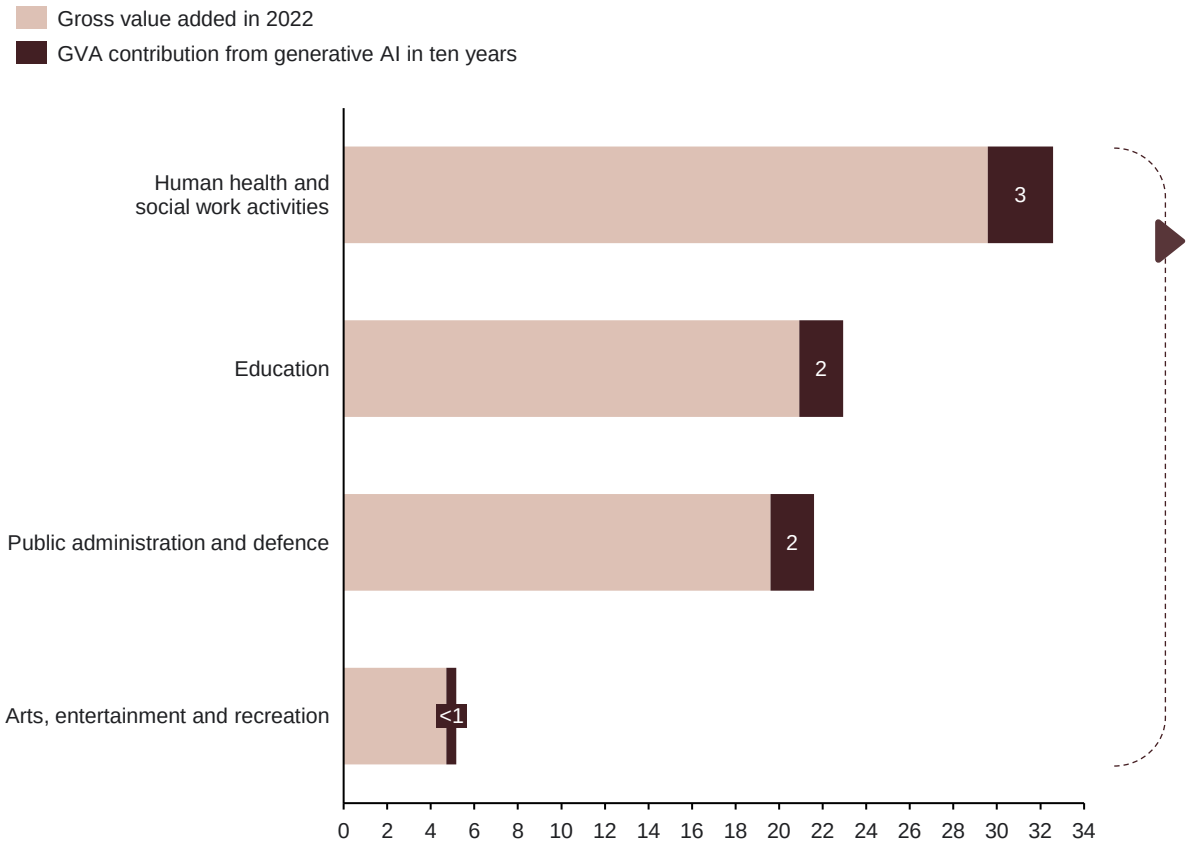
- Finance and insurance constituted 4% of GVA in 2022 and is estimated to gain €2 billion in value from generative AI.
- With an estimated 1.9% productivity growth boost in the peak year, the sector is expected to benefit greatly from generative AI. This growth is higher than in other sectors due to the prevalence of knowledge-based work in finance and insurance, where generative AI is especially potent.
- Due to the relatively higher productivity boost, the GVA increase in the finance and insurance sector from generative AI is estimated to account for 5% of the total potential in Austria.
- By employing generative AI, the sector can reduce financial risks by enhancing predictive modelling and improving compliance with regulations, which contributes to better financial stability and efficiency.
- Automation driven by generative AI can also boost operational efficiency, leading to lower operational costs and higher productivity through streamlined processes and enhanced decision-making capabilities.
- Furthermore, personalised customer services via generative AI can improve customer satisfaction and retention, reduce service costs and position Austria as a leader in financial innovation and customer care.

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

Generative AI can free up resources and increase quality in Austrian public services

Value added in public sector

€ billion



+10% GVA annual contribution in ten years.

Gross value added in public sectors can take form as …

I **Freed-up resources** that can be leveraged to reduce bottlenecks or can be reallocated to other public services.

II **Increased quality** of public services, allowing for new types of services, and increasing personalisation, transparency and accessibility of current services.

- According to the OECD, Austria is among the top performers on satisfaction with public services. Generative AI can play a key role in retaining this satisfaction in the coming decade.
- Generative AI has the potential to drive efficiency and quality in public services. The use of generative AI can result in better citizen satisfaction, shorter response times and better services within a given budget. The potential corresponds to an estimated €7.5 billion in value added in around ten years.
- By allowing public employees to complete their tasks more quickly, generative AI can alleviate bottlenecks and reduce waiting times in areas with scarce resources. Alternatively, the resources freed up can be reallocated to enhance other public services.
- Additionally, generative AI can enhance the quality of public services by introducing new functionalities and services and by enabling increased accessibility, transparency and personalisation of existing ones.
- Overall, generative AI has the potential to support public services across Austria that are under increasing strain, thereby maintaining public satisfaction and trust in Austrian public services.

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

04

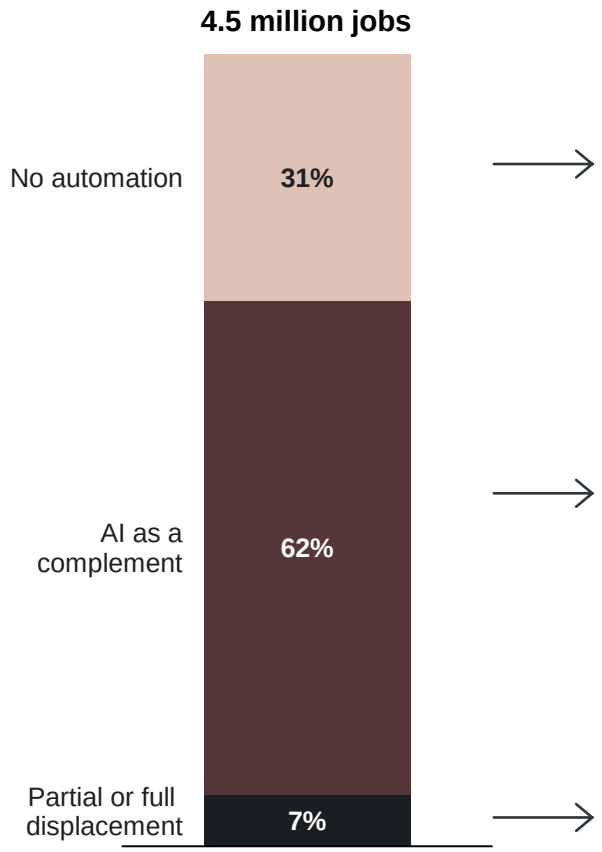
Job implications of AI

Generative AI will introduce job changes in Austria – the nature and degree of which depend on economic and demographic factors.

Generative AI augments most jobs

Share of jobs exposed to automation by generative AI

% of total employment in Austria



~ 1.4 million jobs are unlikely to be exposed to automation

An estimated 31% of jobs in Austria 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.

~ 2.8 million jobs are likely to be augmented by generative AI

Most jobs (62%) 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.

~ 0.3 million jobs are likely to be fully or partially displaced

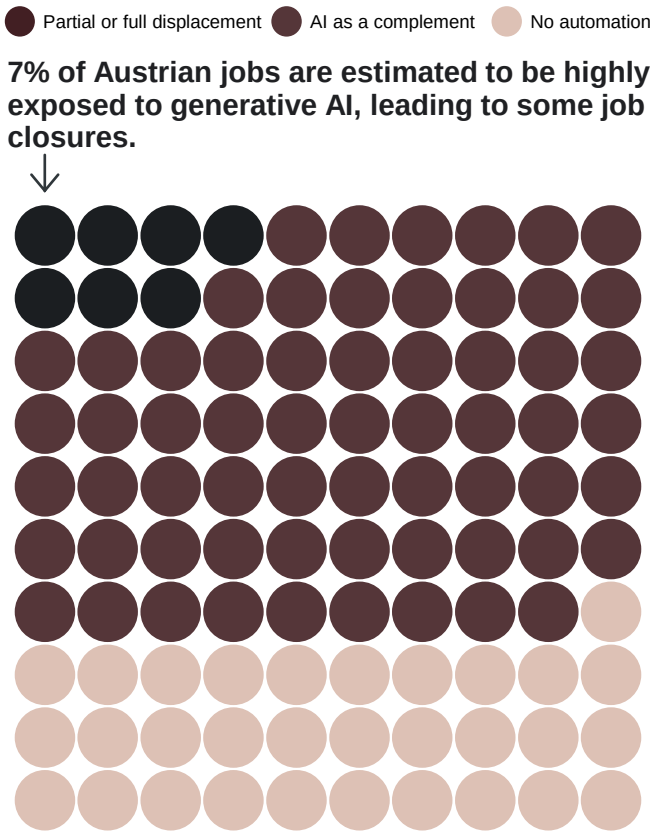
A small share of jobs (7%) are expected to have over half of their work activities exposed to automation by generative AI, e.g. in occupations such as clerical support workers, contact centre salespersons and translators. These workers are likely to see their jobs fundamentally change and may need to be re-employed in new occupations.

Note: Based on Q3 2023 employment data. In accordance with Briggs and Kodnani (2023a), "No automation" are occupations with less than 10% exposure, "AI as a complement" are occupations with 10-49% exposure and "partial or full displacement" 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 and ensure full re-employment of potentially displaced workers

Share of jobs exposed to automation by generative AI

% of total employment in Austria



7% of Austrian jobs are estimated to be highly exposed to generative AI, leading to some job closures.

At the same time, 62% 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 hence 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 15,000-30,000 people in highly exposed jobs are estimated to need re-employment per year, which is low compared to expected future job openings towards 2035 according to CEDEFOP (see page 28). **Jobs and wages could come under pressure if Austria is slower to adopt generative AI than competing countries.**

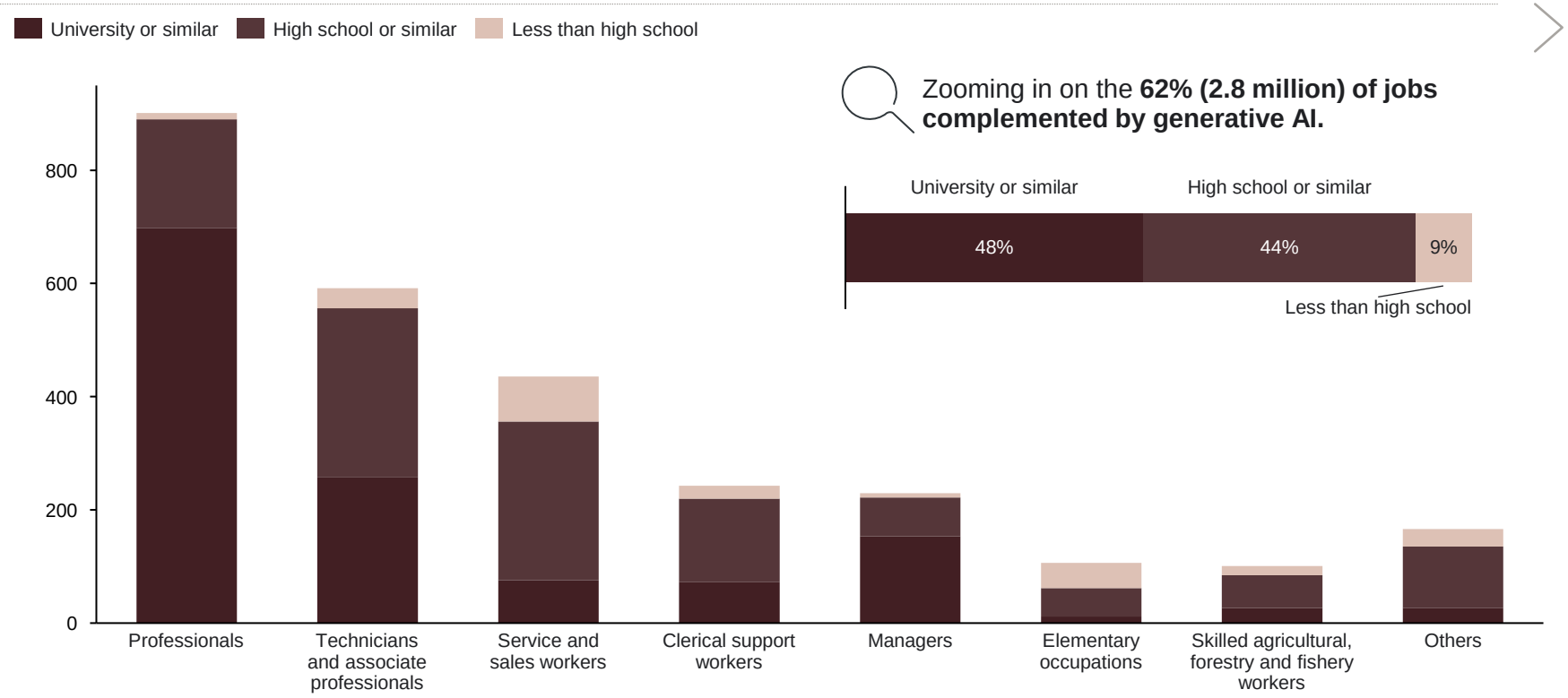
- The job development in Austria over the next decades will depend on a range of factors.
- The isolated impact of generative AI depends on the speed of adoption and size of the productivity boost relative to the size of the displacement effect for the jobs that are highly exposed to generative AI.
- This report assumes full re-employment of displaced workers over a ten-year period. This means no net change in total employment or unemployment.
- The assumption builds on the large size of the 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 the labour supply and skill mix of the workforce.
- The short-term job impacts will depend on, among other things, the flexibility of the labour market as well as re-training and skilling opportunities for workers.

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 and Briggs and Kodnani (2023a).

2.8 million jobs are expected to be complemented by AI – mainly highly educated professionals and technicians

Jobs complemented by generative AI

Thousand jobs



Zooming in on the **62% (2.8 million) of jobs complemented by generative AI.**

Examples of jobs include:	Research, analysis, creative services and advising services (including legal)	Engineering technicians, robot controllers and air traffic safety technicians	Caterers, travel attendants, teachers' aides and personal care workers	Secretaries, record keepers and information suppliers	Executives, senior officials and general managers	Transport and storage workers, food preparation assistants	Livestock and farm workers, fishery and forestry workers	Fashion designers and jewellery makers

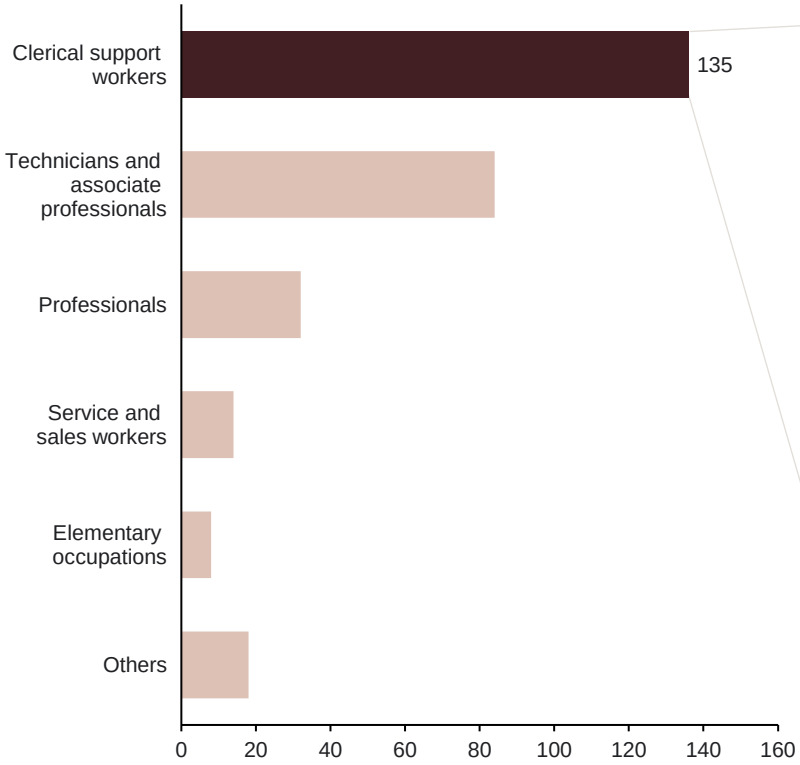
- Generative AI is estimated to augment the capabilities of around 2.8 million jobs in Austria at full adoption and around half of these over a ten-year period.
- Of the estimated complemented workers, 48% hold higher educational attainment, such as lawyers, scientists and engineers.
- Generative AI can perform complex cognitive tasks and complement human abilities, creating opportunities for individuals to work with generative AI to create new content and free up time for other tasks.
- Unlike previous waves of automation, generative AI is less relevant in jobs carried out by those with lower levels of educational attainment.

Note: Based on Q3 2023 employment data.
Source: Implement Economics based on Eurostat, O*Net and Briggs and Kodnani (2023a).

Around 300,000 Austrian jobs are highly exposed to generative AI, but the AI-powered economy will help create new types of jobs and higher demand

Jobs highly exposed to generative AI

Thousand jobs



Highly exposed jobs in total ~ 300,000

Example: Austrian clerical support workers and job transition

Of the 135,000 highly exposed clerical support workers, only around half are assumed to be affected by generative AI over ten years, and all of these are assumed to be employed either outside or within the occupation.

Most are expected to be re-employed in other occupations due to:

I **Increase in general demand for goods and services** due to increased income in the AI-powered economy leading to job opportunities in other sectors.

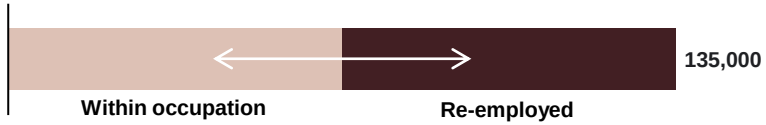
II **New types of AI-related tasks created** arising from the introduction of generative AI such as AI prompt engineers, AI-assisted creative professionals and AI application specialists.

A smaller share is expected to be employed *within* occupation because:

III **Not all highly exposed workers will be displaced.** Some will continue to hold employment with new tasks replacing the exposed tasks.

Increased demand within occupation due to the increase in productivity and lower costs.

The proportion of employment within occupations and in new occupations are uncertain.



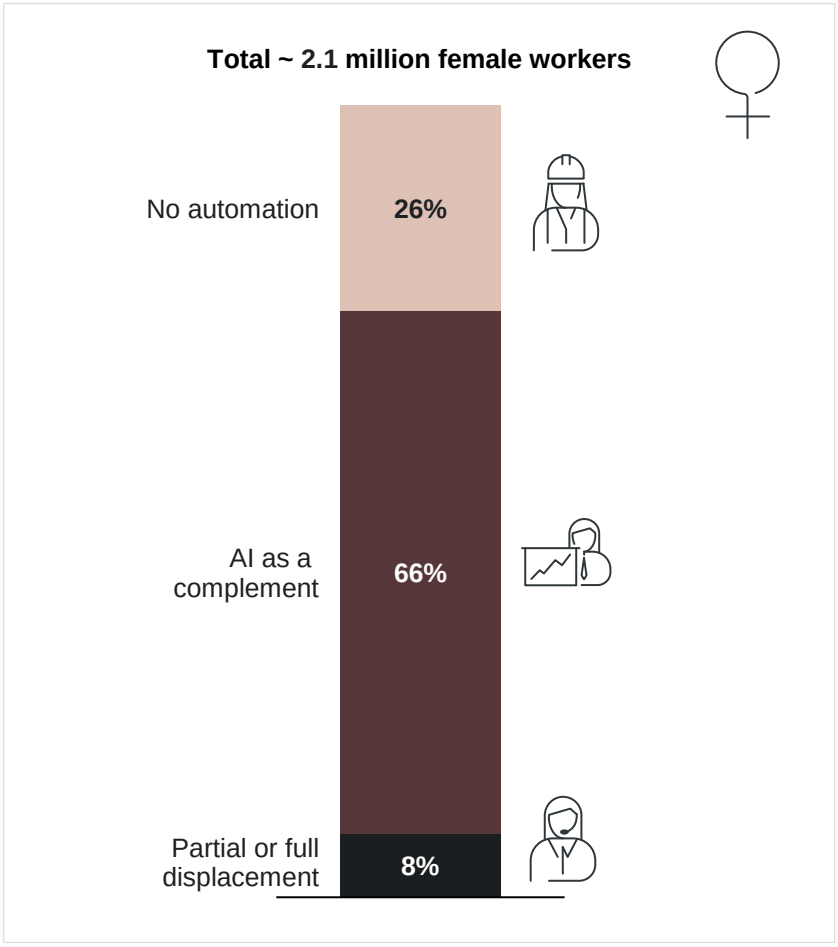
- Around 300,000 jobs in Austria are estimated to be highly exposed to generative AI at full adoption, and around half of these are expected to be affected over a ten-year period.
- This report assumes full re-employment of displaced workers. This means no net change in total employment or unemployment.
- The Austrian economy is thus assumed to be able to sustain at least the current level of employment in the coming 10-15 years as also predicted by EU forecasts from CEDEFOP.
- Clerical support workers, technicians and service and sales workers are highly exposed to generative AI and up to a third of these jobs are expected to see significant change.
- The transition is likely to be gradual, allowing workers time to adapt to new tasks and skills.
- The AI-powered economy will gradually lead to new jobs through three channels and support employment within the occupation or re-employment in other sectors.
- Historically, worker displacement from automation has been offset by the creation of new jobs, and the emergence of new occupations following technological innovations accounts for the vast majority of long-run employment growth.

Note: Based on Q3 2023 employment data. High exposure to AI does not automatically imply full displacement of all workers in that occupation. In the GDP estimates, we conservatively assume low automation to avoid overestimating GDP impacts. In the job exposure and potential displacement assessment, we show the full size of the potential displacement to avoid underestimating the job implications. The size of each re-employment channel is uncertain and depends on how the technology is adopted and the interplay between increased efficiency and how unmet demand translates into increased or decreased employment in various occupations.
Source: Implement Economics based on Eurostat, O*Net, CEDEFOP and Briggs and Kodnani (2023a).

A higher share of female workers are estimated to be affected by generative AI – both in terms of potentially positive and negative impacts

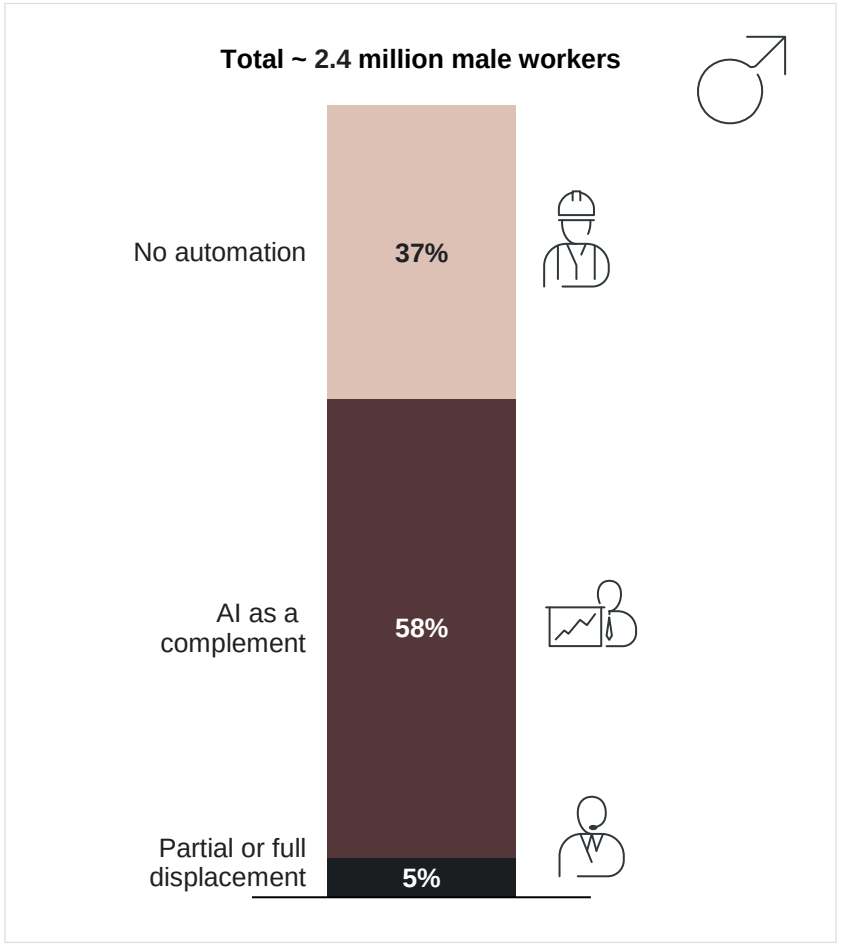
Share of jobs held by women exposed to automation by generative AI

% of total employment among female workers



Share of jobs held by men exposed to automation by generative AI

% of total employment among male workers



No automation

- 26% of female workers and 37% of male Austrian workers are in jobs with limited exposure to generative AI. These are, for example, manual, outdoor and human-to-human jobs.

Complemented jobs

- 66% of female workers are expected to see generative AI complement their current job, whereas the share is only 58% for male workers. Female workers are, to a higher degree than men, employed in jobs such as teachers and lawyers, where generative AI is expected to augment human capabilities and make workers more productive.

Potentially displaced jobs

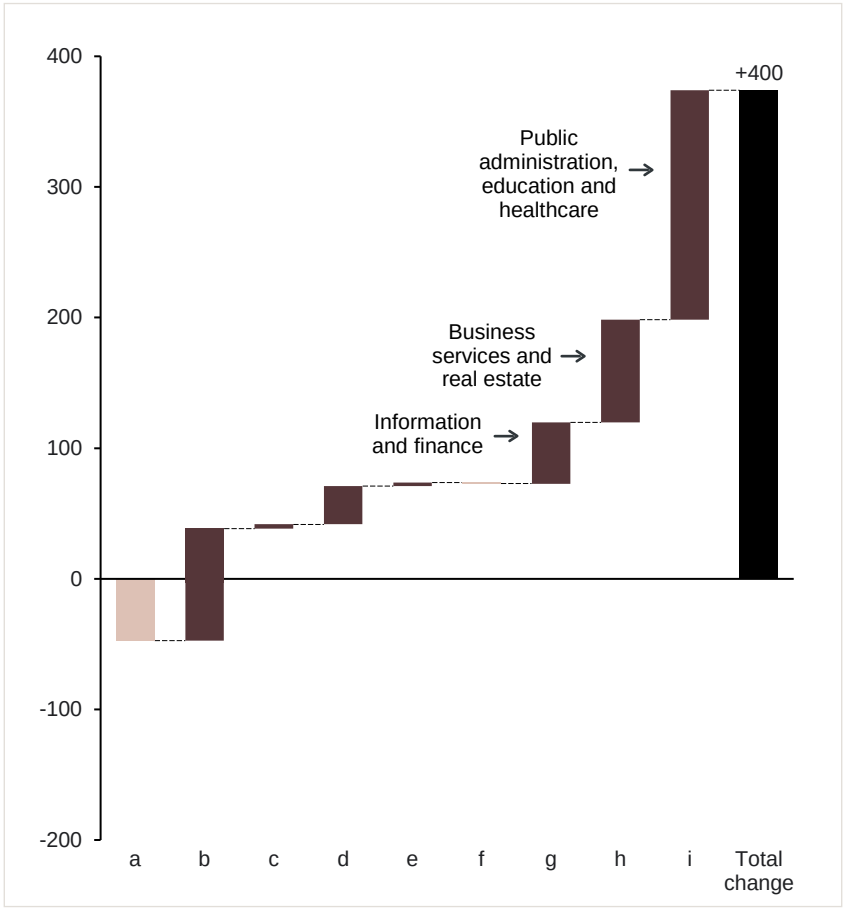
- 8% of female workers and 5% of male workers in Austria are currently in jobs such as clerical work, call centres and technician work that are likely to be highly exposed to automation by generative AI and hence are more at risk of seeing their current jobs being fully or partially displaced by the new technology.

Note: Based on 2023 employment data. In accordance with Briggs and Kodnani (2023), "No automation" are occupations with less than 10% exposure, "AI as a complement" are occupations with 10-49% exposure, "Partial or full displacement" 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).

Job changes from generative AI are small compared to expected future averages

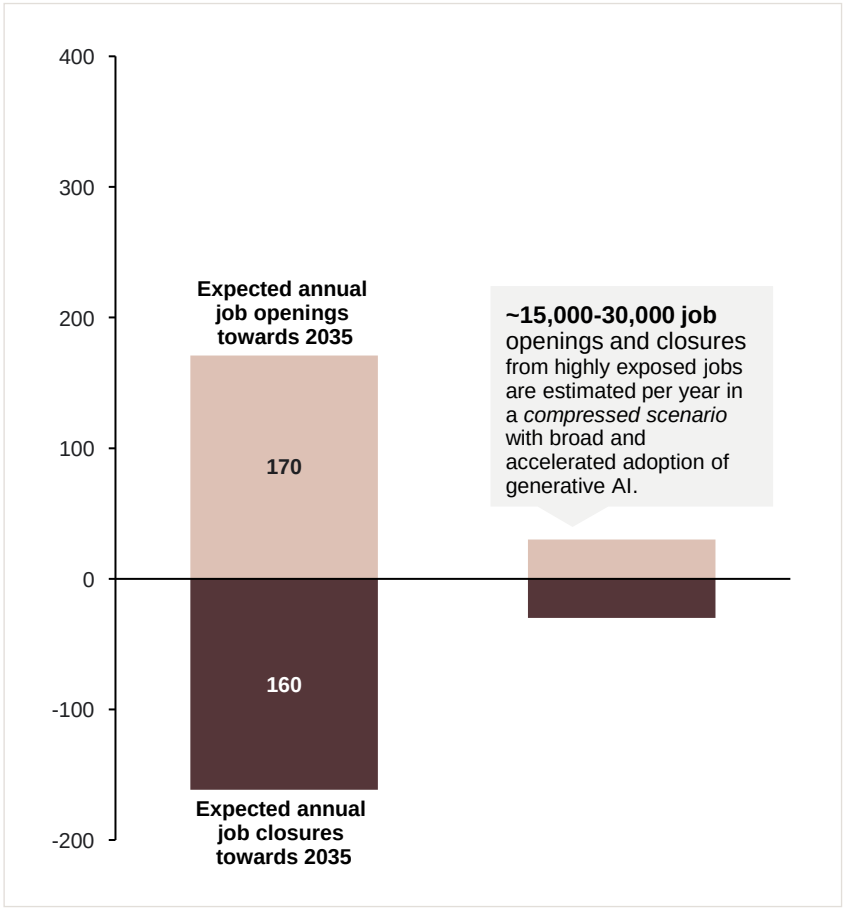
Change in employment across sectors in Austria, 2013-2022

Thousand jobs



Estimated annual re-employment in Austria from generative AI

Thousand jobs



- Austria's economy has added around 400,000 jobs over the last ten years. Only the agriculture and primary sectors have contracted, while most other sectors have added significant amounts of new jobs, e.g. business services, information and finance and the public sector.
- In addition, numerous new jobs are created and closed each year *within* each sector to adapt to changing needs and demands.
- According to CEDEFOP, Austria's economy is expected to see around 170,000 job openings and 160,000 job closures each year until 2035.
- We estimate that the jobs highly exposed to generative AI can lead to 15,000-30,000 annual job openings and closures over the coming ten years. This is around 10-20% of the expected future annual number of job openings in Austria.
- The labour market effects stemming from generative AI's impact on highly exposed jobs are thus small compared to expected future 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 and construction; c. Utilities, raw materials and waste; d. Wholesale and retail trade; e. Transport and storage; f. Tourism and other services; g. Information and finance; h. Business services and real estate; i. 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.

Workers need a broad set of skills to effectively use generative AI

Skill needs in the age of AI (including both generative and traditional), OECD

Skills …	*Type of skills*	*Examples*
… for developing and maintaining AI systems.	Specialised AI skills	Machine learning capabilities and knowledge
	Data science skills	Data analysis and visualisation, cloud computing and programming
	Other cognitive skills	Creative problem-solving
	Transversal skills	Social skills and management skills
… for adopting, using and interacting with AI applications.	Elementary AI knowledge	Principles of machine learning
	Digital skills	Ability to use computer/smartphone
	Other cognitive skills	Analytical skills, critical thinking and problem-solving
	Transversal skills	Creativity, communication, teamwork and multitasking

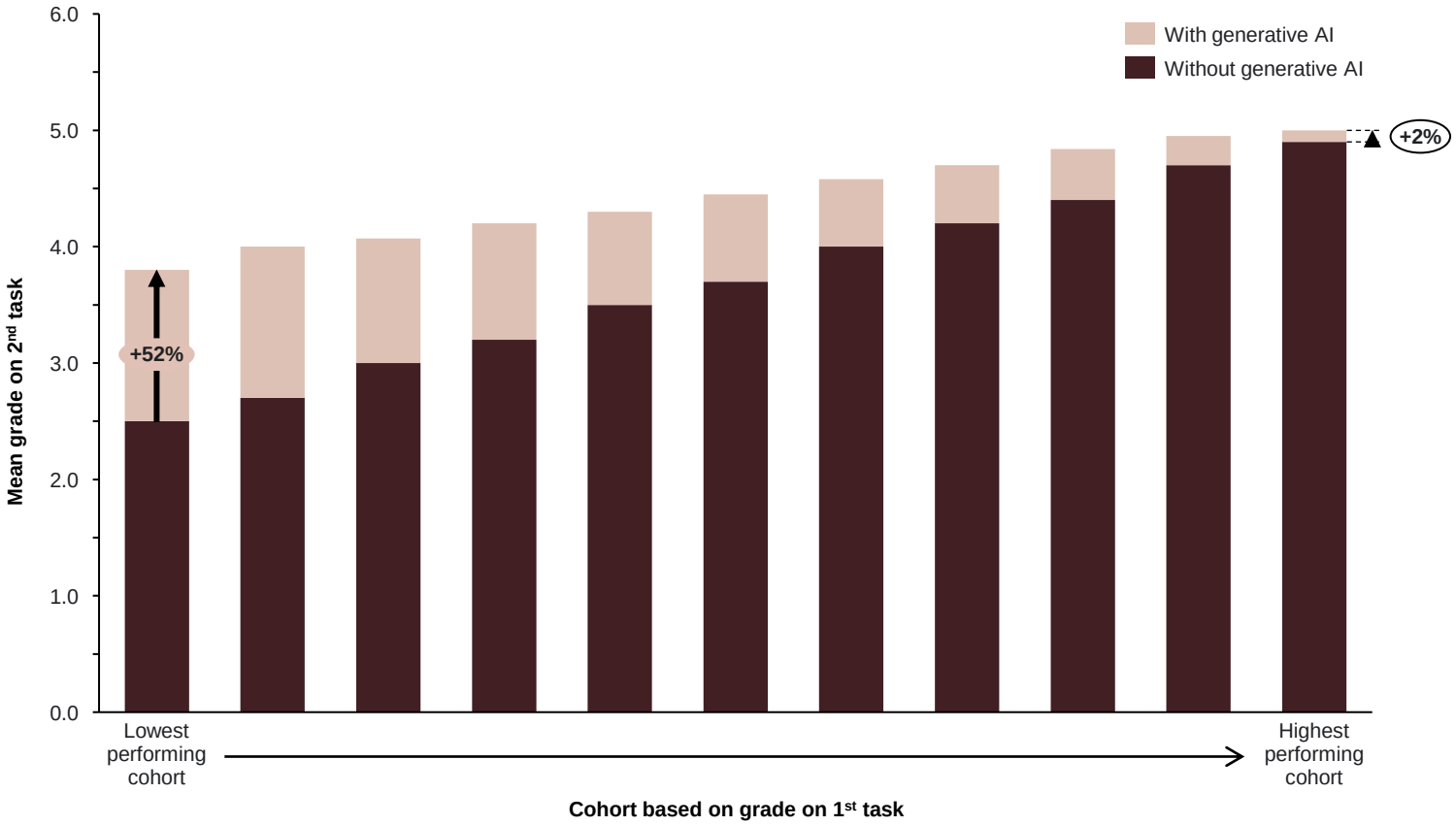
- Generative AI adoption and usage requires limited digital skills relative to earlier advancements in information and communication technology (ICT) due to its ease of use via normal language prompts.
- However, fully leveraging generative AI requires skills beyond basic digital skills, i.e. creative, managerial and analytical skills.
- OECD studies suggest that companies that provide ICT training to their employees on average have 3-5% higher growth in their annual labour productivity.
- The literature highlights that companies that combine technology/ICT adoption with employee training have higher implementation and financial success.
- The Austrian government has launched a "Digitale Kompetenzoffensive" (Digital Skills Offensive) with the aim to promote basic digital skills among all individuals in Austria and increase the number of IT professionals.

Source: Implement Economics based on OECD, Eurostat, Mosiashvili and Pareliussen (2020), Borowiecki et al. (2021), Gal et al. (2019), Andrews et al. (2016), Jiang et al. (2020) and Ouyang et al. (2022).

Early studies suggest that generative AI can help close the skills gap for those with the lowest skill levels

Grades with and without generative AI

Estimated mean grade on 2nd task



- 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) and Dell'Acqua et al. (2023).

05

AI’s impact on societal challenges

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

AI significantly improves the capabilities to predict, prepare for and respond to environmental impacts

AI has the potential to …

Improve **prediction capabilities** by forecasting environmental challenges such as wildfires, floods and droughts.

Leverage synthetic data and simulations to **assess environmental impacts**, aiding planning and mitigation efforts.

Leverage historical data and real-time input to provide **early warnings**, enabling timely evacuations and precautions.

Optimise resource management and response coordination, improving intervention effectiveness during environmental crises.

- The prevalence of local environmental events, such as wildfires, floods and droughts, is intensifying, posing a critical concern for ecosystems and communities alike.
- AI is a key tool already being used to predict, prevent and mitigate environmental impacts, using predictive analytics to inform effective response strategies.
- The advent of generative AI has expanded the horizons of predictive accuracy and data synthesis, significantly enhancing AI's role in managing environmental impacts.

The European Flood Awareness System (EFAS)

- EFAS deploys AI for the analysis of hydrological data and weather predictions to ascertain flood risks in Europe with heightened precision.
- The continuous refinement of predictive models through AI enables more effective strategies for flood preparedness and response by utilising the most current data and historical event analyses.

Google's Wildfire Boundary Map

- Google's Wildfire Boundary Map uses AI to analyse satellite data in real time, providing up-to-date information on the extent of wildfires.
- The AI system also incorporates user reports and data from local authorities to continuously improve the accuracy and timeliness of its wildfire boundary updates.

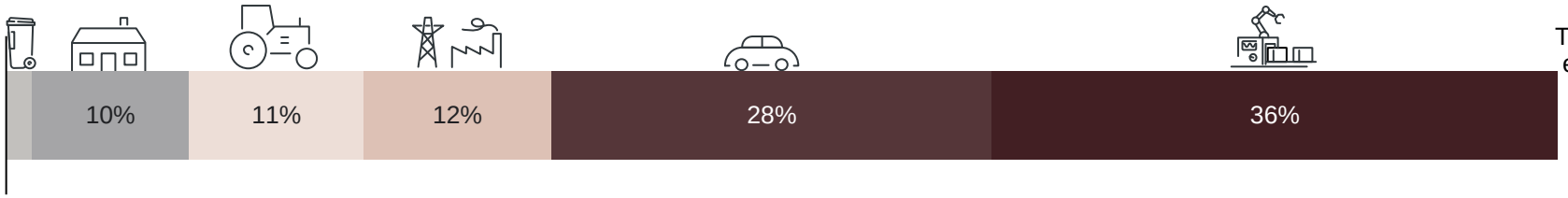
Norway's Use of AI in Landslide Prediction

- Varsom, Norway's AI-based system for landslide prediction, analyses geological data, rainfall records and satellite imagery to identify potential landslide risks.
- By continuously updating AI-based risk models, the system improves the ability to predict landslides, supporting more proactive safety measures and effective evacuation planning.

AI can play a key role in addressing climate change

Austria's gross greenhouse gas emissions, 2022

$MtCO_2e$



Total GHG emissions

73

$MtCO_2e$

Decarbonisation initiatives enabled by AI and other digital technologies
(non-exhaustive)

Buildings

- Smart buildings
- Transition to heat pumps
- Improved energy efficiency

Agriculture

- Efficiency improvements from precision farming
- Reduced food waste
- Changes in land use

Energy supply

- Expansion of renewable energy
- Electrification
- Smart grid
- Flexible electricity demand

Domestic transport

- Electric cars, vans, buses and small trucks
- Efficient and eco-friendly driving
- Reduced travel by use of digital tools (working from home and video conferences)

Manufacturing

- Smart factory with AI systems
- Efficiency improvements
- Electrification of lighter processes

- Artificial intelligence and other digital solutions are expected to play a key enabling role in reaching Austria's ambitious climate goals of carbon neutrality by 2040 and complete switch to renewable energy by 2030.
- In manufacturing, AI and other digital solutions can help optimise energy efficiencies as well as reduce overproduction by more accurately forecasting demand.
- Large gains also arise from facilitating the electrification of vehicles, where AI and other digital solutions are crucial to optimising the charging of EVs, providing a cleaner and cheaper solution for consumers.
- AI and other digital technologies can play a significant role in decarbonising the energy sector by supporting the transition to flexible energy utilisation and smart grids.
- Agricultural emissions can also be reduced by AI and other digital solutions, where machine learning algorithms allow precision farming practices that are more eco-friendly and reduce consumption of, for example, fertilisers.

Note: Data on net greenhouse gas emissions and removals sent by countries to UNFCCC and the EU Greenhouse Gas Monitoring Mechanism (EU Member States). This data set reflects the GHG inventory data for 2022 as reported under the United Nations Framework Convention for Climate Change. CRF inventory categories: Energy supply: CRF 1A1 (energy industries) + 1B (fugitives); Industry and manufacturing: CRF 1A2 (manufacturing industries and construction) + CRF 2 (industrial processes and product use); Domestic transport: CRF 1.A.3; Residential and commercial: CRF 1A4a (commercial) + CRF 1A4b (residential); Agriculture: CRF 1A4c (agriculture, forestry and fishing) + CRF 3 (agriculture); Waste: CRF 5 (waste); LULUCF: CRF 4 (LULUCF); Other combustion (CRF1A5a + CRF1A5b + CRF indirect CO_2).
Source: Implement Economics based on the European Environment Agency (EEA).

AI can help optimise critical healthcare resources and improve patient care in Austria

The Austrian healthcare system is characterised by a high standard of care and universal coverage but faces challenges such as increasing costs and an aging population that strain resources and require reforms to ensure long-term sustainability.

Additionally, regional disparities in healthcare access and workforce shortages further complicate the efficient delivery of services.

More hands are needed

- Austria, like the rest of Europe, faces significant health staff shortages. Austria faces an uneven distribution of doctors in rural areas as well as a declining number of general practitioners.
- Despite an increase in nurses, the number of nursing graduates is below the EU average, worsening the shortage compared to other EU countries.

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.

Austria's Artificial Intelligence Mission Austria 2030 (AIM AT 2030) aims to use AI to improve healthcare by enhancing diagnostics, treatment and patient safety while ensuring privacy and ethical standards.

Furthermore, the Digital Austria Act aims to enhance healthcare through digital advancements, integrating health data via the ELGA platform, improving accessibility, ensuring robust data security and supporting the digitisation of social insurance processes using health data.

AI can help free up and optimise critical resources by …

- Automating tasks in healthcare administration, e.g. appointment scheduling.
- Recording and summarising appointment notes, referral information and care plans.
- Faster and more accurate screening and decisions by physicians.
- Enabling physicians to undertake remote consultations.

AI can improve how we treat patients by …

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

Austrian hospitals are already piloting various highly specialised AI tools.

AI System for Predicting Severe COVID-19 Cases Developed in Vienna

- Researchers from the University of Vienna have developed an AI-based tool, CODOP, to predict severe COVID-19 outcomes using routine blood test data.
- CODOP, trained on data from 30,000 patients, helps identify high-risk individuals up to nine days in advance, improving resource allocation and patient management in hospitals.

Source: Implement Economics based on OECD/European Observatory on Health Systems and Policies.

06

AI readiness in Austria

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

In assessing Austria's AI readiness, we look to comparable countries

- In assessing Austria's AI readiness, we can compare Austria to its neighbours – a comparable group of European countries.
- Big economies, such as the United States, have an advantage when it comes to scale, i.e. absolute AI capacity, including the amount of commercial activity, availability of funding and volume of R&D.
- Common indicators, such as the Tortoise Global AI Index, compound both **scale** and **intensity** (AI capacity relative to population or GDP).
- Austria cannot compete on scale with global giants on, for example, the absolute amount of AI-related R&D investment. To gain scale and remain competitive, collaboration with other EU countries is beneficial.
- Therefore, Austria should work for initiatives at European level, especially in the areas of R&D investment, regulation and digital infrastructure.

Austria and comparable countries

Spain
#8 in DESI in 2022

Estonia
#10 in DESI in 2022

Austria
#11 in DESI in 2022

France
#13 in DESI in 2022

Germany
#14 in DESI in 2022

Italy
#19 in DESI in 2022

Belgium
#17 in DESI in 2022

Czech Republic
#20 in DESI in 2022

Hungary
#23 in DESI in 2022

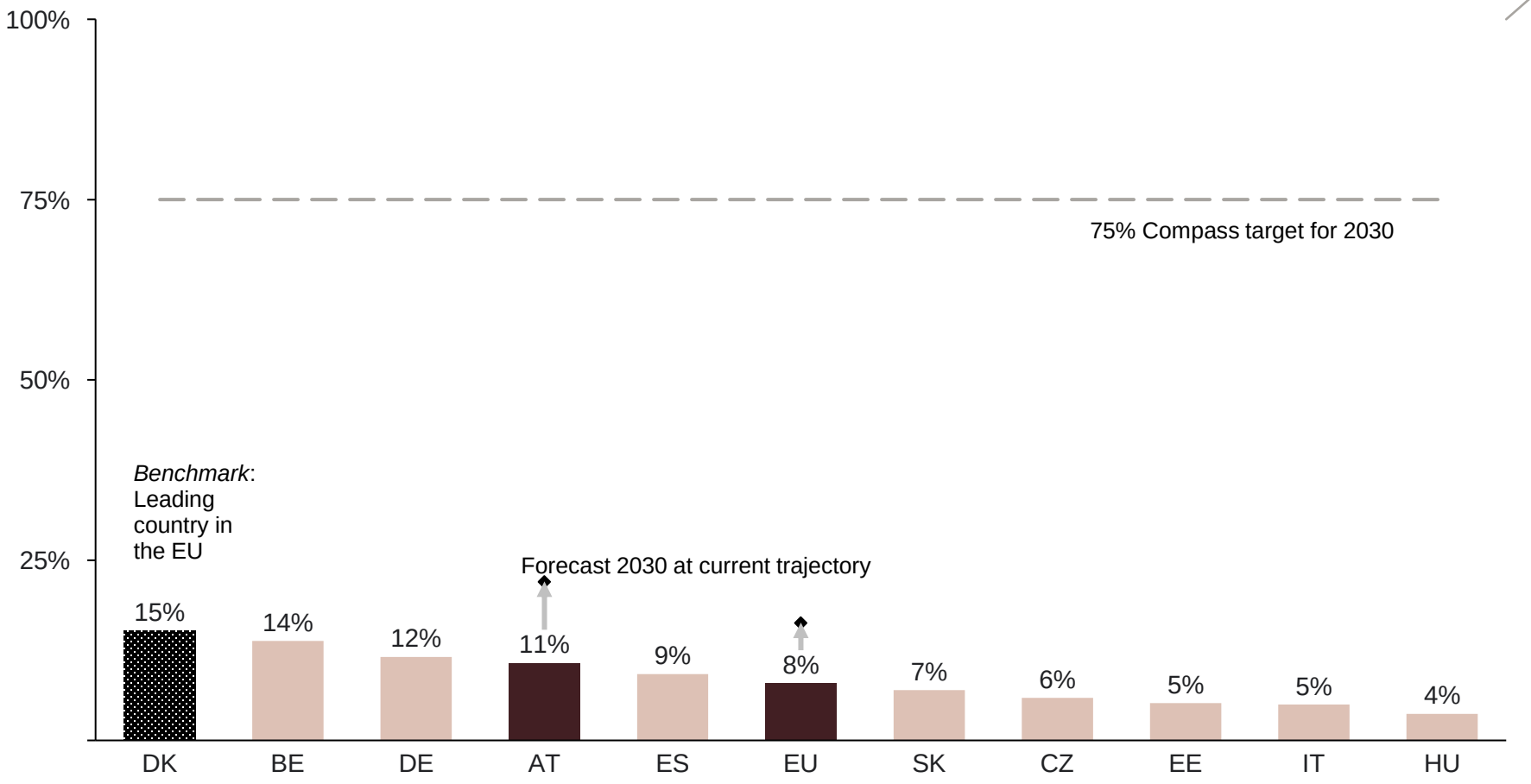
Slovakia
#24 in DESI in 2022

Switzerland
Not in DESI

AI adoption in Austrian enterprises is ahead of the EU average but far from the EU 2030 target of 75% adoption

Adoption of AI 2023

% of enterprises using at least one type of AI technology



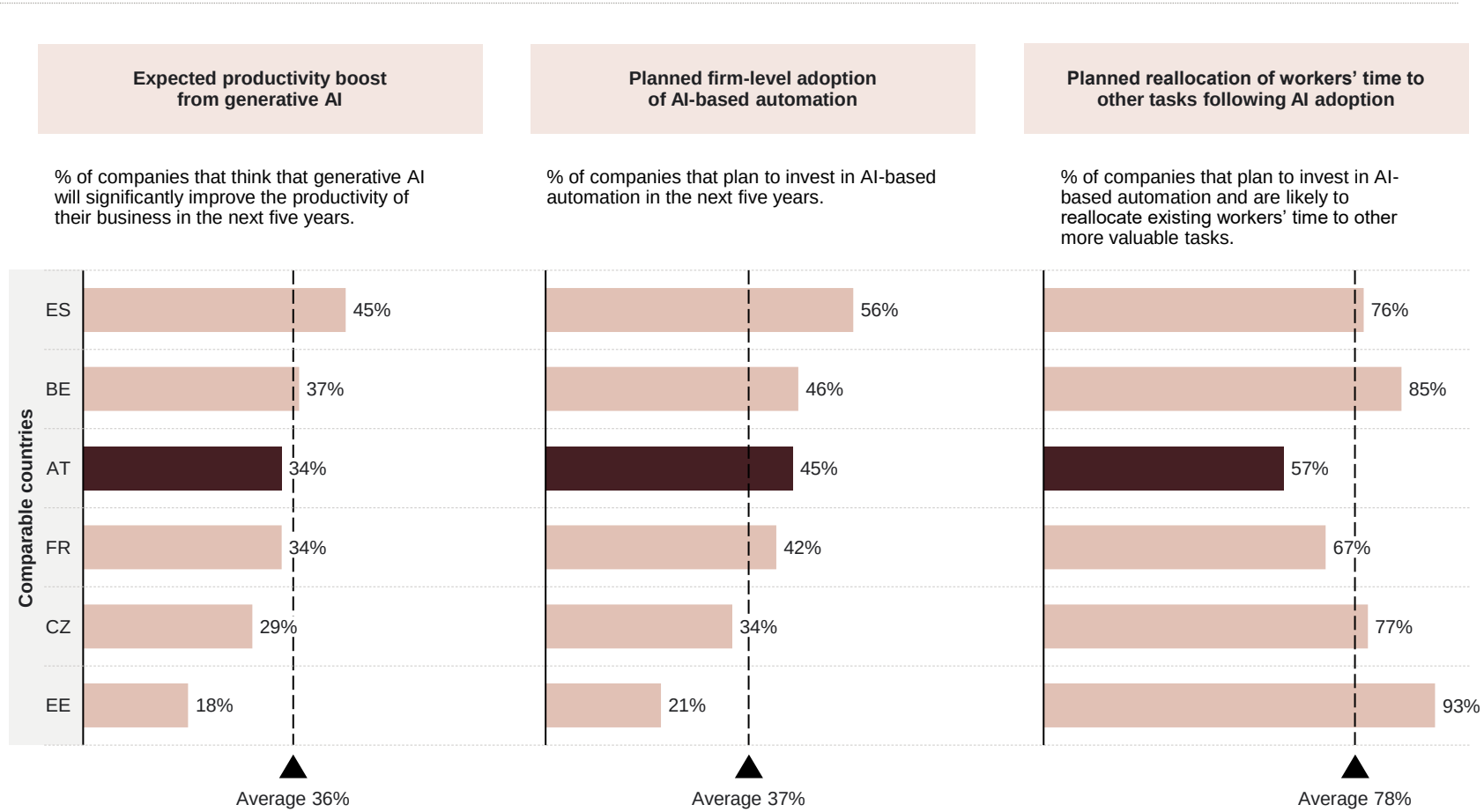
- Austria ranks fourth among comparable European countries and on par with the EU average in terms of AI adoption by enterprises. 11% of Austrian companies had adopted at least one type of AI technology in 2023.
- There is a large gap in AI adoption between large enterprises and SMEs in Austria: 35% and 10% had adopted AI in 2023, respectively.
- In its most recent assessment, the European Commission concludes 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, there is a risk that Austria will fall short of the 2030 target.
- Firm-level adoption data underestimates actual use in business settings (see page 7) as many instances of individual-level AI use are not captured.

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

34% of Austrian companies expect a significant productivity boost from generative AI, and 45% plan to invest in AI in the next five years

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

% weighted average of enterprises



- According to polling by Public First, 34% of Austrian companies anticipate significant productivity impacts from generative AI on their business in the next five years, which is slightly below the average of comparable countries.
- 38% of companies in Austria claim that they plan to invest in AI-based automation in the next five years, which is higher than the average of comparable countries.
- Of the Austrian companies planning to invest in AI-based automation, 57% are likely to reallocate workers' time to other more valuable tasks.
- While these metrics generally suggest 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.

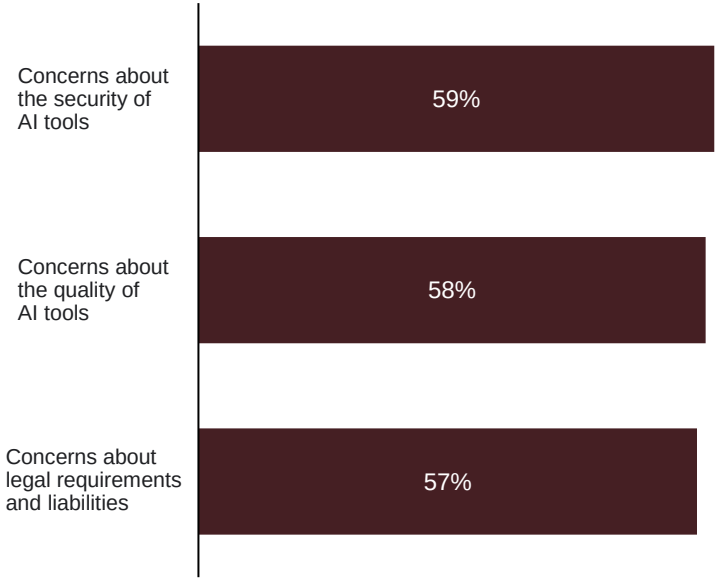
Note: Public First surveys conducted in Q3 2023 for Spain, Belgium, France and Czechia, Q1 2024 for Estonia and Q2 2024 for Austria. Nationally representative consumer and business polling. The average across other surveyed countries is computed as an arithmetic mean.
Source: Implement Economics based on Public First country surveys.

59% of Austrian companies cite security concerns as a barrier to AI adoption, and 31% say that they need enhanced digital skills to leverage the full potential of AI

Security concerns is the most frequently cited barrier to AI adoption among Austrian companies

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

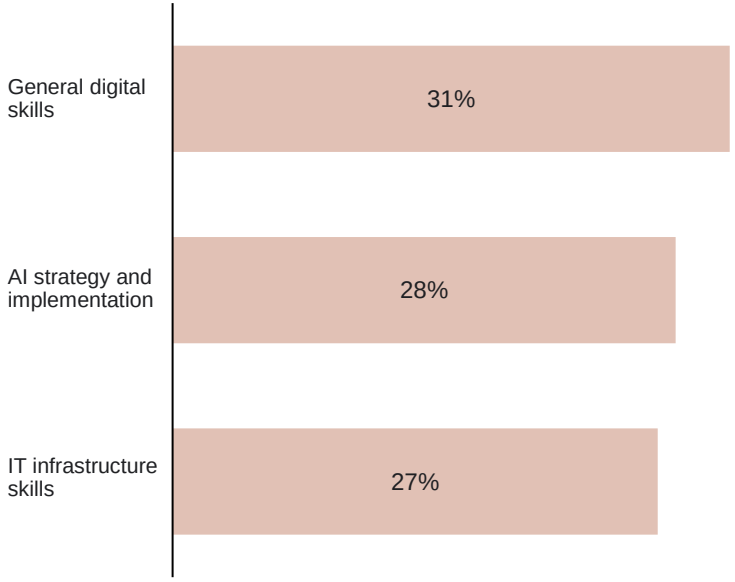
% weighted average of enterprises, 2024



Austrian 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



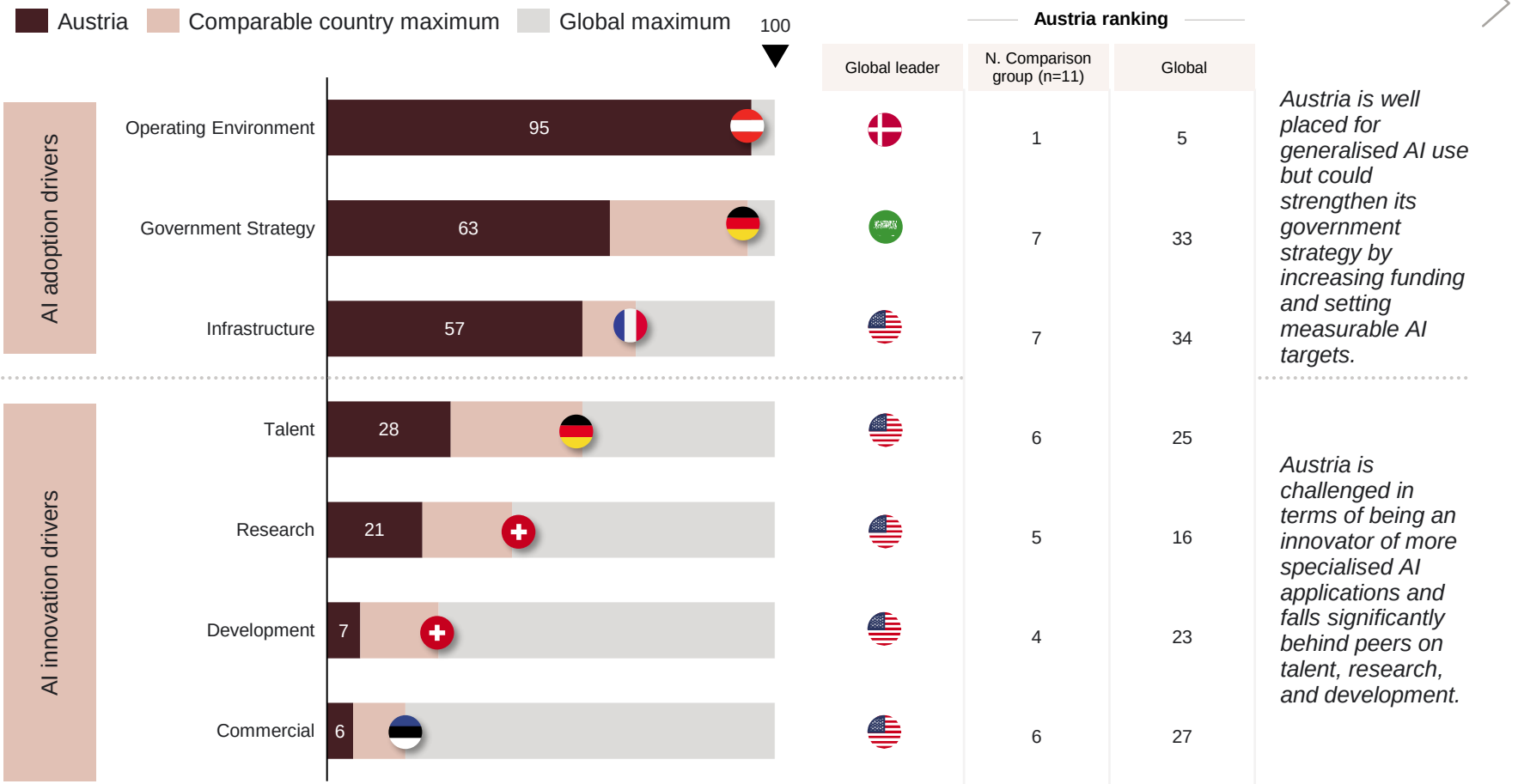
- Polling conducted by Public First shows that 59% of Austrian companies cite security concerns related to AI tools as a barrier to AI adoption. As additional adoption barriers, Austrian companies point to concerns about the quality and legal requirements of AI tools.
- 31% of Austrian companies believe that they need enhanced general digital skills to take full advantage of AI. Companies also highlight a greater need for specialised AI strategy and implementation skills as well as IT infrastructure skills.
- To overcome the cost barriers and skills gaps hindering AI adoption, companies in Austria are seeking supportive measures from the private sector.
- Public First polling shows that these companies want technology companies to offer upskilling programmes to enhance digital and AI-specific skills.

Note: Public First survey for Austria conducted in Q2 2024.
Source: Implement Economics based on Public First country survey.

Drivers of AI adoption suggest that Austria is at risk of losing ground to European and global leaders – efforts are required across the board to catch up

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

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



Austria is well placed for generalised AI use but could strengthen its government strategy by increasing funding and setting measurable AI targets.

Austria is challenged in terms of being an innovator of more specialised AI applications and falls significantly behind peers on talent, research, and development.

- Overall, Austria demonstrates strong performance in early AI adoption drivers that are necessary to drive the uptake of the technology. Austria performs particularly well on the operating environment (e.g. trust, data governance), ranking as a global frontrunner, but could improve its infrastructure and government strategy to catch up to peers.
- According to the IMD World Digital Competitiveness ranking, Austria is in the top 30% of the 64 studied countries in terms of future readiness.
- Additionally, more specialised AI applications and the realisation of full productivity gains will require a cohesive and competitive innovation ecosystem that is conducive to development and commercial Austria.
- Similar to its peers, Austria is behind on AI innovation drivers globally, where the United States claims the lead. Furthermore, Austria is behind its regional peers in talent, research and development, with neighbouring Germany taking the European lead.
- Austria needs to focus on strengthening efforts across both basic adoption drivers as well as innovation drivers and could draw inspiration from regional best practices.

Note: The Global AI Index looks at seven sub-pillars of 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 start-up activity, investments etc.).
Source: Implement Economics based on Tortoise Media.

07

The way forward to capture the benefits of AI

Austria 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 thing 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 due to a lack of competences or failure 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?

Note: For more background AI policies and principles, see: **OECD**, **IMF** and **Google**.

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

The benefits of 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. The EU's AI Act aims to lead on this. 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.

Austria can draw on policy choices of comparable countries

Austria leads on responsible and ethical use …

… and can draw on best practice initiatives from peers

Indicator	Operating environment	Infrastructure	Talent	Research	Development	Commercial
Leaders in comparison group						
Best practice	Austria is committed to shaping a responsible AI future through strategic initiatives and regulations, ensuring alignment with European standards and values. **Example**: Artificial Intelligence Mission Austria 2030 (AIM AT 2030) • This AI strategy focuses on creating a robust AI ecosystem that adheres to ethical and legal standards. • It engages stakeholders from various sectors to foster interdisciplinary collaboration and innovation in AI.	France is advancing its AI capabilities through significant investments in high-performance computing, improved data access and enhanced internet infrastructure. **Example:** Jean Zay supercomputer • With a €3 million computing grant from French research institutes, the Jean Zay supercomputer in Paris offers substantial HPC resources to drive AI research and computational studies. • The Jean Zay has been leveraged to train Hugging Face's open-source BLOOM model; an LLM that is able to generate text in 46 languages.	Germany is advancing its technological prowess by prioritising AI education and training at all levels, from basic digital literacy to cutting-edge research and development. **Example**: AI Campus Initiative • The AI Campus is an online learning platform designed to offer free, high-quality educational content on artificial intelligence to all interested learners in Germany. • This initiative supports the development of both foundational and advanced AI skills, promoting widespread accessibility and engagement with AI technologies across sectors.	Switzerland excels in AI research, evidenced by extensive national programmes and collaborations between prestigious institutions, such as ETH Zurich and EPFL, and global tech leaders. **Example:** Swiss AI Lab IDSIA • Develops cutting-edge algorithms and methodologies in deep learning, significantly advancing robotics and perception systems. • Engages in partnerships with major tech companies and academic institutions worldwide, fostering a global exchange of knowledge and setting benchmarks in AI research.	Switzerland is actively pursuing AI development, focusing on robust research, fostering public-private partnerships and encouraging the commercialisation of AI technologies. **Example**: Swiss AI Initiative • This initiative, led by ETH Zurich and EPFL, leverages the Alps supercomputer to support the creation of transparent and reliable AI technologies. • It facilitates partnerships among academic institutions, industry leaders and governmental bodies to integrate AI applications in fields such as healthcare, finance and public administration.	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, including 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.

Austria can capture the AI potential with a balanced set of choices

Grow R&D by local innovators

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

Dilemma

Ensuring performance of AI technology in an Austrian context

and

Driving application of leading global AI technology

Recommendation

- Austria has a strong foundation in AI initiatives like AIM AT 2030 and support from the Austrian Research Promotion Agency (FFG), but increased investment in talent and infrastructure is needed to reach the level of leading European peers.
- While Austria is already advancing through the Vienna Scientific Cluster (VSC), enhancing public-private partnerships and leveraging supercomputing capabilities can further drive AI innovation. Drawing inspiration from Switzerland's Swiss AI Lab IDSIA and Swiss AI Initiative, Austria can boost industry-specific AI applications tailored to national needs.

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

- While Austria shows higher than average AI adoption rates, SMEs face significant barriers, including regulatory complexities, skill shortages and uncertain implementation costs, which hinder their ability to fully leverage AI technologies.
- Building on AIM AT 2030, Austria could provide targeted sparring and training programmes for SMEs while expanding the AI-Service-Point to offer comprehensive legal advice. Inspiration from Estonia's AIRE initiative shows how funding, training and service provider connections can help SMEs integrate AI efficiently and stay competitive.

Retrain and upskill workforce

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

Dilemma

General AI upskilling across the population

and

Targeted reskilling of groups affected by AI

Recommendation

- Austria faces the dual challenge of needing to broadly upskill the general population to work effectively with AI technologies while also fostering targeted specialisation in STEM fields to develop advanced AI capabilities.
- Austria already shows strong government support through initiatives like the Digital Skills Initiative Austria. Austria could expand these programmes to provide widespread AI literacy in the general workforce while enhancing specialised AI programmes, such as the Master's Program in AI at JKU Linz to develop high-level expertise.

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

08

Annex

Modelling the impacts of generative AI in Austria.

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Modelling the economic opportunity for Austria

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 (2023a).
Source: Implement Economics based on the European Commission, Eurostat, O*Net and Briggs and Kodnani (2023a&b).

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Disclaimer

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The purpose of this Report is to assess the economic opportunity of generative AI in Austria.

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