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CONSULTING GROUP

The AI innovation opportunity

How Finland can scale innovative digital businesses with AI to close the innovation and competitiveness gap

An Implement Consulting Group study commissioned by Google

November 2024

The upcoming AI era calls for new ways of thinking about innovative businesses

This report examines a unique but highly important group of companies that we refer to as *innovative digital businesses*. Many of these companies have traditionally been described as “startups” or “tech businesses,” but we believe it is time to broaden these concepts and reframe how we talk and think about them.

More than startups

There is more to the story than just startups. Startups are important — they are where it all begins. However, for both investors and the broader economy, it is essential that a sufficiently large number of these ventures succeed and grow into larger, profitable, and highly productive companies, as their success enhances competitiveness and spreads new technologies throughout society.

More than tech

Similarly, there is more to the story than just tech businesses. The innovation potential of the emerging AI era extends beyond technology companies or industries like IT and telecom. AI has the potential to create innovative businesses across all sectors of the economy and boost their productivity.

Innovative digital businesses are key to capturing the AI opportunity and closing Europe’s innovation and competitiveness gap

The creation of new innovative companies and the ability to scale them is crucial for closing Europe’s innovation and competitiveness gap, as highlighted in the Draghi report.

We are now on the brink of a new era of AI-driven economic growth, which has the potential to elevate Europe’s long-term growth beyond its historical trend. AI holds such transformative power that it could reverse the declining productivity trend in most EU countries.

Innovative digital businesses are key to capturing the AI potential because they:

- Develop new AI tools and applications
- Enable businesses across all sectors to adapt and benefit from AI.
- Demonstrate AI's value by being early adopters and innovators
- Inspire other businesses to use AI technology smartly
- Create healthy competitive pressure on slower adopters.

WHAT ARE INNOVATIVE DIGITAL BUSINESSES?

Innovative digital businesses are defined as businesses with scalable business models that are less than 30 years old. Most of these businesses either have digital technology at their core or are heavily enabled by it. To identify these businesses, we use Dealroom data. The analysis focuses on companies headquartered in Finland which are further classified as startups (2–50 employees), scaleups (51–500 employees), and grownups (over 500 employees).

SUMMARY

AI can super-charge Finland's ecosystem of innovative digital businesses, boosting productivity and competitiveness

Finland's innovative digital businesses are already contributing to the economy

Finland is home to around 1,600 innovative digital businesses. They employ 30,000 people accounting for 2% of private sector employment and around 4% of private sector job creation since 2017. Innovative digital businesses create high-value jobs paying 38% higher wages than Finnish firms on average. Finland has a high level of entrepreneurial activity, with 47 innovative digital businesses per 100,000 working-age adults compared to the EU average of 19.

But Finland has a shortage of high-productivity firms

Finland has seen a sluggish productivity development since 2008 and part of the reason is a shortage of highly productive firms. This report points to a particular scaling challenge for Finland's innovative digital businesses, as Finland has relatively fewer of these firms reaching the grownup scale (>500 employees).

As a result, the average labour productivity of the 1,600 innovative digital businesses is lower than the average of all Finnish firms. However, when innovative digital businesses successfully scale, they make an outsized contribution to the economy. Workers in grownup innovative digital businesses are 70% more productive than workers in Finnish firms on average.

AI opens new opportunities

As pointed out in the Draghi report, Europe largely missed out on the digital revolution led by the internet. Now, with AI emerging, we are on the verge of a new tech-driven productivity boom. This opens new possibilities to innovate and build more effective businesses:

- AI can boost Finland's ecosystem of innovative digital businesses by enhancing the productivity of research and development.
- Innovative digital businesses develop and adopt AI tools, showcasing their value and facilitating their use across the economy.

> *Finland needs bold and open-minded ideas on how to boost its lagging economic growth. In the long term, growth is the only way to secure the wellbeing of Finland and the Finnish people.*
>
> **The Finnish Government**

If Finland successfully retains and scales innovative digital businesses to be on a par with leading OECD countries, this could:

- **Create 13,000 more high-value jobs,** supporting the future competitiveness of the Finnish workforce.
- **Contribute up to EUR 1.2 billion annually** to the economy.
- **Enhance the diffusion of AI innovations to the rest of the economy.** Startups have a roughly 50% higher chance of radical innovations than incumbent firms and they drive around 26% of productivity growth in the economy.

Better framework conditions are needed for innovative digital businesses to be fit for the AI-powered future:

People. Growing, attracting and retaining the people with business and AI-relevant talent and ideas.

Technology. Providing access to state-of-the-art AI tools, digital infrastructure, and compute power.

R&D. Accelerating R&D with AI.

Rules. Providing regulatory clarity and reasonable compliance costs.

Capital. Unlocking Europe's fragmented risk capital markets and increasing attractiveness for venture capital investment in the EU.

01

The economic role of innovative digital businesses

Innovative digital businesses play an outsized role in the Finnish economy when they scale.

Innovative digital businesses are scalable and tech-enabled

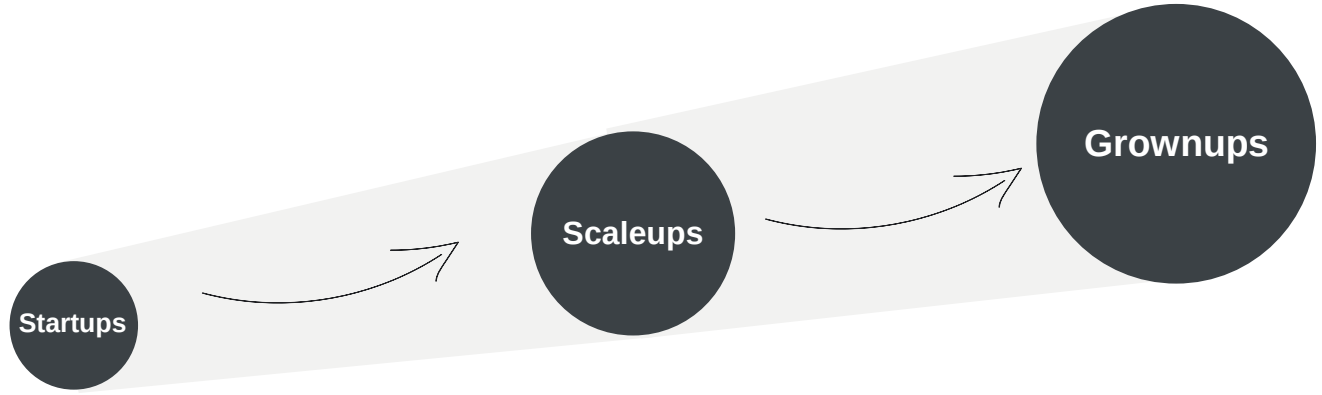
This research defines innovative digital businesses as companies headquartered in Finland with a scalable business model, less than 30 years old, and whose product and/or business model are inherently innovative.

In most cases, these companies are tech-enabled, either utilising proprietary technology or software, or having business processes that are heavily enabled by technology.

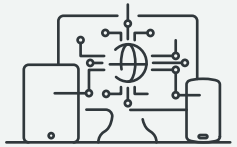
This study categorises innovative digital businesses by employment size into three main stages: startups, scaleups, and grownups.

> Europe cannot afford to remain stuck in the “middle technologies and industries” of the previous century. We must unlock our innovative potential. This will be key not only to lead in new technologies, but also to integrate AI into our existing industries so that they can stay at the front.
>
> **Mario Draghi** in The Future of European Competitiveness

Innovative digital businesses



Startups	Scaleups	Grownups
Innovative digital businesses designed to grow fast, employing between 2-50 people.	Innovative digital businesses with scaled operation, employing between 50-500 people.	Established and stable innovative digital businesses that have successfully scaled, employing more than 500 people.



Digital infrastructure provides the foundational technology and platforms necessary for innovative digital businesses to operate, innovate and scale efficiently. It includes:

- Data centres
- Cloud storage
- Computing capacity and graphics processing units (GPUs)
- AI/ML technologies and tools

Note: The definition of innovative digital businesses is based on Dealroom.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Draghi (2024).

Europe and Finland are not capturing enough venture capital investments in generative AI

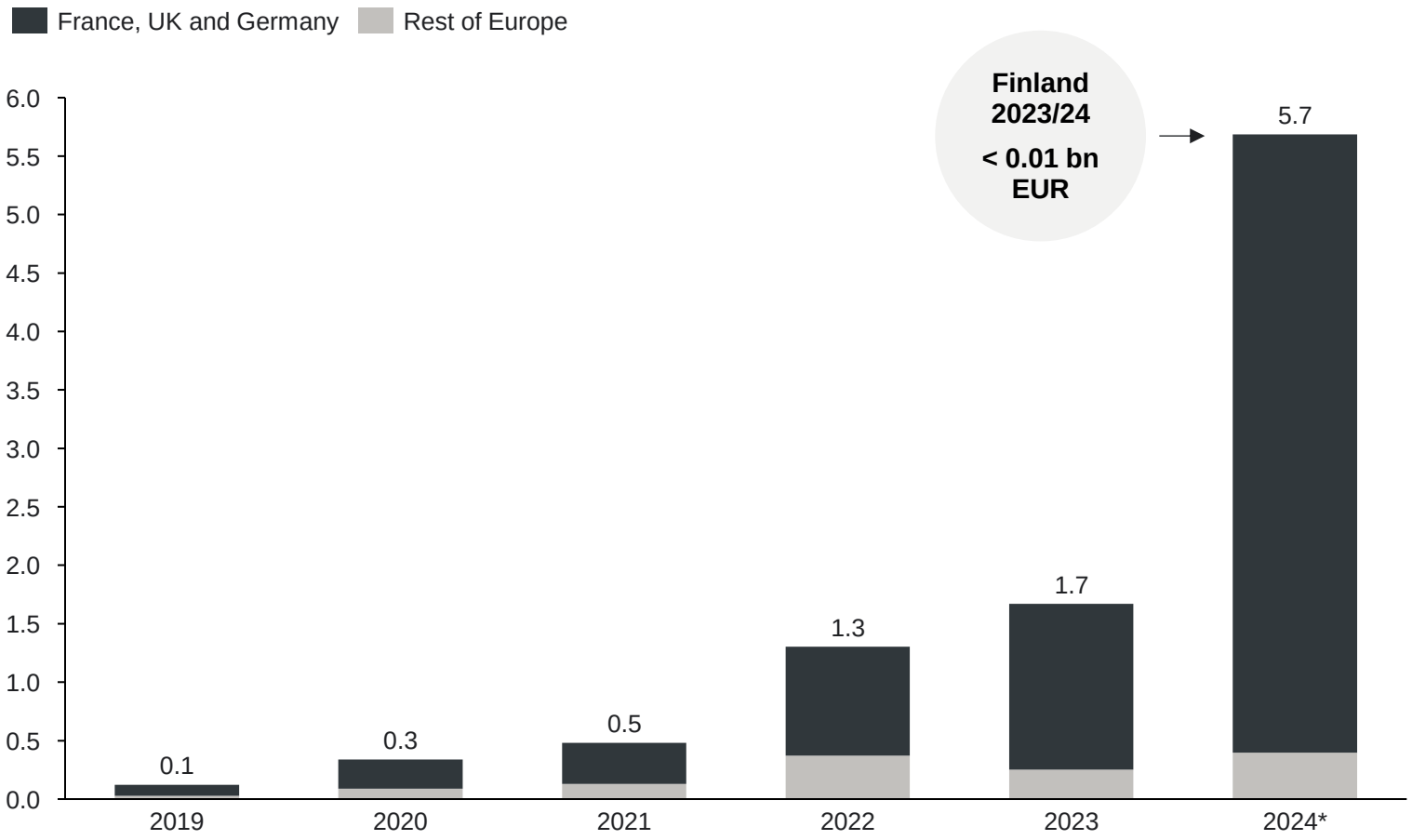
Generative AI investment is projected to reach around EUR 52 billion globally in 2024, but only EUR 5.7 billion (11%) is directed to Europe, while none is recorded in Finland.

Most European venture capital (VC) funding is concentrated in a few nations: France, the UK, and Germany.

Europe risks falling behind in generative AI; increased funding is crucial to fully seize the opportunities AI presents.

11% of global generative AI VC funding is projected to flow to Europe in 2024

Europe generative AI VC investment
EUR billion



Note: *2024 numbers are projections by Dealroom.
Source: Implement Economics based on Dealroom.

Finland is home to around 1,600 innovative digital businesses, employing 30,000 people

Innovative digital businesses employ 30,000 people in Finland, accounting for 2% of private employment. Additionally, they employ another 20,000 people outside Finland.

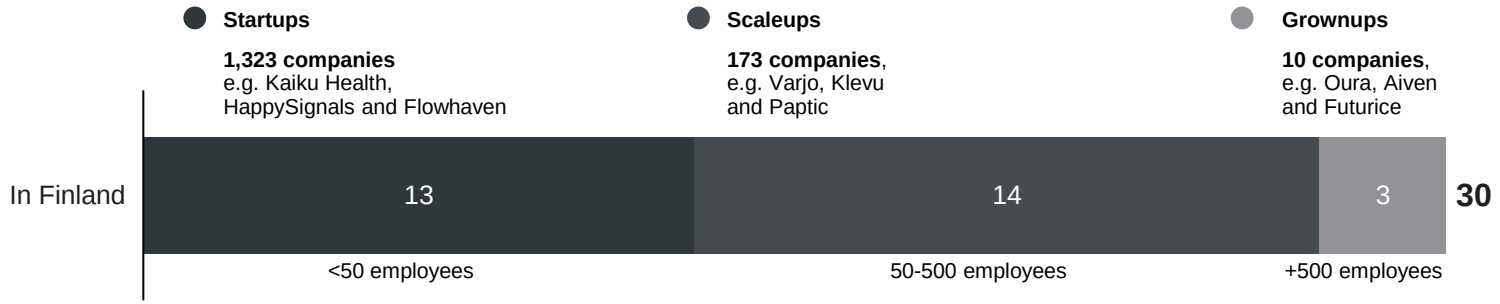
- *Startups* employ 13,000 people in Finland and 4,000 people abroad.
- *Scaleups* employ 14,000 people in Finland and a further 7,000 people abroad.
- *Grownups* employ 3,000 people in Finland and have created 9,000 jobs abroad.

The employment by innovative digital businesses in Finland and abroad highlights their international reach and the facilitation of cross-border knowledge and expertise exchange.

40% of jobs in innovative digital businesses headquartered in Finland are abroad

Employment in Finnish innovative digital businesses
Thousand employees

30,000 people are employed in innovative digital businesses in Finland



20,000 people are employed *outside* Finland by Finnish-headquartered innovative digital businesses

Note: The number of innovative digital businesses and their employment figures are based on companies with “verified” employment data from Dealroom. A number of innovative digital businesses are likely not captured in this data, making this a conservative estimate of their count and employment..
Source: Implement Economics based on Windsor (2024) using Dealroom data.

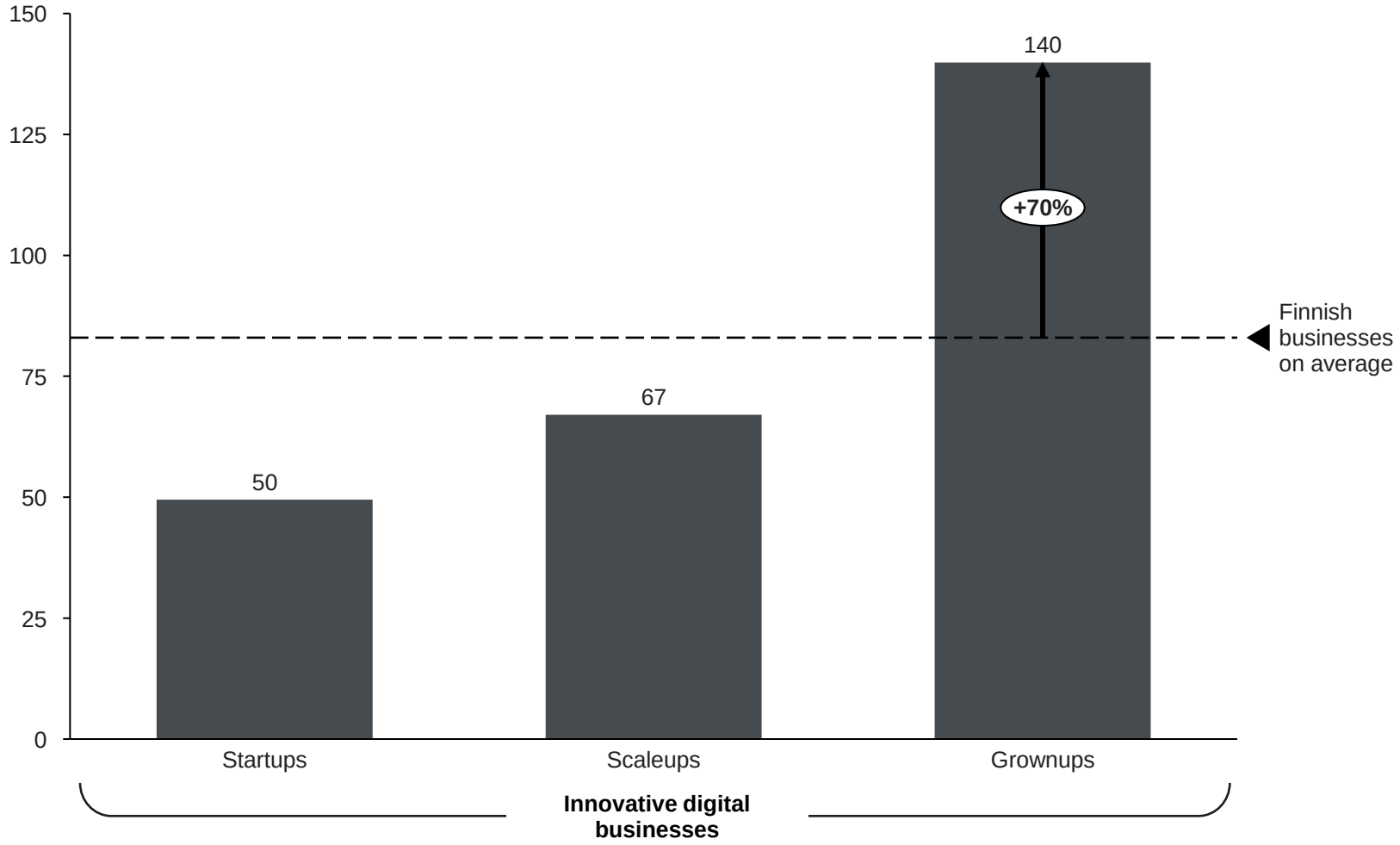
Innovative digital businesses make an outsized contribution when they scale

Employees in grownups are 70% more productive than in Finnish businesses on average.

Startups and scaleups are less productive than businesses in Finland on average, which can be caused by several factors including rapid headcount growth, steep learning curve on operating model, resource constraints or market development.

Thus, while all innovative digital businesses begin as startups, the outsized contribution depends critically on enough of them succeeding in becoming grownups.

Average labour productivity by business size
EUR (thousand) per employee



Notes: Calculations based on matching of companies in Dealroom with companies in Orbis that have available financial data.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Bureau van Dijk's Orbis database.

Finnish entrepreneurial activity is high but scaling success is limited compared to peers

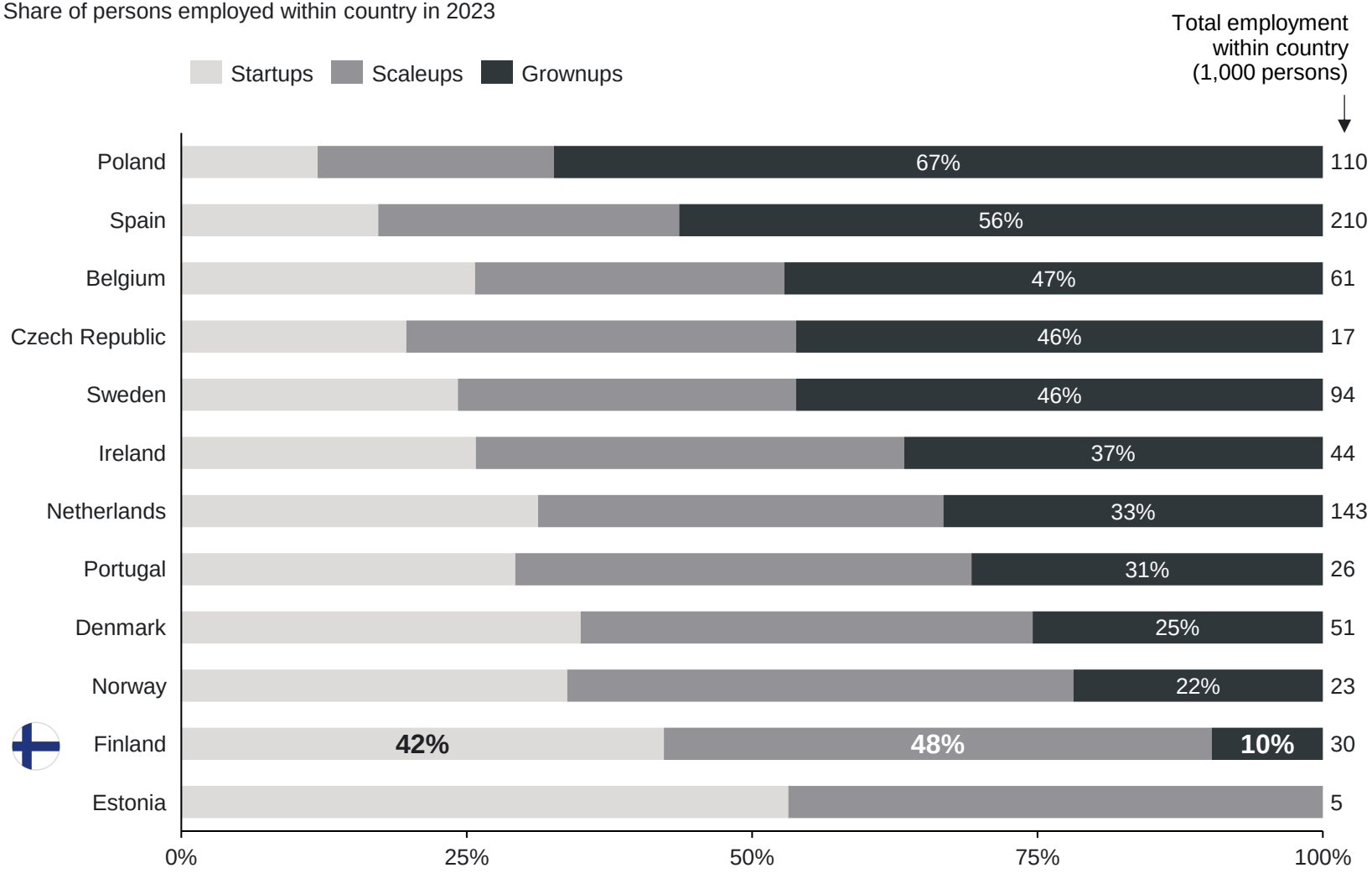
The Economic Policy Council finds that in Finland, less productive firms have a higher market share compared to similar economies, hinting that resources are allocated inefficiently.

The Ministry of Finance supports this, stating that Finland generally has poor resource allocation and few high-productivity firms.

Our analysis supports these findings. In Finland, startups and scaleups, which employ 90% of people working in innovative digital businesses, have a labour productivity lower than average. On the other hand, grownups, which have a higher-than-average labour productivity, only employ 10% compared to 25% in Denmark and 46% in Sweden.

> Any action is justified that supports the emergence, adoption and spread of new ideas and contributes to the transition of productive resources from declining to growing industries.
>
> **Economic Policy Council**

Employment in innovative digital businesses in D9+ countries
Share of persons employed within country in 2023



Note: D9+ countries refers to the group of European digital frontrunners. *Allocative inefficiency* is studied by the OECD using the covariance between the share of value added and firm productivity (commonly known as the Olley-Pakes covariance). In private services, this covariance provides a lower contribution to TFP in Finland relative to benchmark countries.
Source: Implement Economics based on Windsor (2024) using Dealroom data, Economic Policy Council (2022) and the Ministry of Finance.

Innovative digital businesses create high paying jobs but have low labour productivity

On average, innovative digital businesses pay higher wages than other Finnish businesses.

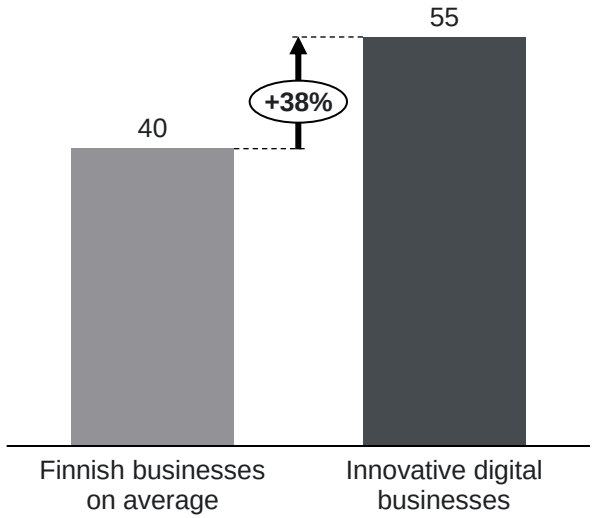
However, the challenges Finland faces in growing startups and scaleups into high productive grownups has the consequence that the overall labour productivity for innovative digital businesses is lower than average.

This is contrary our findings in other Northern European countries like Denmark, Sweden and Belgium where innovative digital businesses have a higher labour productivity than average.

Finnish innovative digital businesses …

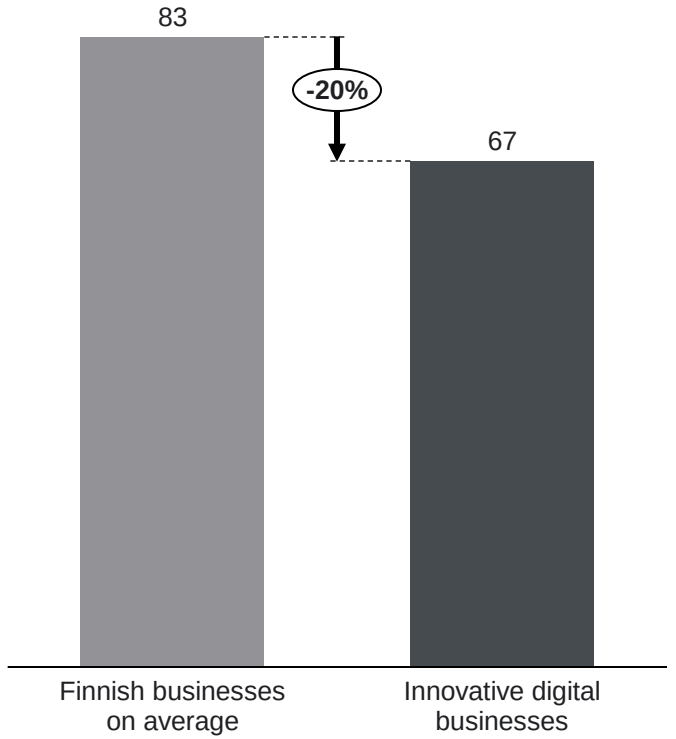
… pay higher wages

Median wages
EUR (thousand) per employee



… but are less productive

Average labour productivity
EUR (thousand) per employee



Note: Calculations based on companies in Dealroom and Orbis with available financial data. Value added at the company level is approximated as the sum of EBITDA and remuneration to employees. The average number of employees is based on Orbis, and results may therefore deviate from figures recorded in Dealroom.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Bureau van Dijk's Orbis database.

Innovative digital businesses have created 4% of all new private sector jobs in Finland

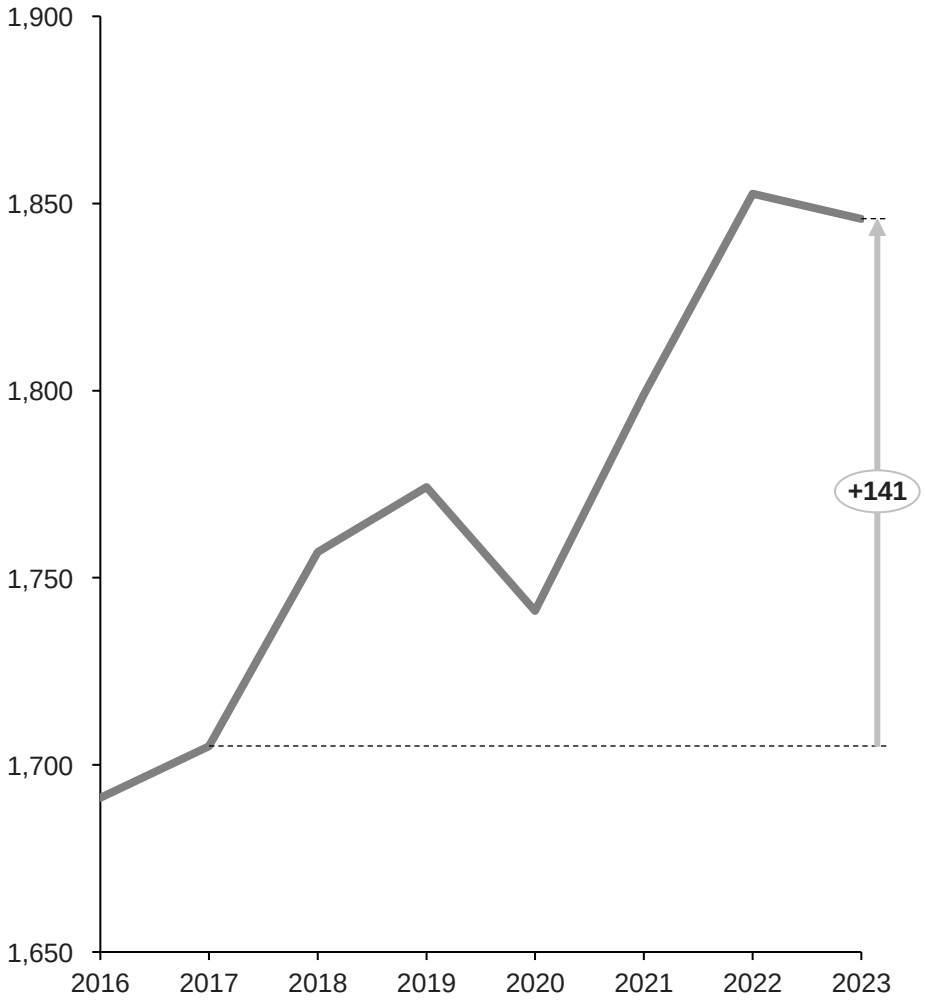
Private sector employment in Finland has grown by 141,000 jobs since 2017.

Innovative digital businesses were responsible for around 5,000 of these new jobs, corresponding to 4% of all new private sector jobs in Finland.

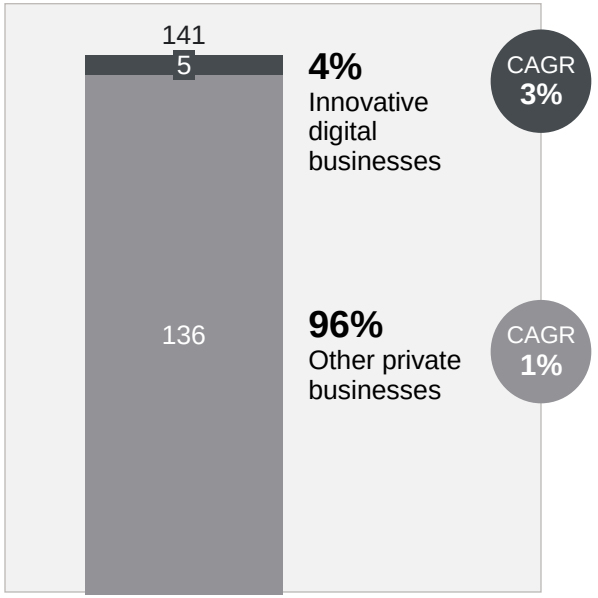
The pace of job growth in innovative digital businesses is higher than for other private businesses in this period, growing at 3% per year on average. By contrast, job growth in other private businesses was only 1% per year.

Innovative digital businesses in Finland create fewer jobs compared to similar countries. In Denmark, these businesses account for 11% of new jobs, and in Sweden, they account for 13%.

Finnish private sector employment
1,000 persons



Net job creation in the private sector from 2017 to 2023
1,000 persons



Note: Calculations based on Orbis data for companies with available employment data.
Source: Implement Economics based on Windsor (2024) using Dealroom data, Bureau van Dijk's Orbis database and Eurostat.

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Innovative digital businesses use AI to innovate and grow

Innovative digital businesses are major drivers of radical innovation and play a crucial role in the early adoption and diffusion of new technologies.

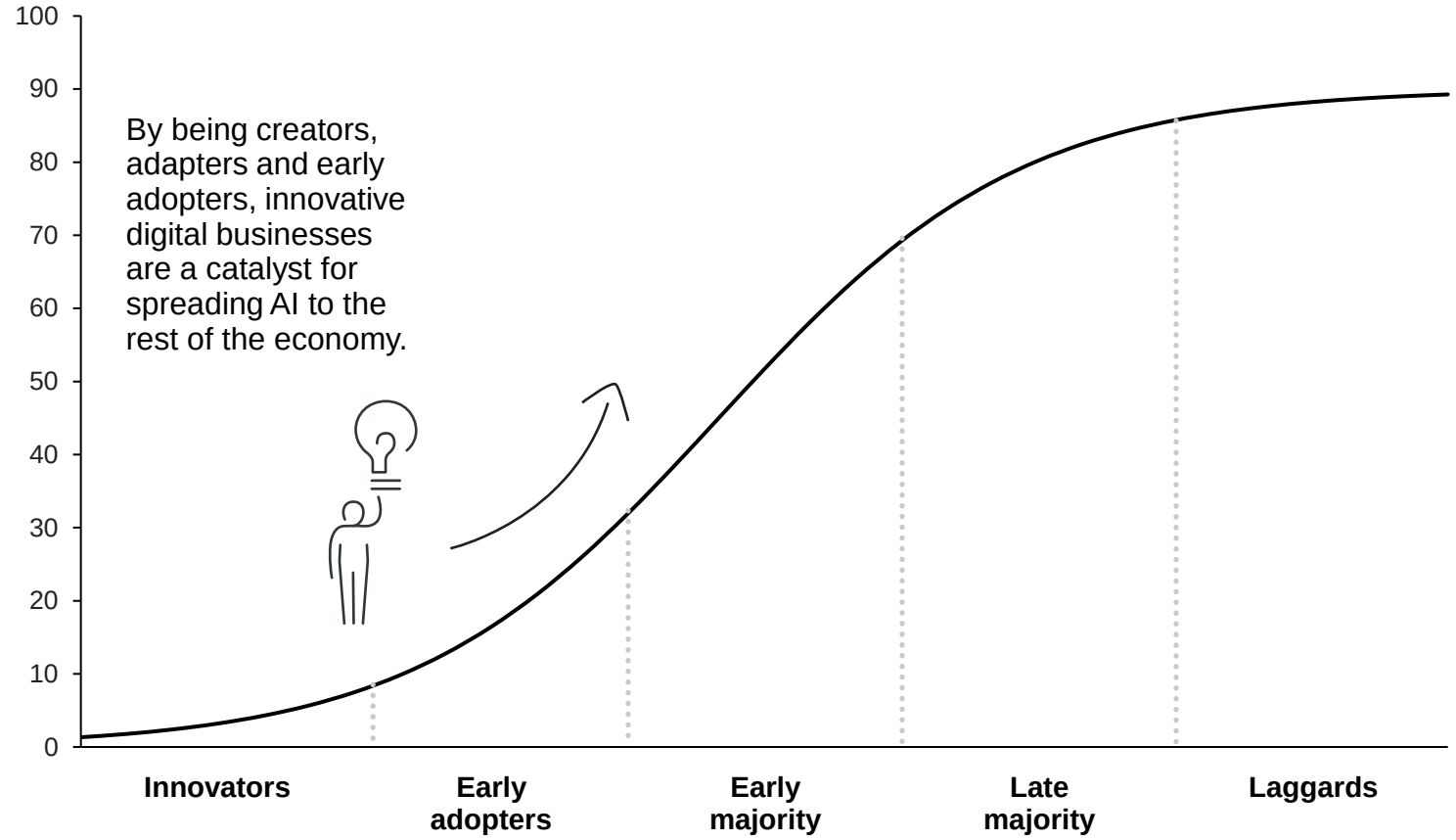
Innovative digital businesses propel AI adoption across the economy

The coming AI era holds major potential economic benefits for Finland.

Innovative digital businesses find new ways of using AI tools and create new ones. This enables other businesses across sectors to benefit from the new technology. For example, in Finland, Silo.AI helped Finnair improve situational awareness of air traffic using AI.

Innovative digital businesses are also early adopters of AI, demonstrating its value and making it easier for other businesses to start using it.

Diffusion of AI technologies in Europe
%



Note: The figure shows generative AI adoption expressed as a share of economy-wide firms exposed to AI automation.
Source: Implement Economics based on Bruegel (2021).

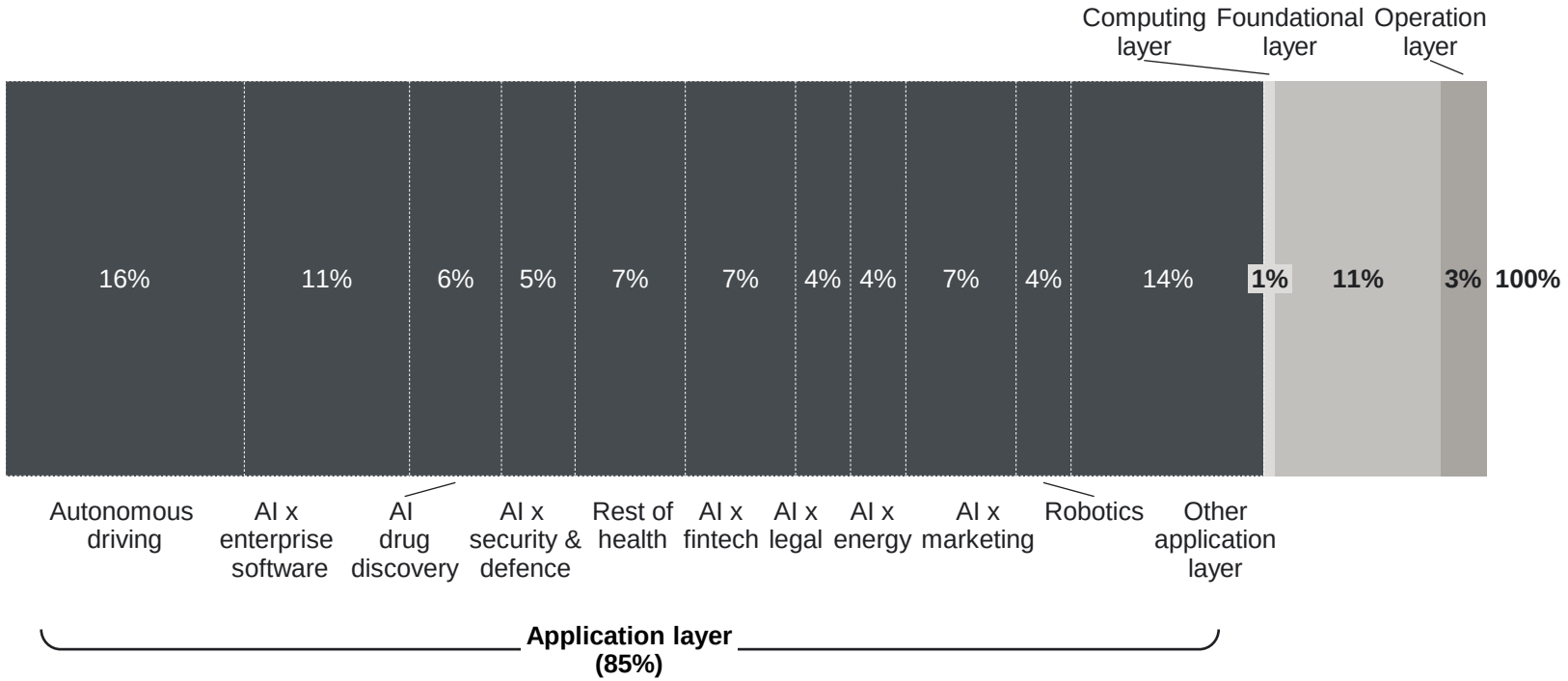
Innovative digital businesses can use AI to transform sectors across the economy

85% percent of European AI venture capital funding is directed toward the application layer of AI, focusing on real-world uses and integration into diverse sectors of the economy.

This investment trend reflects AI's transformative potential beyond traditional tech, reaching areas such as transportation, security, and healthcare.

By prioritising practical applications, these investments aim to drive meaningful changes that enhance productivity, safety, and quality of life across multiple industries, underscoring AI's role in reshaping the broader economic landscape.

AI VC funding in Europe by segment (2023/24)
Share of VC funding



Notes: Dealroom data as of 12th June 2024
Sources: Implement Economics based on Dealroom.

4 out of 5 European innovative digital businesses use generative AI

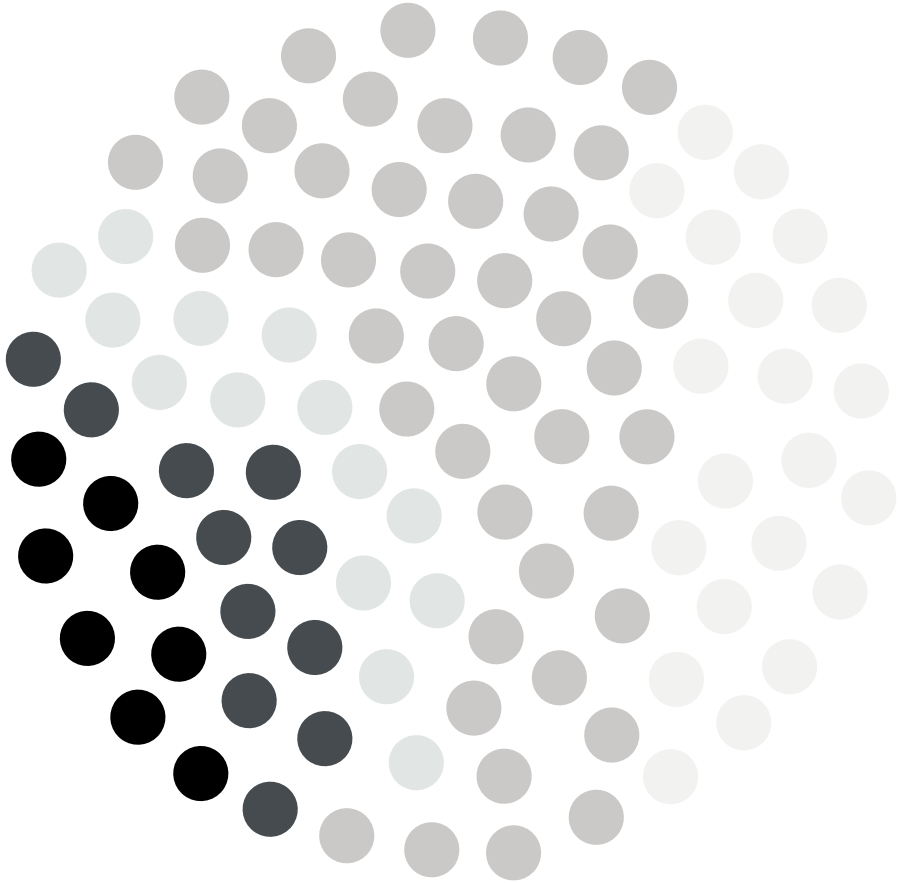
Realising the productivity potential of AI hinges on Finnish and European businesses' ability to adopt and develop AI and other technologies. Recent survey results from Notion Capital indicate that innovative digital businesses are early adopters and adapters of generative AI.

Use of generative AI in European innovative digital businesses
% of respondents

Notion Capital poll

79% of European innovative digital businesses use generative AI. (82% in Finland). This covers…

- ... **46%** who have **experimented** with or **partially adopted** generative AI (49% in Finland).
- … **14%** who have **fully adopted** generative AI. (5% in Finland)
- … **11%** who have **adopted and actively adapted** generative AI technology to suit business needs. (13% in Finland)
- … and **8%** who have **generated** new AI technologies to serve business needs. (15% in Finland)



21% who do not use generative AI. (18% in Finland)

Note: Sample size of n=1095 in Europe and n=61 in Finland for Notion Capital survey.
Source: Implement Economics based on Notion Capital survey (2024).

Innovative digital businesses work to solve societal challenges

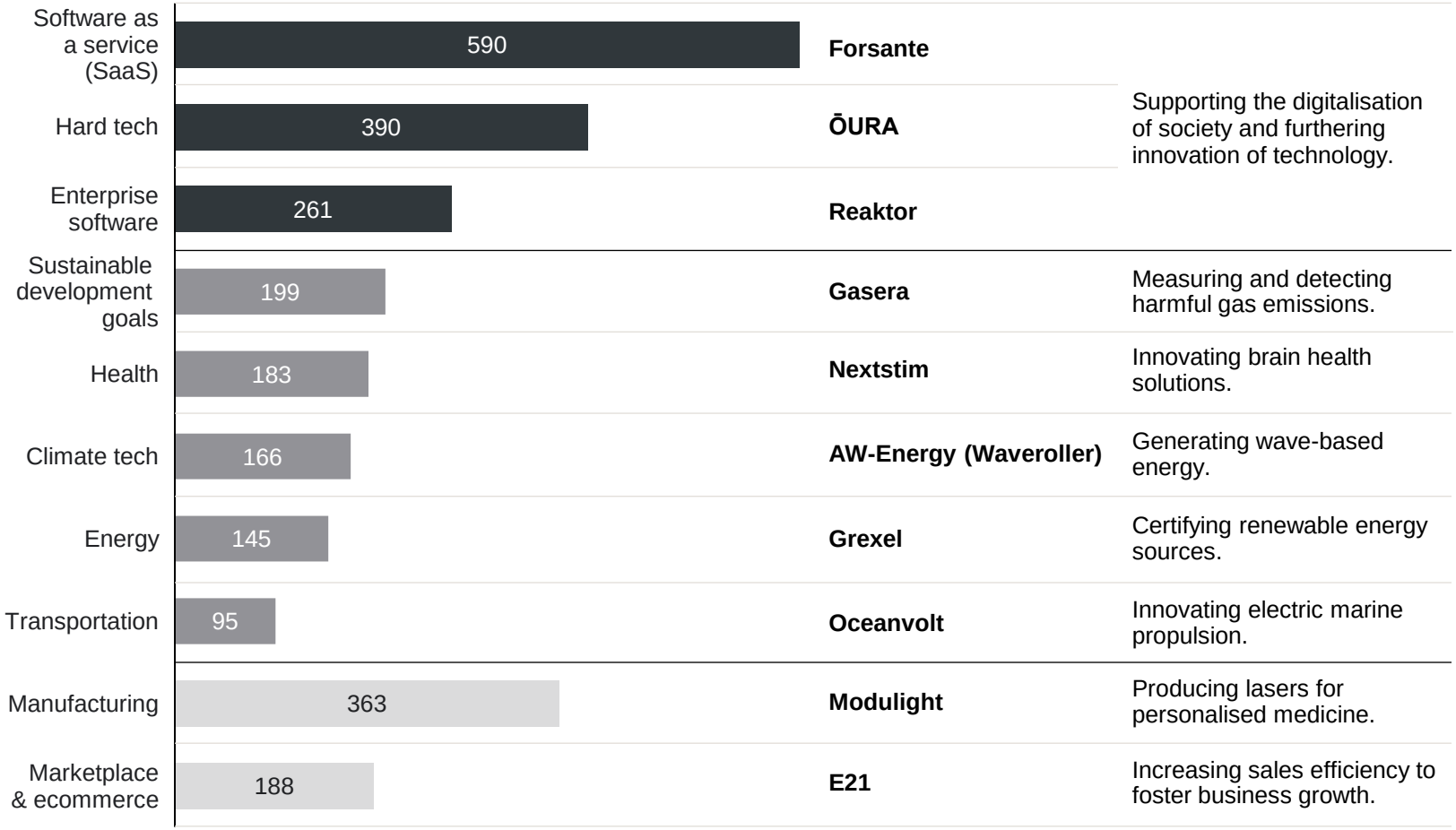
Innovative digital businesses have an innovative product or business model and are often tech-enabled with proprietary technology, software, or tech-driven business processes.

In Finland, 590 of them work within software as a service (SaaS), 390 work in hard tech, 363 in manufacturing and 261 in enterprise software.

Many of them work to address societal challenges, including 199 in sustainable development goals, 183 in health and 166 in climate tech.

> Integrating AI 'vertically' into European industry will be a critical factor in unlocking higher productivity.
>
> **Mario Draghi** in The Future of European Competitiveness

Focus areas of Finnish innovative digital businesses
Number of innovative digital businesses operating in the focus area
Note that each business can be active in multiple areas



Note: Categories are not mutually exclusive, ie. businesses may be working within multiple business areas. Calculations are based on self-reported tags of companies' business areas.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Draghi (2024).

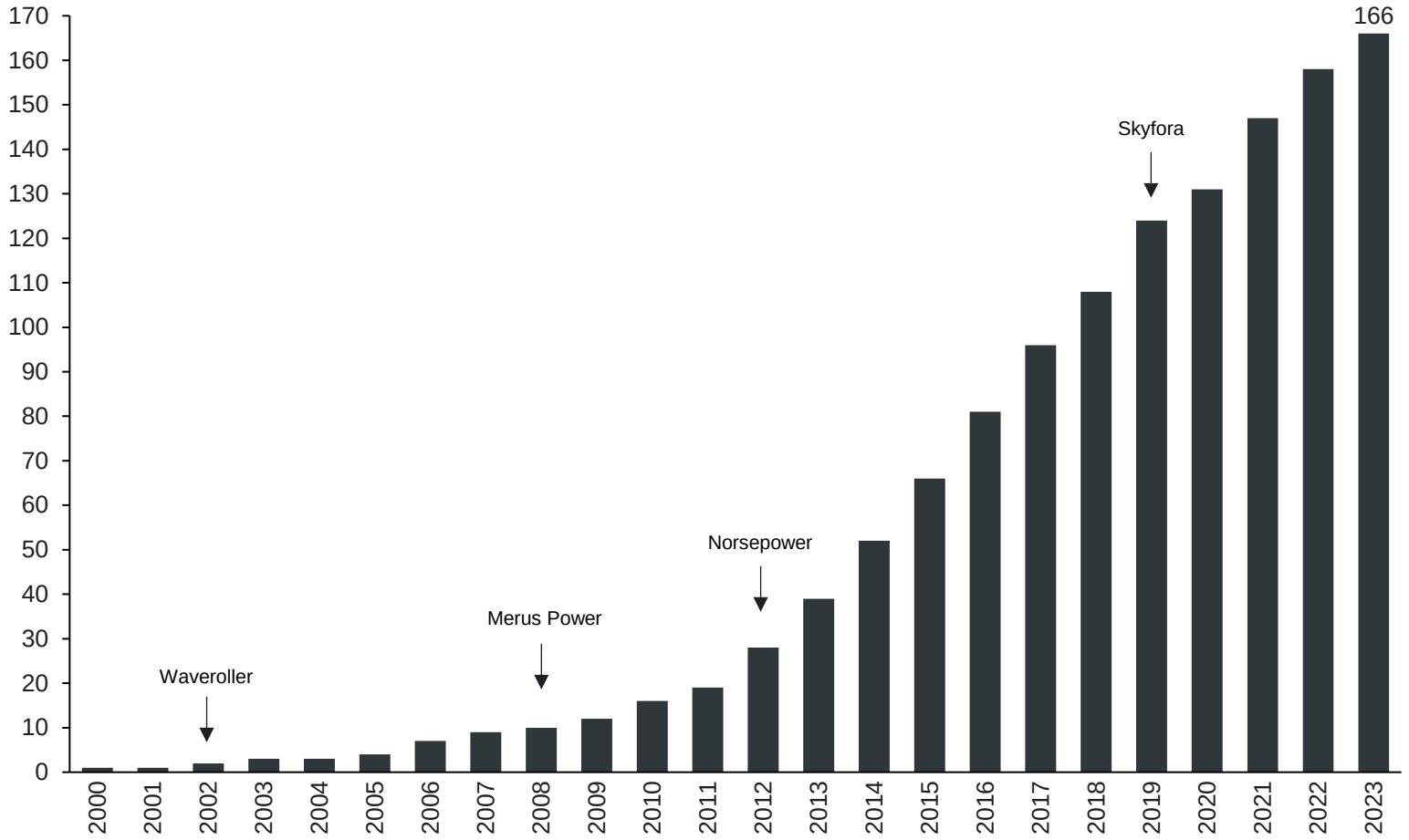
Innovative digital businesses in Finland are tackling climate issues

Innovative digital businesses play an important role in advancing sustainable solutions to climate challenges.

In Finland, the number of digital businesses focusing on climate tech has seen steady growth over the past two decades, particularly accelerating since 2015.

This upward trend highlights a strong commitment from the Finnish tech ecosystem to leverage innovation for addressing climate issues, reaching a record high of 166 businesses in 2023.

Finish innovative digital businesses working with climate tech
Number of innovative digital businesses



Note: Calculations are based on self-reported tags of companies' business areas.
Source: Implement Economics based on Windsor (2024) using Dealroom data.

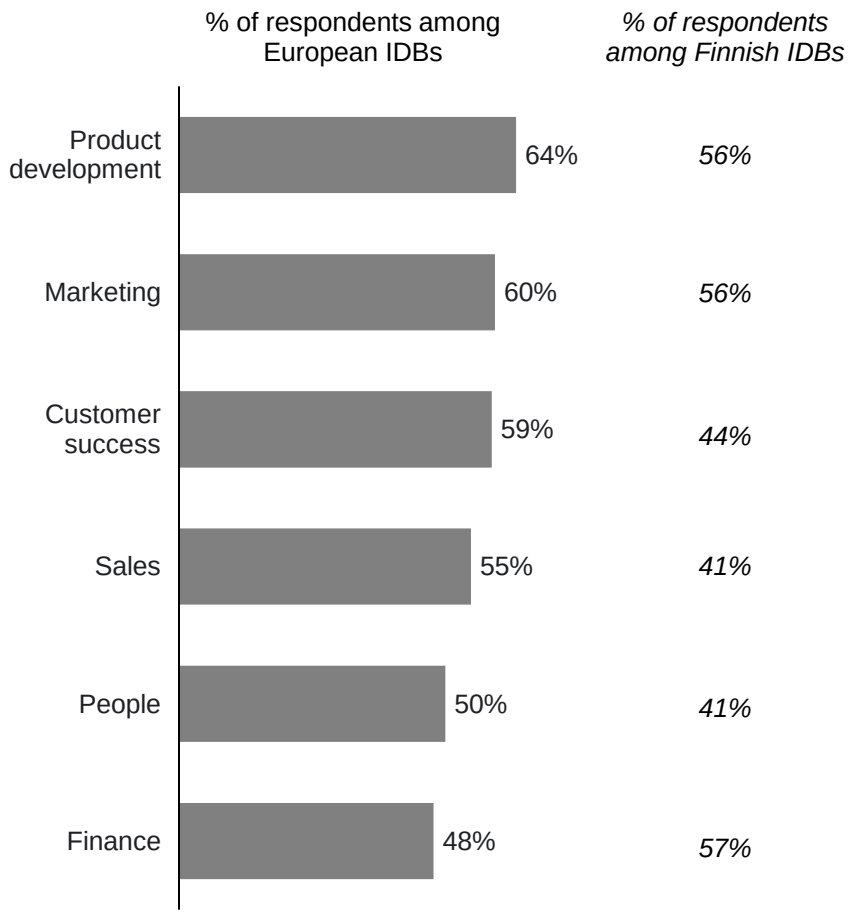
AI boosts value creation and efficiency in innovative digital businesses

Surveyed innovative digital businesses in Europe and Finland use AI to create value across several key business functions. For example, 64% of European respondents state that AI has positively influenced their product development, while 60% state it has improved their marketing.

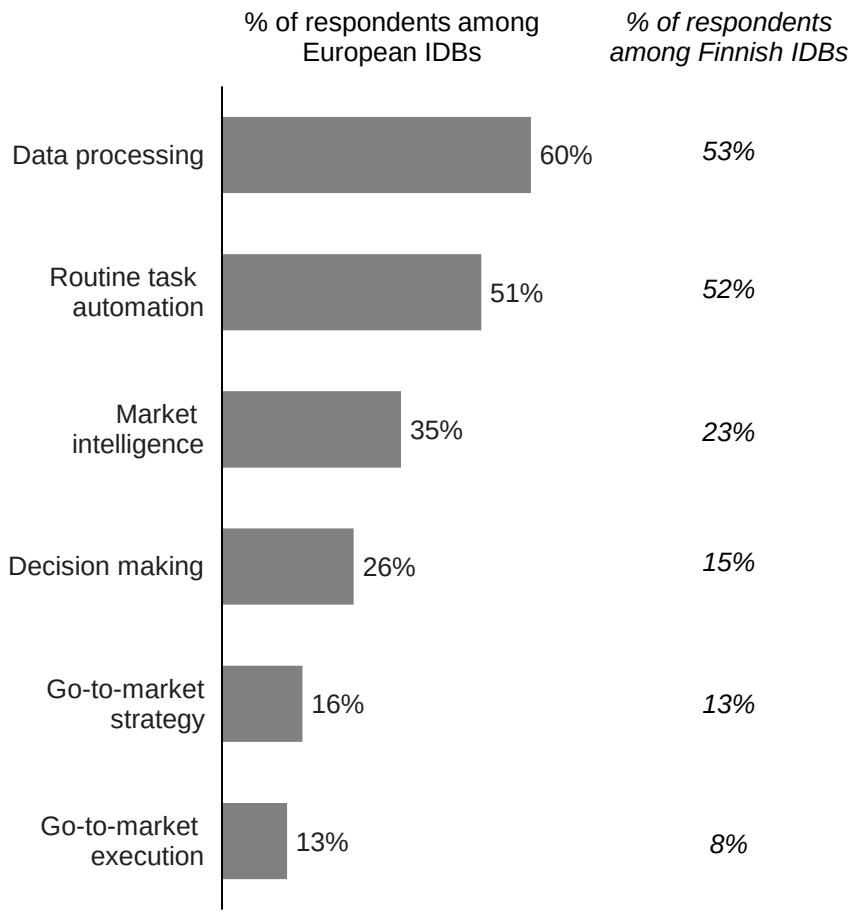
In addition, surveyed innovative digital businesses report that AI has improved efficiency across multiple areas, helping to optimise and streamline operations. For example, 60% of European respondents report improved data processing and 51% point to improvements in routine task automation.

Responses from Finnish innovative digital businesses are similar to average response rates across Europe. To ensure a large sample size, European polling results are reported.

How has AI influenced the following value creation activities in your company?
% of respondents answering *slight positive impact* or *significant positive impact*



In which areas, if any, has AI improved efficiency in your company?
% of respondents



Note: Sample size of n=1095 in Europe and n=61 in Finland for Notion Capital survey.
Source: Implement Economics based on Notion Capital survey (2024).

Innovative digital businesses benefit from global access to AI technology

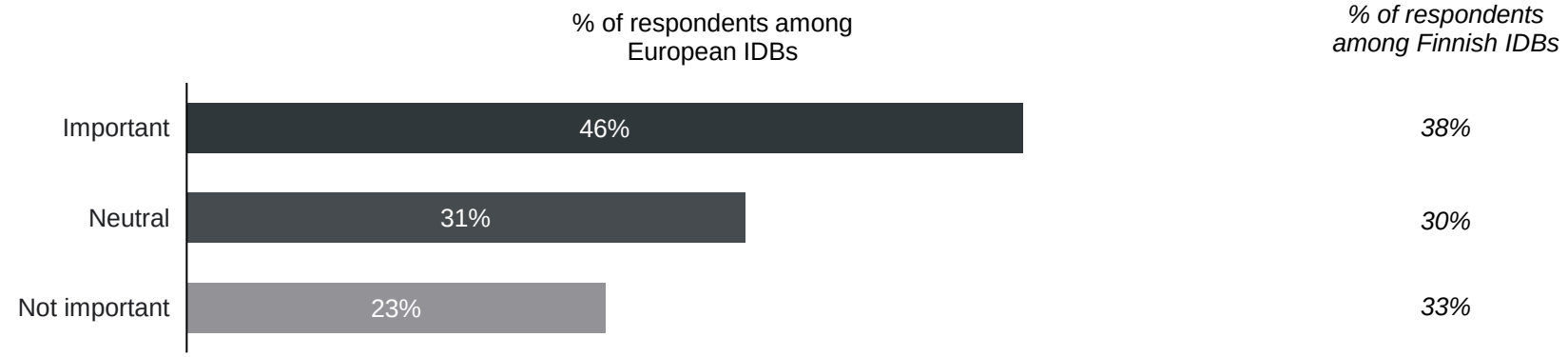
Generative AI is a general-purpose technology with broad application across industries and countries. While the majority of foundational AI models (73%) are developed in the US, according to the Draghi report, companies worldwide can benefit from them.

European innovative digital businesses state that they benefit from AI models developed outside Europe, with 46% saying that access to cutting-edge AI technologies from non-European companies is important for their business. Most respondents (58%) source these technologies from North America.

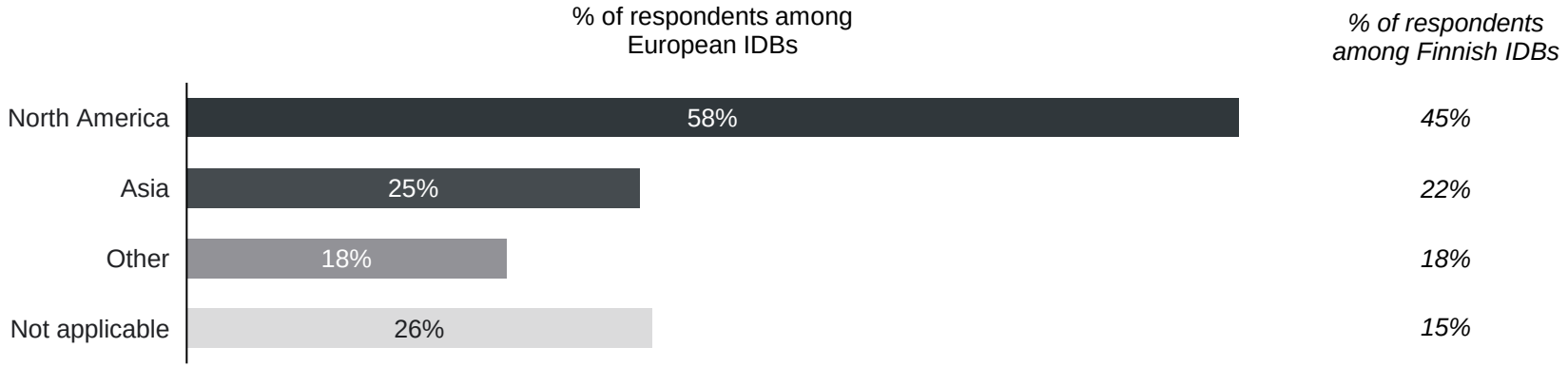
Access to these pre-trained models allows innovative digital businesses to develop AI applications efficiently without the risk and cost of training models from scratch.

Responses from Finnish innovative digital businesses are similar to average response rates across Europe. To ensure a large sample size, European polling results are reported.

To what extent is access to cutting edge AI technologies built by companies outside of Europe important to your business?
% of respondents



If important to your business, from which continent(s) are you sourcing cutting edge AI technologies?
% of respondents among innovative digital businesses



Note: Sample size of n=1095 in Europe and n=61 in Finland for Notion Capital survey. A foundational AI model is a large, pre-trained model designed to perform a wide range of tasks, serving as a versatile base that can be fine-tuned or adapted for specific applications in various domains.
Source: Implement Economics based on Notion Capital survey (2024) and Draghi (2024).

Innovative digital businesses are key to innovation and diffusion of new technologies to the rest of the economy

Academic studies show that …

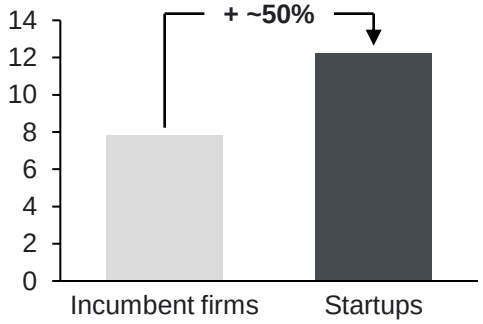
… startups create more radical and disruptive innovations …

~50% higher chance of radical innovations than incumbent firms.

Startups, and hence innovative digital businesses, are more likely to introduce transformative innovations compared to incumbent firms.

These "outlier inventions", defined as innovations within the top 5% of the citation distribution, can be transformative due to their profound impact on business processes and industries.

Likelihood of radical innovations
% outlier inventions



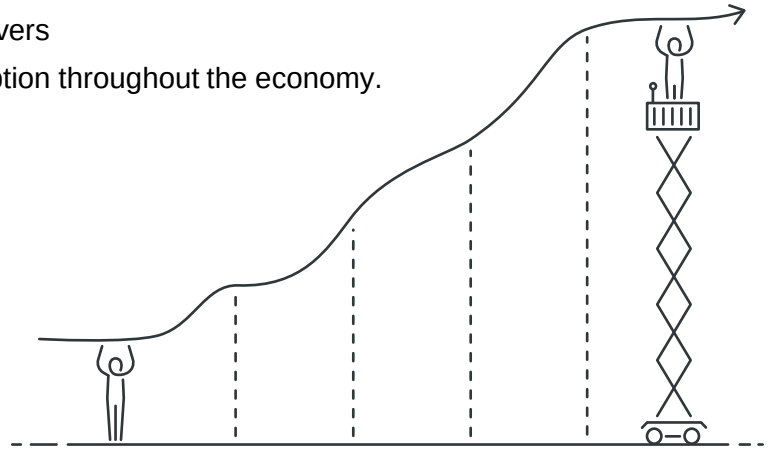
> Startups generate innovations that are more radical and disruptive than those of incumbent firms.
>
> **Kolev et al. (2022)**

… and these innovations have positive spillover effects on the rest of the economy

26% of productivity growth in the economy is estimated to be driven by new businesses.

The entry of new businesses drives positive change by bringing new ideas to the market and creating competitive pressures that:

- Incentivise incumbents to innovate
- Create knowledge spillovers
- Push technological adoption throughout the economy.



Note: Note that these metrics are based on various academic studies with different definitions of market entrants, startups and high growth businesses. While these definitions differ slightly from ours, they are closely correlated, making the results both indicative of broader trends and applicable to our definition of innovative digital businesses. Based on US business-level data, Akcigit & Kerr (2016) estimate that 25.7% of aggregate growth due to innovation is driven by new entrants defined as businesses entering the census data during the sample period.
Source: Implement Economics based on Kolev et al. (2022) and Akcigit & Kerr (2018).

03

The potential of scaling innovative digital businesses

Successful scaling of innovative digital businesses hold major economic potential for the Finnish economy.

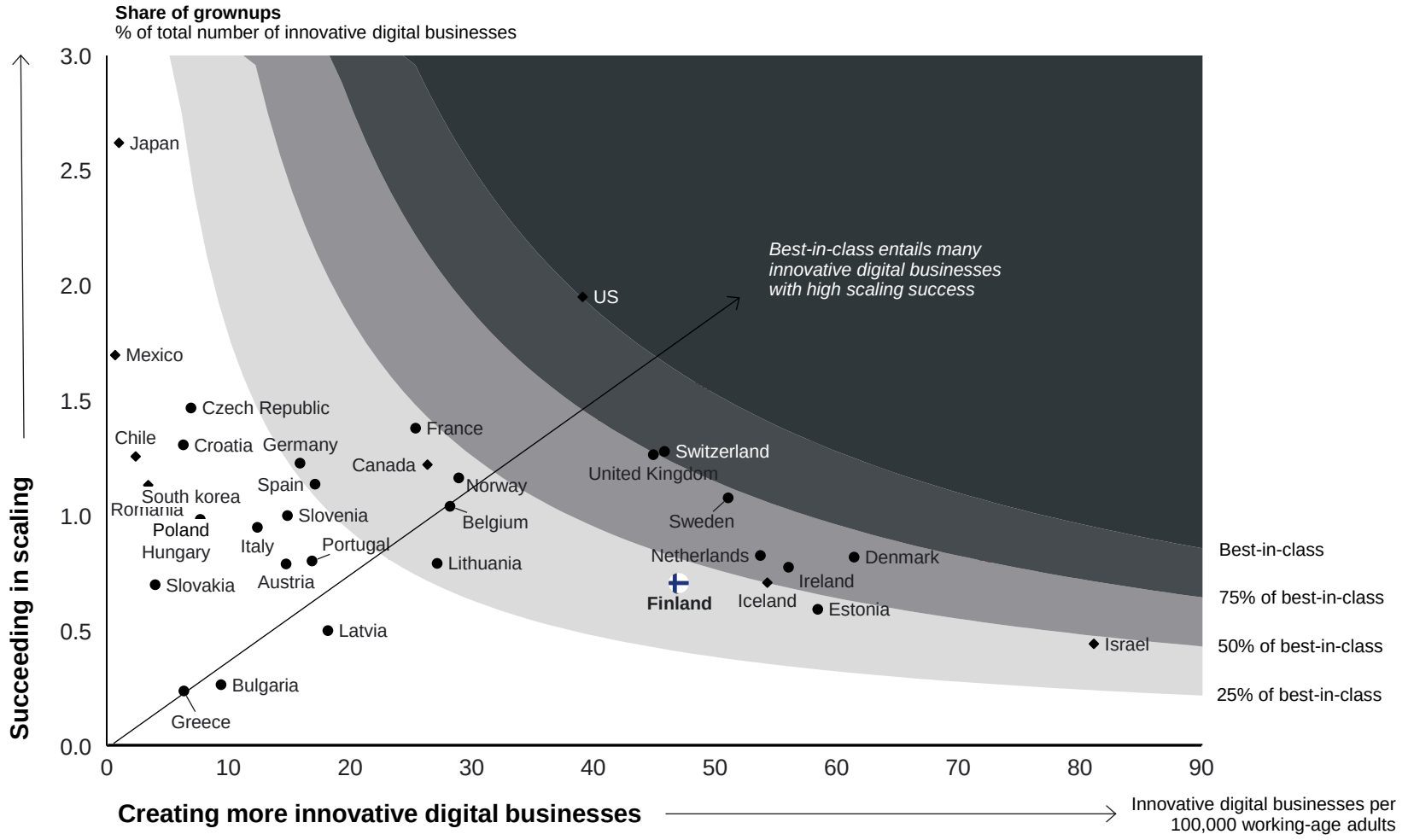
Finland has high entrepreneurial activity but low scaling success

Finland has a high level of entrepreneurial activity, with 47 innovative digital businesses per 100,000 working-age population compared to the EU average of 19.

However, Finland has relatively fewer of these businesses reaching the grownup scale (>500 employees).

Finland can unlock significant economic growth by improving the success rate in terms of the share of innovative digital businesses transforming into grownups.

The success of these businesses is also crucial for capturing the AI opportunity because they are instrumental in spreading the technology across the economy.



Notes: The scatterplot shows the complete dataset from Dealroom to ensure comparability.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Eurostat.

Finland retains its unicorns even after foreign acquisitions

Since 2000, Finland has produced 7 unicorns (1.3 per million people), which is lower than its Nordic peers of Sweden (3.2), Denmark (2.2) and Norway (1.6).

Finland has a strong record of retaining its unicorns, with none relocating their headquarters abroad, compared to 9% in Sweden and 62% in Denmark. However, many of the Finnish unicorns have been sold to US or Chinese companies while keeping their headquarters in the country.

Growing and retaining more of these strong businesses holds significant economic potential for Finland.

> … many innovative companies end up seeking out financing from US venture capitalists (VCs) and see expanding in the large US market as a more rewarding option than tackling fragmented EU markets.
>
> **Mario Draghi**
> in The Future of European Competitiveness

	Unicorns per million inhabitants	Number of unicorns founded since 2000	% of unicorns that have moved out
Estonia	7.3	10	80%
Sweden	3.2	34	9%
Denmark	2.2	13	62%
UK	1.9	128	8%
Ireland	1.7	9	22%
Norway	1.6	9	11%
Finland	1.3	**7**	0%
Netherlands	1.1	20	5%
France	0.8	52	21%
Germany	0.7	61	3%
Belgium	0.6	7	29%
Austria	0.5	5	20%

Several of the Finnish unicorns have been **acquired by foreign companies.**

Note: Unicorns as of February 2025. Many unicorns in Finland have been sold to US or Chinese companies, while keeping their HQs in Finland, contributing to Finland's strong record of retaining unicorns.
Source: Implement Economics based on Dealroom, World Bank Group and Draghi (2024).

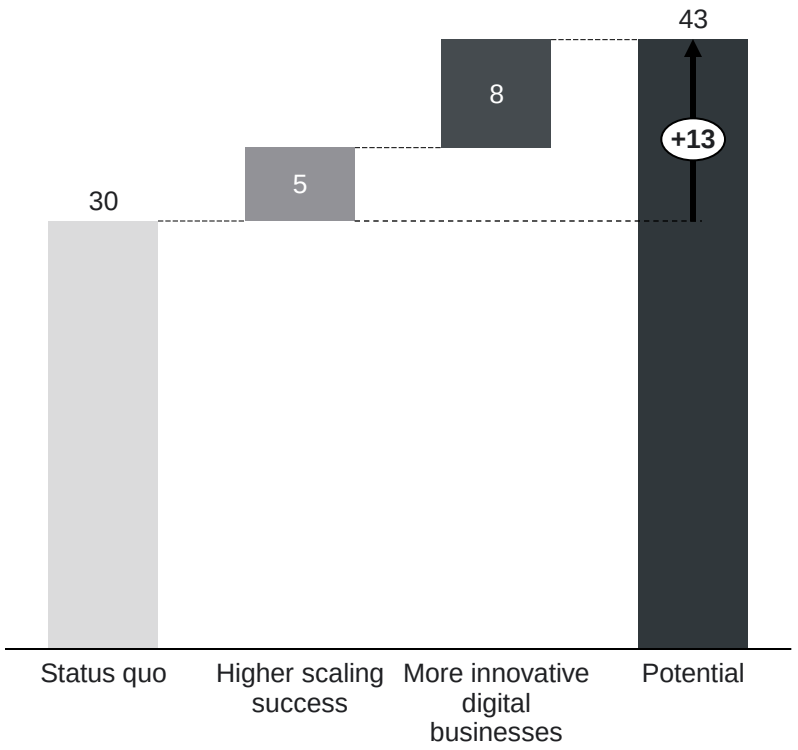
Finland can unlock significant economic growth through innovative digital businesses

More and better innovative digital businesses could create 13,000 high-value jobs and contribute almost EUR 1.2 billion to the Finnish economy. The impacts stems from:

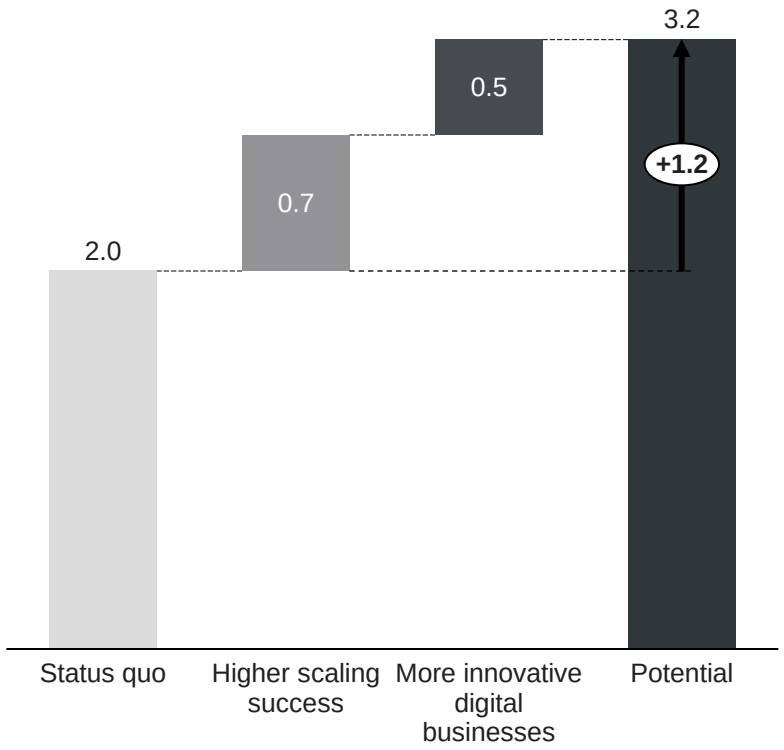
- **Higher scaling success of innovative digital businesses.** Transforming more startups into grownups, reaching the same success rate as the three leading OECD countries, could create 5,000 high-value jobs and add EUR 0.7 billion annually to the Finnish economy.
- **More innovative digital businesses.** If Finland can grow more innovative digital businesses reaching the entrepreneurial activity of leading peers, these new innovative digital businesses could support 8,000 jobs and contribute EUR 0.5 billion annually to the Finnish economy.

The workers in the new jobs may otherwise have been employed in average productivity jobs. Accounting for this implies that the overall net impact on the Finnish economy is EUR 0.2 billion.

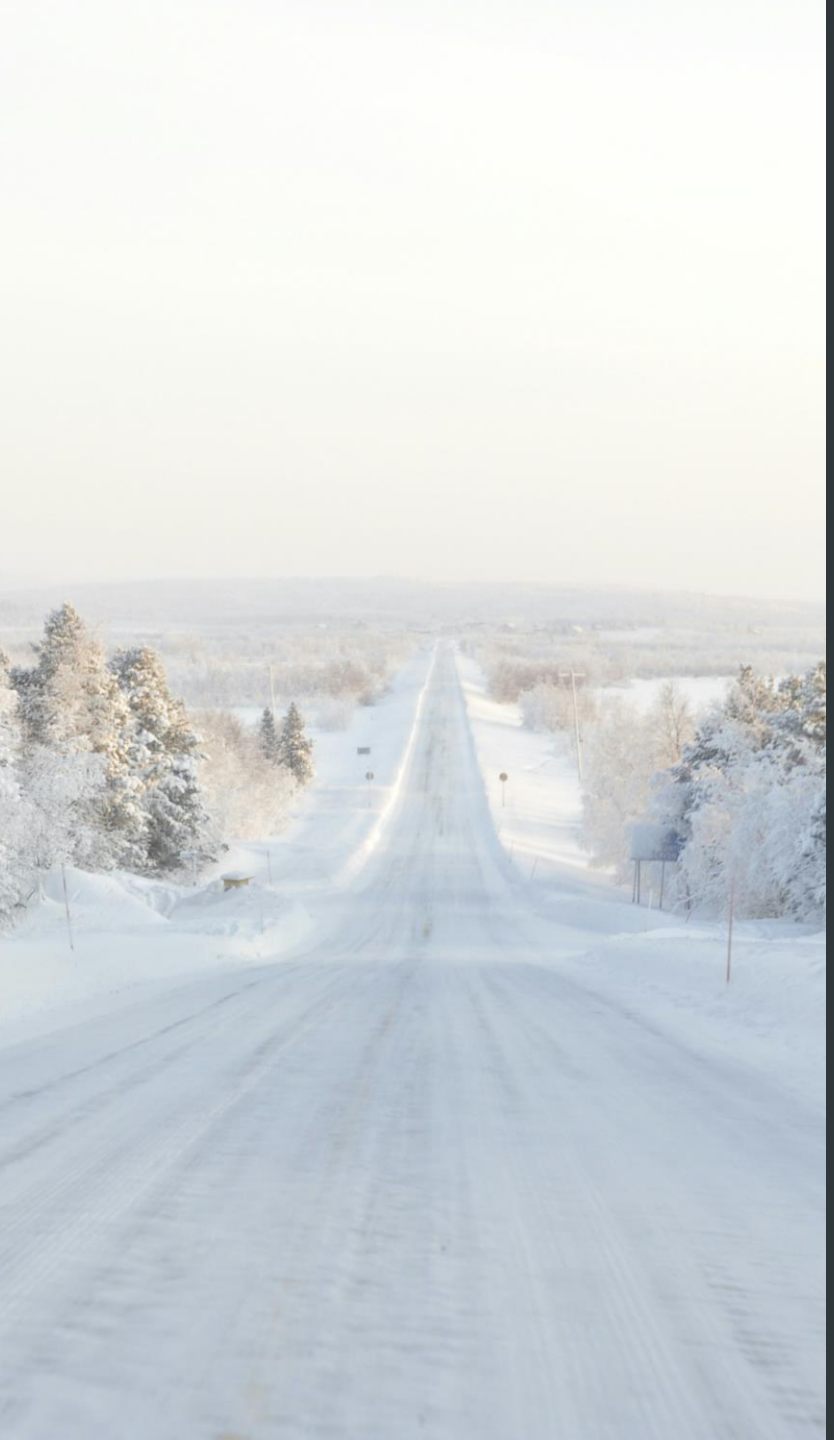
Jobs
Thousand



Annual GVA* in innovative digital businesses
EUR billion



Note: Higher scaling success is defined as performance corresponding to the average of the top three OECD countries (UK, Switzerland and the US). Likewise, the scenario of "More innovative digital businesses" is defined by the average performance of the top three OECD countries (Ireland, Denmark and Estonia). *GVA: Gross Value Added.
This report's calculations do not presuppose a given timeline to achieve the potential.
Source: Implement Economics based on Windsor (2024) using Dealroom data and Bureau van Dijk's Orbis database.



04

The way forward

> *Fostering innovation among the most productive firms is particularly important in the Finnish case, as there is evidence that the most innovative and productive firms have suffered the most from the Nokia crisis.*
>
> **OECD in** *The slowdown in Finnish productivity growth: causes and consequences*

Finland has strong framework conditions to grow innovative digital businesses, but challenges remain

Innovative digital businesses need…		Finland is generally well-positioned to grow innovative digital businesses:
People	Growing, attracting and retaining the people with business and tech talent and ideas	The Finnish workforce is generally well-equipped, but labour shortages highlights the need for continuous upskilling and attracting skilled foreign labour to grow innovative digital businesses and realise the full AI potential.
Tech	Accessing state-of-the-art AI tools, digital infrastructure and compute power	Access to open, flexible and secure cloud platforms and AI tools and models is critical for growing efficient innovative digital businesses. The Finnish digital infrastructure is a solid foundation, but to fully capture the AI opportunity, significant expansions in the digital infrastructure capacity are needed across Europe.
R&D	Accelerating R&D with AI	AI has the potential to accelerate scientific breakthroughs and innovation, and Finland has a strong starting point to harness this opportunity with high R&D spending and success in innovation as measured by the WIPO Global Innovation Index (GII).
Rules	Regulatory clarity and reasonable compliance-costs	Regulatory barriers make it especially hard for innovative digital businesses to grow, particularly for small businesses.
Capital	Unlocking Europe’s fragmented risk capital markets and increasing the attractiveness of venture capital investment in the EU	The lower levels of venture capital investment in Europe are a symptom of a low expected risk-adjusted after-tax return.

The Finnish workforce holds key potential for AI-driven economic growth

People

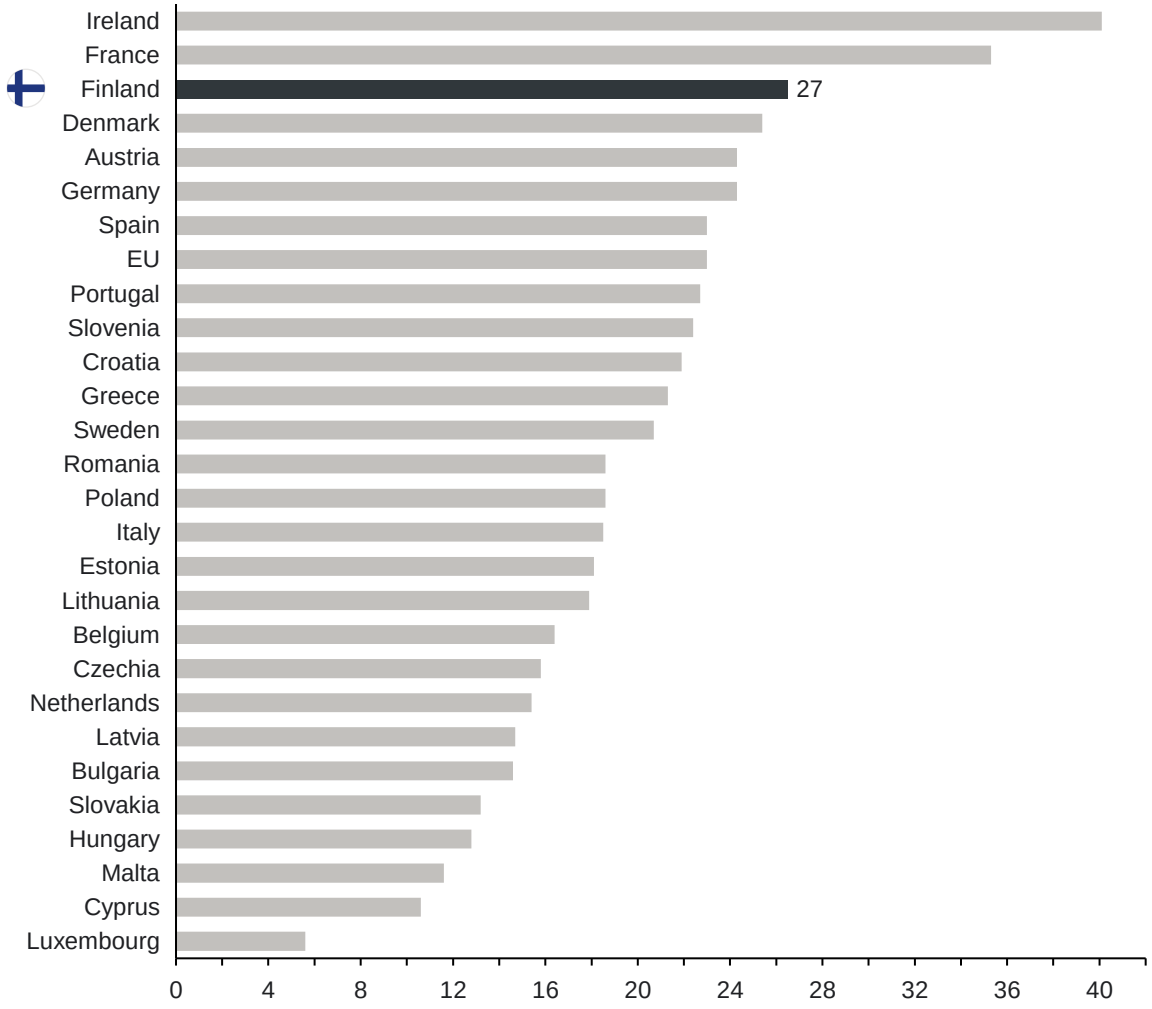
A skilled workforce is essential for growing digital innovative businesses. Using and innovating on top of cutting-edge technology like AI requires a well-educated workforce with strong technical capabilities, creative problem-solving skills and specialised AI skills.

The Finnish workforce is digitally enabled and well-educated. Finland has a high share of STEM graduates and leads the EU on the DESI human capital indicators, with 7.4% of its workforce in ICT roles (EU average of 4.5%), and nearly double the EU average of companies providing ICT training to employees.

Attracting and building skilled labour will be key to developing innovative digital businesses in the future. According to Statistics Finland, the Finnish population is projected to start declining in 2034. This demographic shift highlights the need to attract foreign labour and continuously upskill the Finnish population to mitigate labour shortages with AI.

The potential of generative AI is especially large for highly educated individuals because it can significantly free up time from mundane tasks such as coding and writing allowing more time for creative thinking and problem-solving.

Graduates in STEM
Per 1000 of population aged 20-29



Source: Implement Economics based on OECD Employment Outlook (2023), World Economic Forum's Future of Jobs report (2023), Eurostat, Statistics Finland and DESI (2022).

The digital infrastructure in Finland is a solid foundation for growing innovative digital businesses

Tech

Access to open, flexible and secure digital infrastructure is critical for startups that usually cannot afford large upfront investments or in-house IT-expertise. Digital infrastructure includes data centres, cloud and compute power.

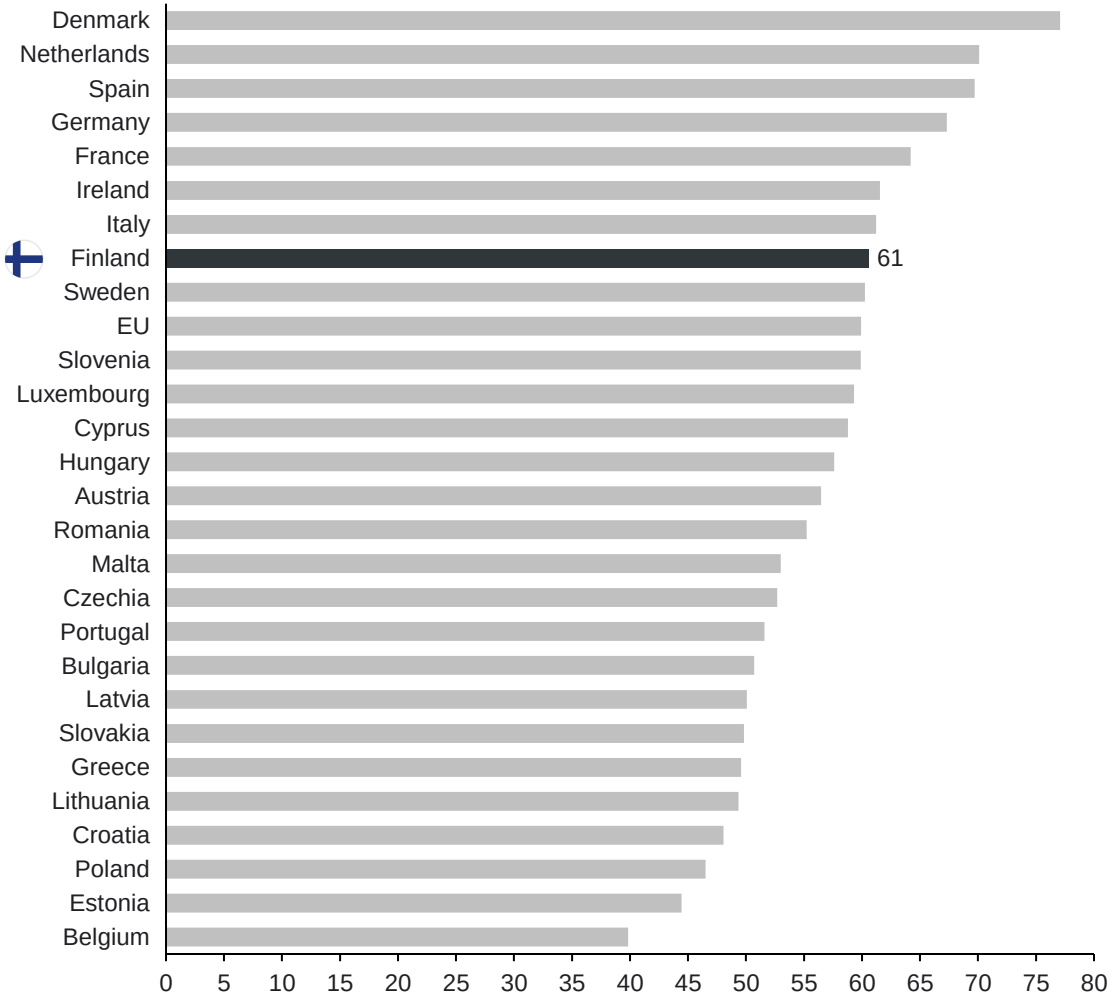
Access to top-performing AI/ML tools like Google Vertex and Hugging Face is central for Finnish innovative digital businesses. According to Notion Capital polling, 38% of them already rely on international models, mostly from North America.

Finland has a relatively strong digital infrastructure, with the 3rd highest score on AI infrastructure in the Global AI Index across the EU, and an average score on connectivity in DESI**.** Finland also participates in the EuroHPC initiative to create a world-class supercomputer ecosystem in Europe.

However, capturing the AI opportunity requires significant expansions in the digital infrastructure. IDC predicts that global data centre demand will nearly triple by 2027, highlighting the need for more and smart investments in digital infrastructure.

> Data access and computing power are critical for developing AI solutions that are robust, scalable, and capable of addressing complex societal challenges, from healthcare to climate change.
>
> **Enrico Letta** in Much More Than a Market, 2024

DESI 2022, Connectivity
Score (index)



Note: The connectivity index is measured as the total score of fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices.
Source: Implement Economics based on the European Commission, The Digital Economy and Society Index (2022) and Letta (2024).

AI has the potential to lift the productivity of R&D

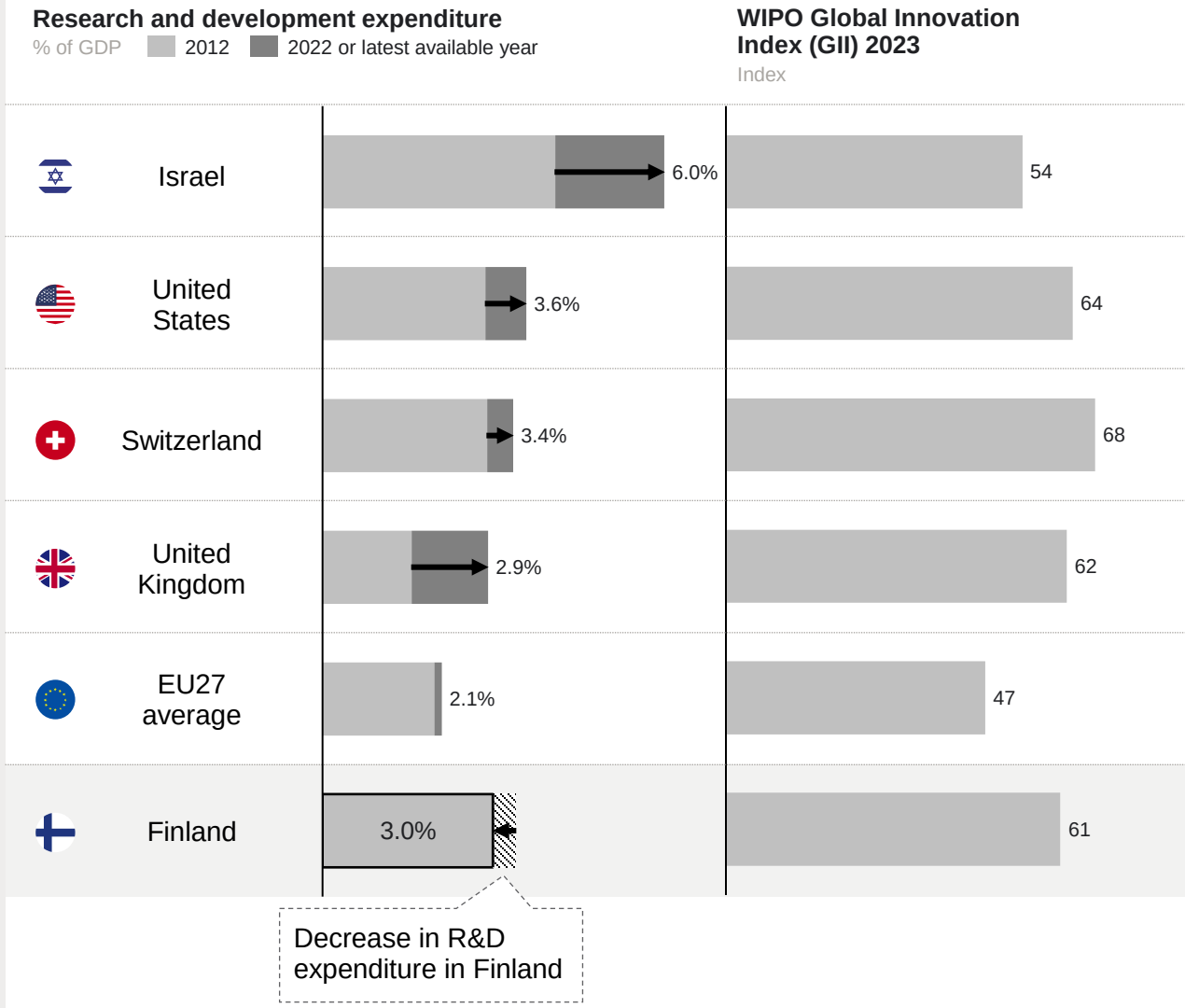
R&D

The productivity of research in general has been declining for the past century while the number of researchers has increased.

Finland has a relatively high R&D spending, above the EU average and nearly matching the US. In addition, Finland has a strong capacity and success in innovation as measured by the WIPO Global Innovation Index (GII).

Gross domestic spending on R&D in Finland has been decreasing since the financial crisis. However, the government recently adopted a target of 4% of GDP by 2030. To maximise the yield from this increased spending, Finland could look to the AI opportunity.

Leveraging AI could be a key advantage for Finland, as AI has the potential to accelerate scientific breakthroughs by addressing the growing complexity of scientific knowledge and vast volumes of research literature. By adopting generative AI, Finland could enhance R&D productivity, enabling researchers to stay current and identify breakthrough opportunities.



Source: Implement Economics based on the European Commission, OECD Economic Surveys: DESI, European Innovation Council, OECD Main Science and Technology Indicators database, Bloom et al. (2020), Philippon (2022) and Goldman Sachs (2023).

Regulatory barriers to scaling are particularly burdensome for small and fast-growing innovative digital businesses

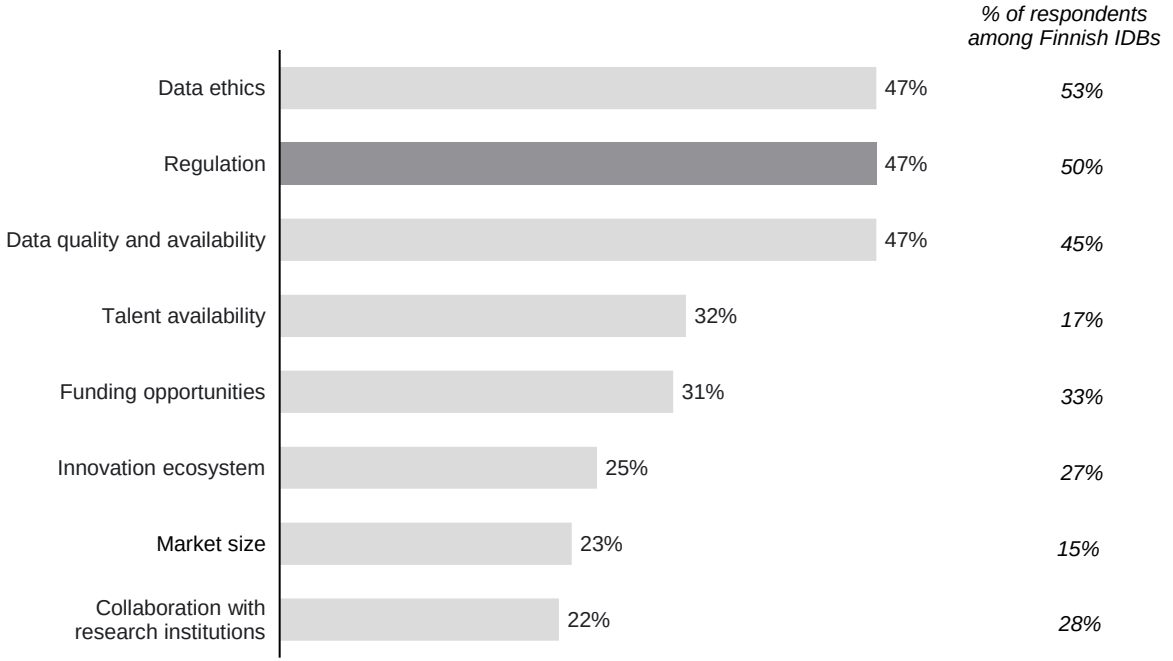
Rules

The complexity of EU regulation hampers innovation and investment. The EU now has around 100 tech-focused laws and over 270 regulators active in digital networks across EU Members.

Compliance costs are substantial and particularly burdensome for small businesses. GDPR enforcement alone led to an 8% reduction in profits by covered businesses, with small tech companies experiencing double the impact.

Regulatory uncertainty delays AI innovation and adoption. 50% of surveyed Finnish innovative digital businesses see regulation as an obstacle to developing cutting-edge AI technologies. Large companies like Apple, Meta and OpenAI have also announced AI product delays or cancellations due to regulatory ambiguity.

What are the main challenges faced by European startups developing cutting-edge AI technologies?
% of respondents among European innovative digital businesses



> … innovative companies that want to scale up in Europe are hindered at every stage by inconsistent and restrictive regulations.
>
> **Mario Draghi** in The Future of European Competitiveness

Source: Implement Economics based on iapp (2024), Draghi (2024), Bruegel (2014), Chen et al. (2022), Euronews, and survey by Notion Capital (2024)

Increase the attractiveness of investing in Europe's innovative digital businesses

Lower levels of venture capital investment in Europe are a symptom of a low expected risk-adjusted after-tax return

Europe is not lacking money. In 2022, EU household savings were EUR 1,390 billion, compared to EUR 840 billion in the US, according to the Draghi report.

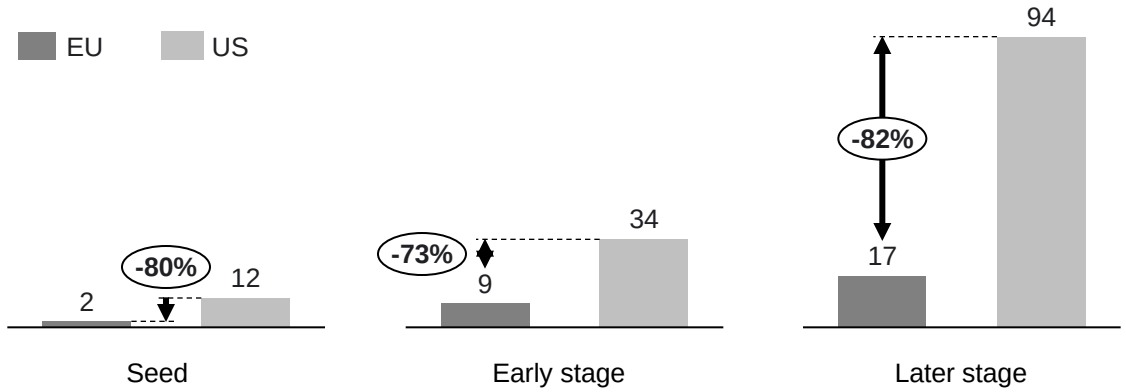
But Europe attracts around USD 100 billion less in venture capital investment than the US. Venture capital is the main source of financing for innovative digital businesses, especially those aiming to grow aggressively towards the 'grownup' scale.

Europe's fragmented capital markets hamper the flow. Different rules in each EU country make it difficult for investors in one country to fund projects in another. This prevents the EU from using its full scale to create large investment funds that can support risky projects.

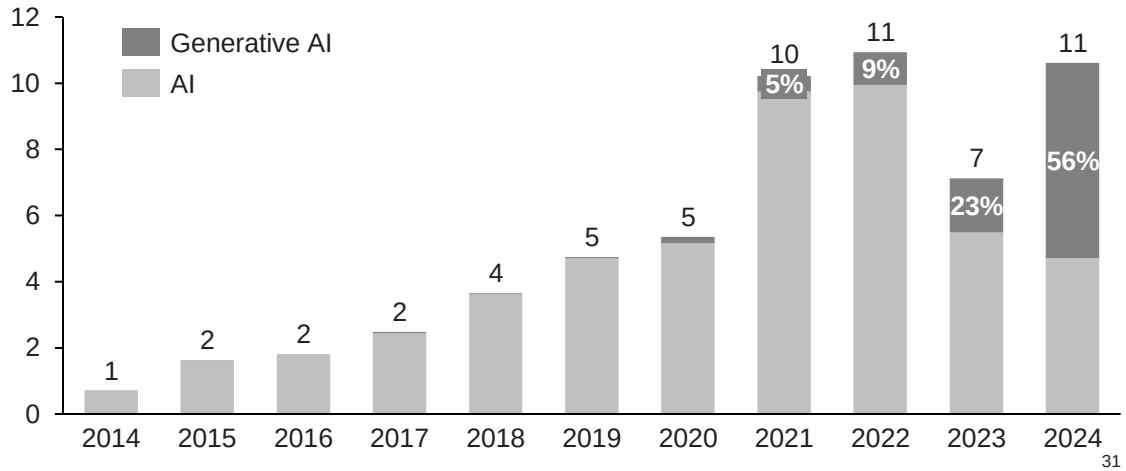
Regulatory uncertainty and excessive regulatory costs are a further negative element. Unclear rules and higher regulatory burdens reduce the expected return on the capital needed to scale up Europe's innovative digital businesses.

Capital

Venture capital investment by development stage
EUR billion, 2023



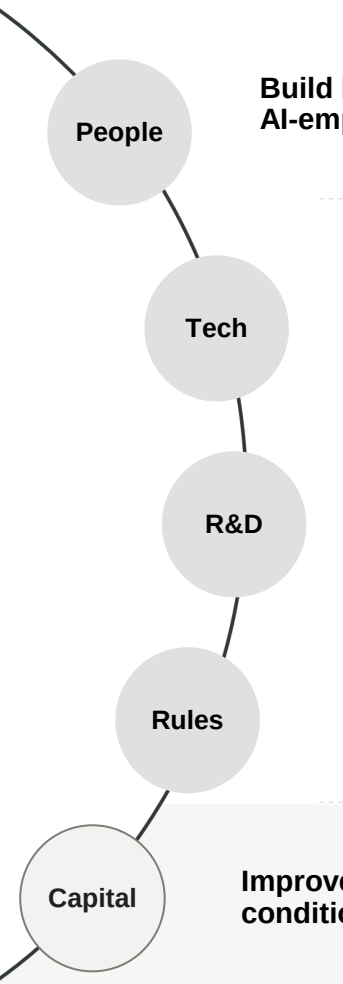
Europe AI venture capital investment
EUR billion



Source: Implement Economics based on Draghi (2024) and Dealroom.

Unlocking the potential of innovative digital businesses with AI

The Finnish government can upgrade the existing framework conditions for innovative digital businesses to be fit for the AI-powered future:



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 workers' capabilities, so that they are trained to work together with the new technology. The aim should be to *improve the marginal productivity of workers* rather than replace them.
Invest in AI infrastructure and compute power	• Ensure the right incentives 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.
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. Make AI tools available to entrepreneurs and scientists so they can use AI in support of other discoveries and innovations. • Support innovation on top of already developed foundational models and findings, e.g. by leveraging the new EU AI innovation package.
Create a conducive and aligned AI regulation	• Avoid siloed approaches to AI regulation to minimise the risk of misalignment and fragmentation through increased international co-operation. • Adopt a risk-based approach to AI regulation to provide clarity to developers, adopters and users about which uses are disallowed.
Improve framework conditions to attract capital	• Speed up the creation of a Capital markets union. • Strengthen the above framework conditions by investing in skills, R&D, sustainable digital infrastructure and ensuring regulatory clarity.

Note: For more details on policies, see OECD AI principles, OECD AI Observatory, EU's ethics 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.