HUGE GROWTH
in the tech industry

TECH IS AN ENABLER
for the entire social economy

SWEDEN IS LOSING GROUND
in the global tech race

A REPORT FROM TECHSVERIGE

The Swedish tech industry in 2023

Strong growth and good future prospects despite tough times

TechSverige

About the report

The report *The Swedish tech industry 2023 - Strong growth and good future prospects despite bundle times* is the premiere edition of TechSverige's new report series . The report is produced on an annual basis with the aim of highlighting the current state and future prospects of the Swedish tech industry. This year's report is the result of a collaboration between TechSverige and the analysis company Makrologik. Mårten Blix, PhD in economics, has contributed a thematic in-depth chapter on productivity and the effects of digitization on productivity growth.

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TechSverige

THE SWEDISH TECH INDUSTRY 2023

FÖRORD

The Swedish tech saga is far from finished

We live in a time of major changes that have a strong impact on us as individuals, companies, countries and globally. Changes that create opportunities but also entail great challenges. Many households and companies are suffering heavily from the economic downturn we are witnessing with high inflation, rising interest rates and shrinking demand. War in Europe, bitter superpower conflicts and geopolitical tensions also underline the precarious situation and heighten the seriousness.

Parallel to the cold winds of the outside world and the state of the economy, we live in an existence where the enabling forces of the tech industry have given rise to large increases in productivity and a prosperity that no one would have dared to dream of only a quarter of a century ago. Clean energy sources, modern battery technology and smart electricity grids pave the way to secure the green transition. Artificial intelligence (AI) opens up new fantastic possibilities, which through responsible use can create great value throughout our society. The fifth generation mobile network (5G) enables everything from self-producing factories to accurate precision surgery at a distance.

The tech industry's solutions redraw the conditions for how we live, work, produce, consume and communicate. Tech contributes to a sustainable social transformation, to sharpening welfare, to competitiveness in all industries and to the creation of new jobs.

In 2022, the tech industry reached a new milestone. Together, Swedish tech companies produced and sold goods and services worth more than SEK 1,000 billion. That is an impressive sum. The company was made possible by 266,000 people in more than 58,000 companies. The industry is growing more strongly than basically everyone else

The future is always uncertain, but thanks to all these enterprising people and companies, we estimate that the tech industry will continue to grow strongly over the next three-year period - despite a troubled environment. In the base scenario presented in the report, the tech industry grows by SEK 187 billion until 2026, a growth of 18 percent compared to the 2022 level.

However, if we gather our strength to take advantage of the opportunities of digitization and have high ambitions to be a digital leadeand policy conclusionsr, the report shows that the industry can grow by an additional SEK 85 billion, corresponding to a growth of 26 percent. Then we contribute to keeping the entire economy going during the tough times and to creating many more modern tech jobs. Such an effort would not only generate much-needed growth, but could also contribute to a more robust IT infrastructure that can better withstand today's and future's cyber threats.

Sweden has every opportunity to be a digital leader with all the positive values it provides. But the global tech competition is tough and we need to jointly protect the development of a world-leading tech industry in our country. Even if we see strong growth in the Swedish tech industry, we should not sit back and risk being overtaken. Rather, we should raise our ambitions and have an even greater focus on creating the right conditions for innovation, tech entrepreneurship and world-class growth.

The Swedish tech saga is far from finished.

Åsa Zetterberg
Association director
TechSverige

November 2023

In the base scenario presented, the tech industry grows by SEK 187 billion until 2026

Åsa Zetterberg

The tech industry and its outlook in numbers

1000
SEK billion
Milestone that tech companies' turnover passed in 2022.

266 000
Number of employees working in more than 58,000 tech companies - an increase of 33,000 people in three years.

346
SEK billion
The industry's export value in 2022, a value that has doubled in 15 years.

7.9
percent
The industry's GDP share in 2022 as is expected to increase to between 8.6 and 9.2 percent in 2026.

18-26
percent
Forecasted industry growth until 2026.

154
SEK billion
Annual tax payments for welfare and public services – much like government spending on defense and the judiciary.

346
SEK billion
The industry's GDP contribution/value added in billions of kronor in 2022.

10
percent
Value added growth 2015–2020, to be compared with, for example, Estonia at 81 percent and Finland at 23 percent.

1 In the report, there are different statistical definitions of the tech industry depending on the availability of data. If nothing else is explicitly stated in the text, the Swedish tech industry refers to companies that are registered and active in Sweden (regardless of where the head office is located) and classified according to the SNI codes 26.110, 26.120, 26.200, 26.300-400, 26.510, 26.800, 42.220, 46.142, 46.510, 46.521-522, 58.210, 58.290, 61.100, 61.200, 61.300, 61.900, 62.010, 62.020, 62.030, 62.090, 63.110, 63.120, 82.200 and 95.110.

The delineation likely underestimates the extent of the tech industry in a broader sense, including products and services in industries that arise in the borderland between the traditional IT and telecom industry and other traditional industries. More about this distinction can be read in the section on tech as an "industry and market cluster" that can be found in the report's first chapter.

2 Refers to GDP share and GDP contribution/value added respectively expressed in 2015 price level. For GDP variables in the report, as a rule, fixed prices are used with 2015 as the reference year, including here and in the report's forecasts. Fixed prices are used because the main focus of the report is the development over time. Following only the tech industry in current prices leads to underestimating the industry's contribution to the economy, especially in times of high inflation. Many other industries' value added in current prices have, for example, been driven up by large price increases between 2021 and 2023 that have not been realized in tech. Using the GDP contribution in current prices would thus give the impression that the tech industry's production is decreasing relative to the entire economy, despite the fact that the tech industry in real terms is growing faster than basically all other large industries.

CHAPTER 1

The role of the tech industry in the economy

In this chapter, the Swedish tech industry's role in the economy and society from a variety of angles. The nature and turnover of the companies are discussed, as well as the industry's GDP contribution, exports and number of employees. The industry is also explored from a regional perspective and the picture is completed by three interviews with tone-setting voices within Swedish tech.

In 2022, a milestone was reached when the companies in the tech industry collectively sold goods and services for well over a thousand tech billions

If DNA is the prerequisite for biological life, then the activity of tech companies is a prerequisite for social and economic life in modern societies. Social media and an increasingly digital working life means that we communicate and organize everyday life in new ways. New technologies such as 5G, artificial intelligence (AI), cloud storage and the Internet of things (IoT) will change the rules of the game going forward. Tasks will be optimized and automated, everyday life will be simplified for many and important insights will emerge from information that previously appeared to be random.

Swedish tech has grown strongly in recent years. The growth has been driven both by the industry's ability to innovate and by increased receptivity to digital aids, a receptivity that was given extra traction by the pandemic's demands for social distancing. In 2022, a milestone was reached when the companies in the tech industry collectively sold goods and services for well over SEK 1,000 billion. By comparison, this is about three times as much money as the Swedes buy food for each year. The turnover of the tech companies has thus passed the turnover of other large sectors such as the engineering industry, the construction industry and the retail trade.

Tech companies' value creation also means that each year they contribute more than SEK 150 billion in tax revenue to the state, municipalities and regions that benefit welfare.3 This corresponds to almost the entire state budget's allocation to defense and the judiciary.4

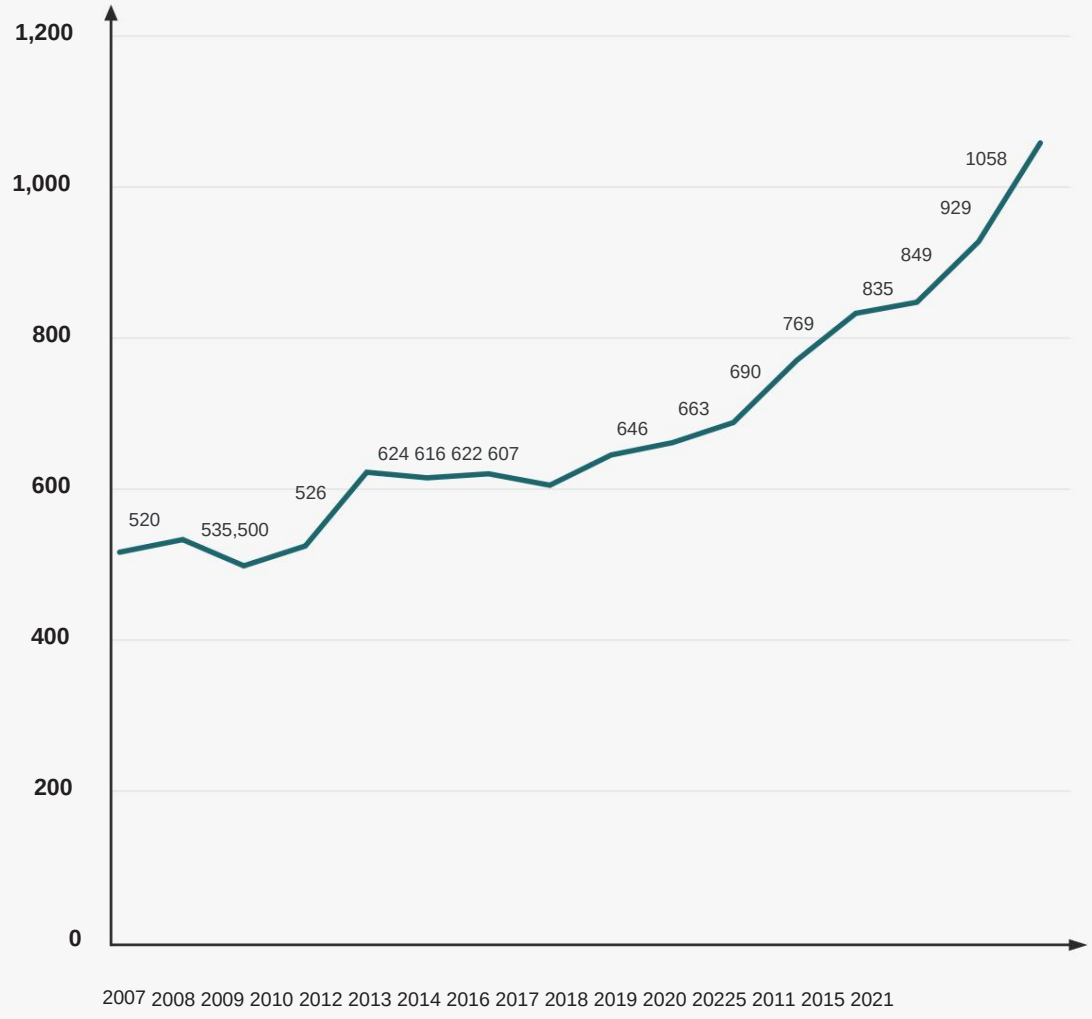
3 The estimated tax contribution of SEK 154 billion comes from VAT, payroll taxes, employer contributions and company taxes. Of the various taxes, VAT is estimated to bring in just over half, income taxes and employer contributions just over a third and corporation tax around a tenth of the tax revenue.
4 Source: Government Office. The sum of the expenditure items "judiciary" and "defense and society's crisis preparedness" in the state budget amounts to SEK 165 billion in 2023, according to the Government Office's forecasts.

The turnover of the tech companies hasthus passed the turnover of other large sectors such as the engineering industry, the construction industry and the retail

Diagram 1

The tech industry reached SEK 1,000 billion in 2022

In billions of kronor.

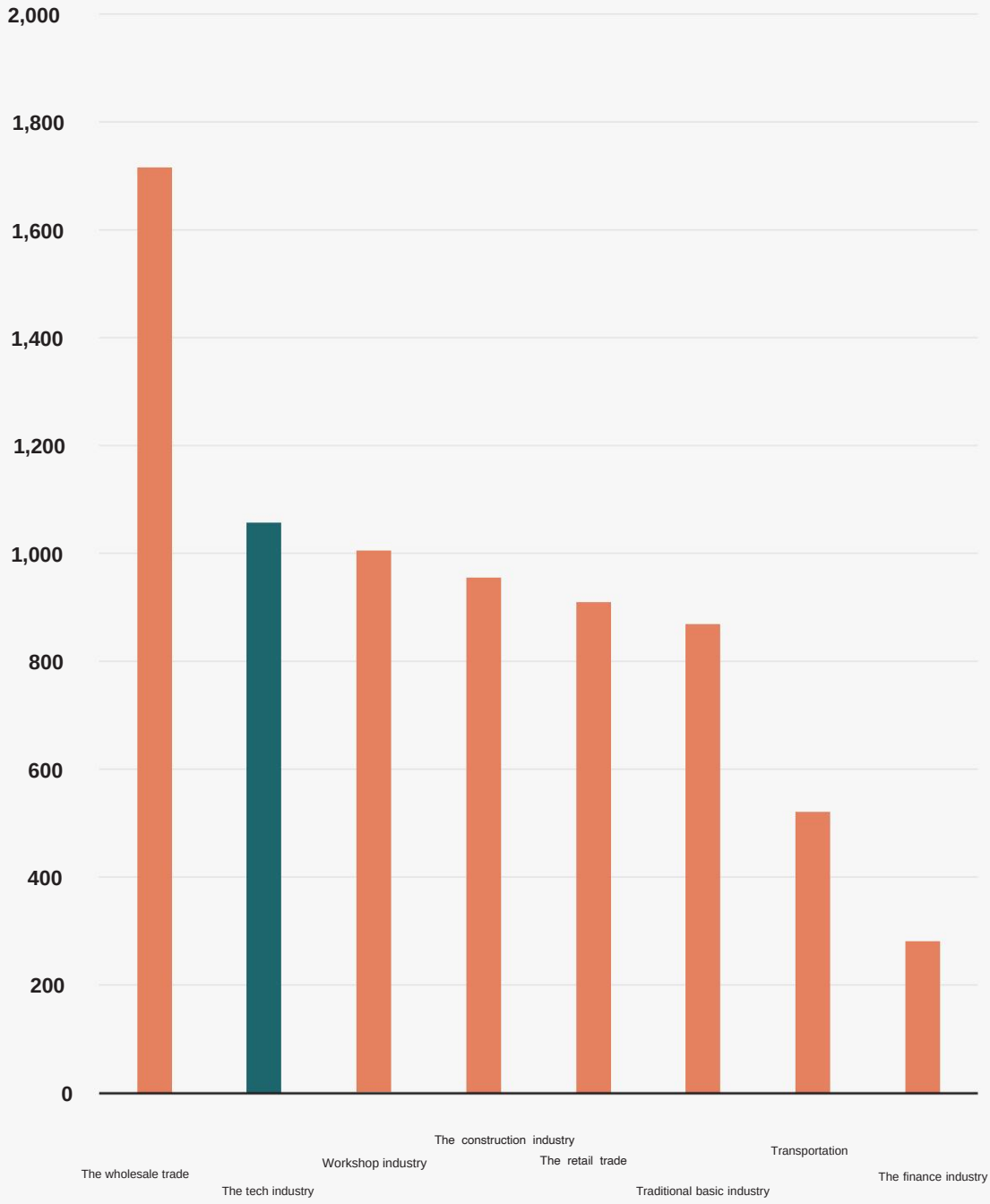


Source: Statistics Sweden Business finances (2007-2021), the Swedish Tax Agency and own calculations (2022). The 2022 figure is preliminary and is based on VAT statistics from the Swedish Tax Agency for companies within SNI codes 61-63.

Diagram 2

Turnover for Swedish companies in various industries

In billions of kroner.



Source: Statistics Sweden Företagens ekonomi, Finansiella Företag annual accounts, Trade facts, Tax Agency and own calculations. The figures for tech, retail and finance refer to 2022, other industry figures refer to 2021.

5 The following definitions are used in the diagram: The wholesale trade is defined as SNI code 46, the engineering industry as SNI 25–30 plus 33 and the construction industry as SNI 41–43. The retail trade is defined in accordance with the measure Retail sales according to Handelsfakta, which is based on SNI code 47 excluding 47.3. Traditional basic industry is defined in terms of SNI 1–8, 16–18 and 22–25 and transport as 49–53. For the financial industry, this refers to the total revenues of financial companies, where net interest and net commissions make up the largest items.

Industry and market cluster – two perspectives on tech

The tech industry consists of 58,000 active companies. 6 Tech companies' operations can be simply divided into four different segments:

1. Software and IT services 2. Telecommunications and infrastructure
3. Manufacturing of hardware
4. Resale and Service

Of the four mentioned segments, companies in software and IT services have grown the fastest in recent years and today account for three out of five turnover kroner in tech. Telecommunications and infrastructure and resale and service account for just under a fifth of turnover each, while hardware manufacturing accounts for four percent.

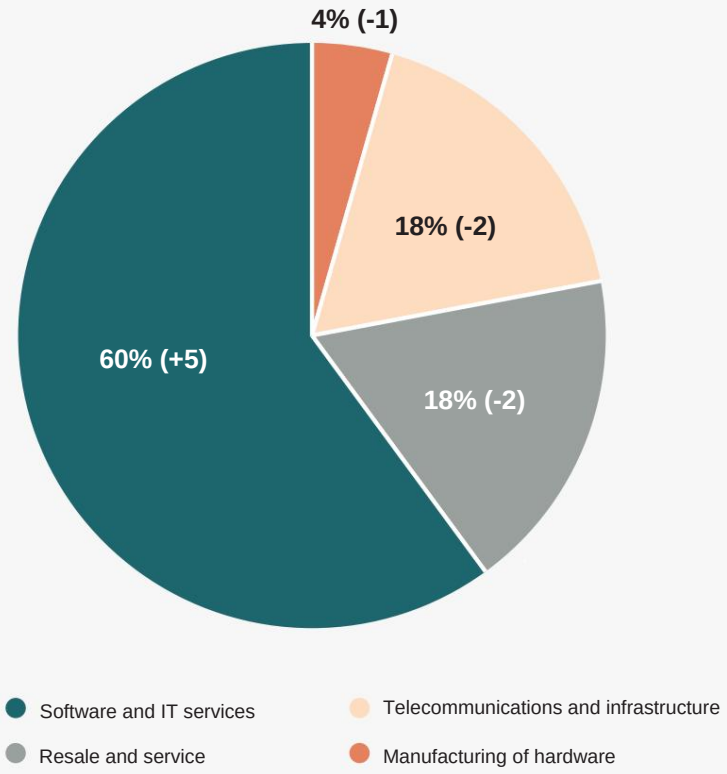
Tech, however, cannot only be visualized as a limited corporate collective. In a broader sense, tech forms an enabling cluster for basically the entire modern social economy. A secure and robust digital infrastructure thus becomes crucial for a long-term sustainable digital society.

As new technology and digitization become a basic prerequisite for operations in all sectors of society, special market clusters arise as a result of the contact surfaces between pure tech companies and other operations. Examples of such market clusters are healthtech in the health area, cleantech in the environmental area and foodtech in food.

Diagram 3

Tech as an industry

The tech segments' revenue shares. Refers to the year 2021. In parentheses, change in percentage points over the last 5 years.

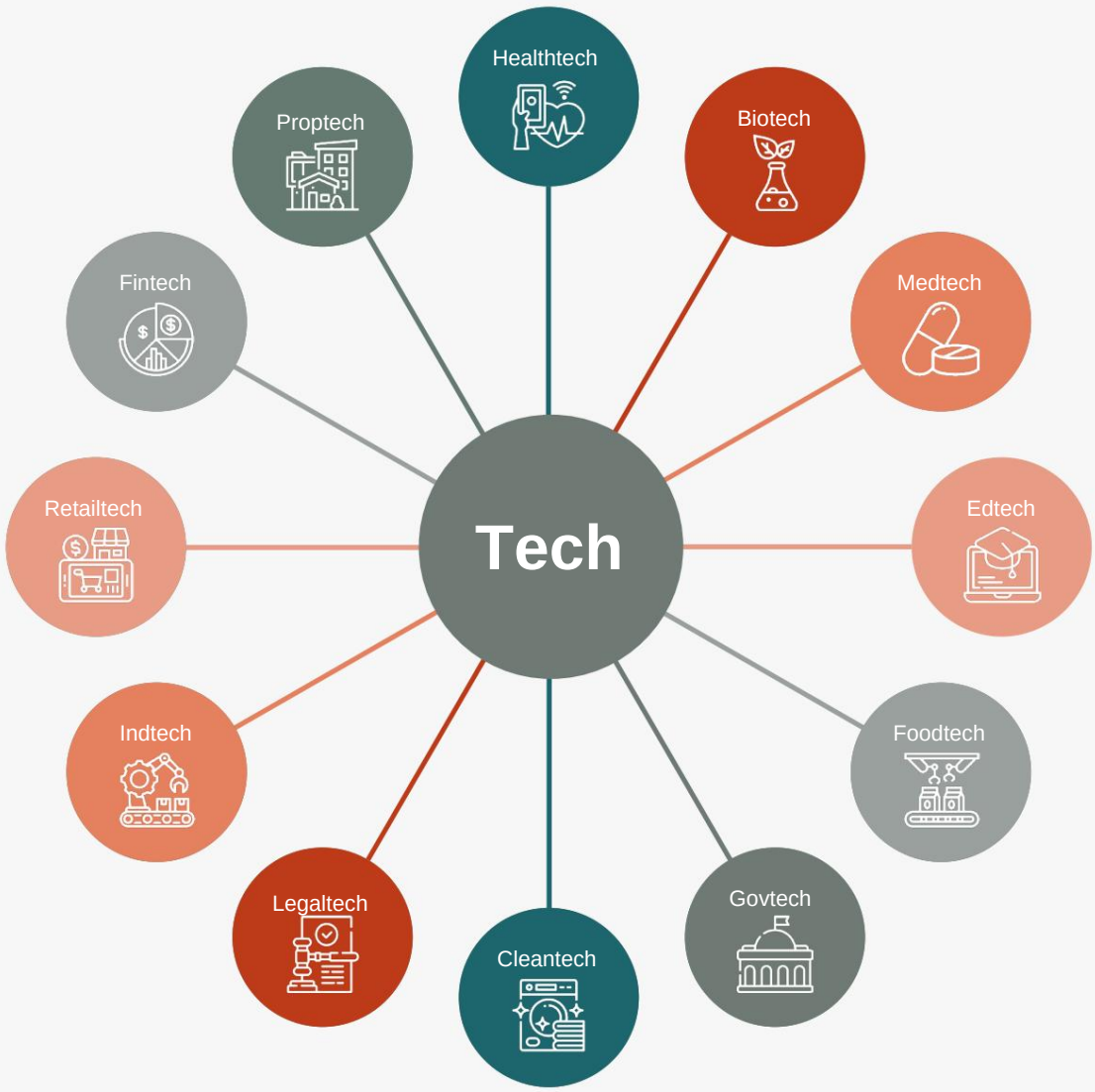


6 Source: Statistics Sweden's Business Register. In total, there are roughly 61,000 industry companies, of which 58,008 companies were active in September 2023.

In a broader sense, tech forms an enabling cluster for basically the entire modern social economy.

Figure 1

Tech as a market cluster



A new basic industry for Sweden

Historically speaking , **the traditional base industry** took on a role that is in many ways similar to the tech industry's position today. Traditional primary industries – which include agriculture, mining with the extraction of metals such as iron ore, steel production, and wood, paper and pulp industries – have long served as a driving force for the economy and an enabler of progress in other industries, particularly the high-value industries that requires a stable flow of necessary base materials and raw materials.

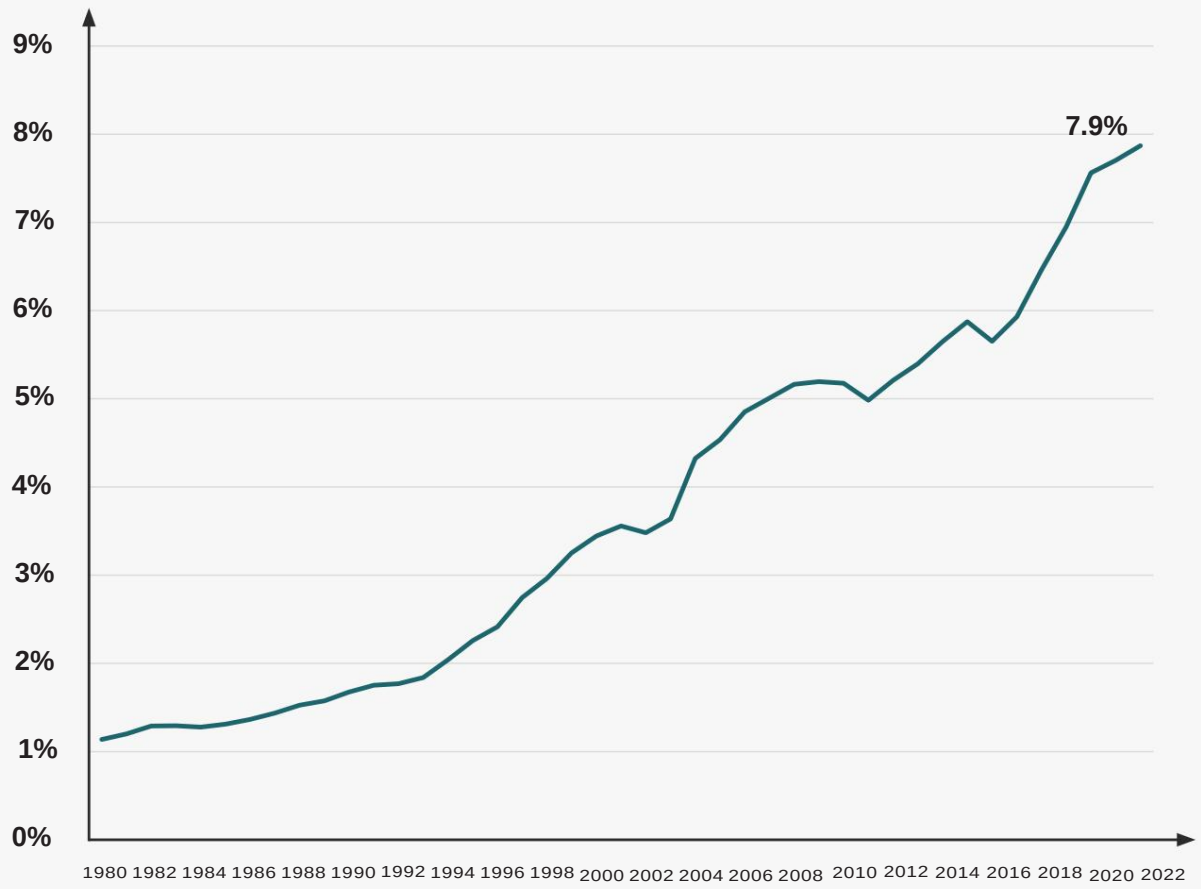
The tech industry constitutes a kind of new base industry for Sweden that complements and develops existing structures. This happens by the tech industry providing companies, households and the public sector with a flow of innovative technical tools, aids and services that make the wheels of the modern economy turn and everyday life work.

The value added from the tech industry was SEK 346 billion at the 2015 price level, corresponding to a GDP share of 7.9 percent. Something of a paradigm shift has taken place in recent years when the tech industry's GDP contribution in 2019 for the first time exceeded the GDP contribution from the traditional basic industry. The reversal is due to the fact that the growth in tech has been exponential in recent decades, while the traditional base industry has grown at a stable but lower and linear rate.7

Diagram 4

The tech industry's GDP contribution 1980-2022

Refers to the value added from the tech industry (in fixed prices with 2015 as the reference year), defined as SNI 26 + 61–63, in relation to the value added of the entire economy (GDP at base price).



Source: Statistics Sweden's national accounts.

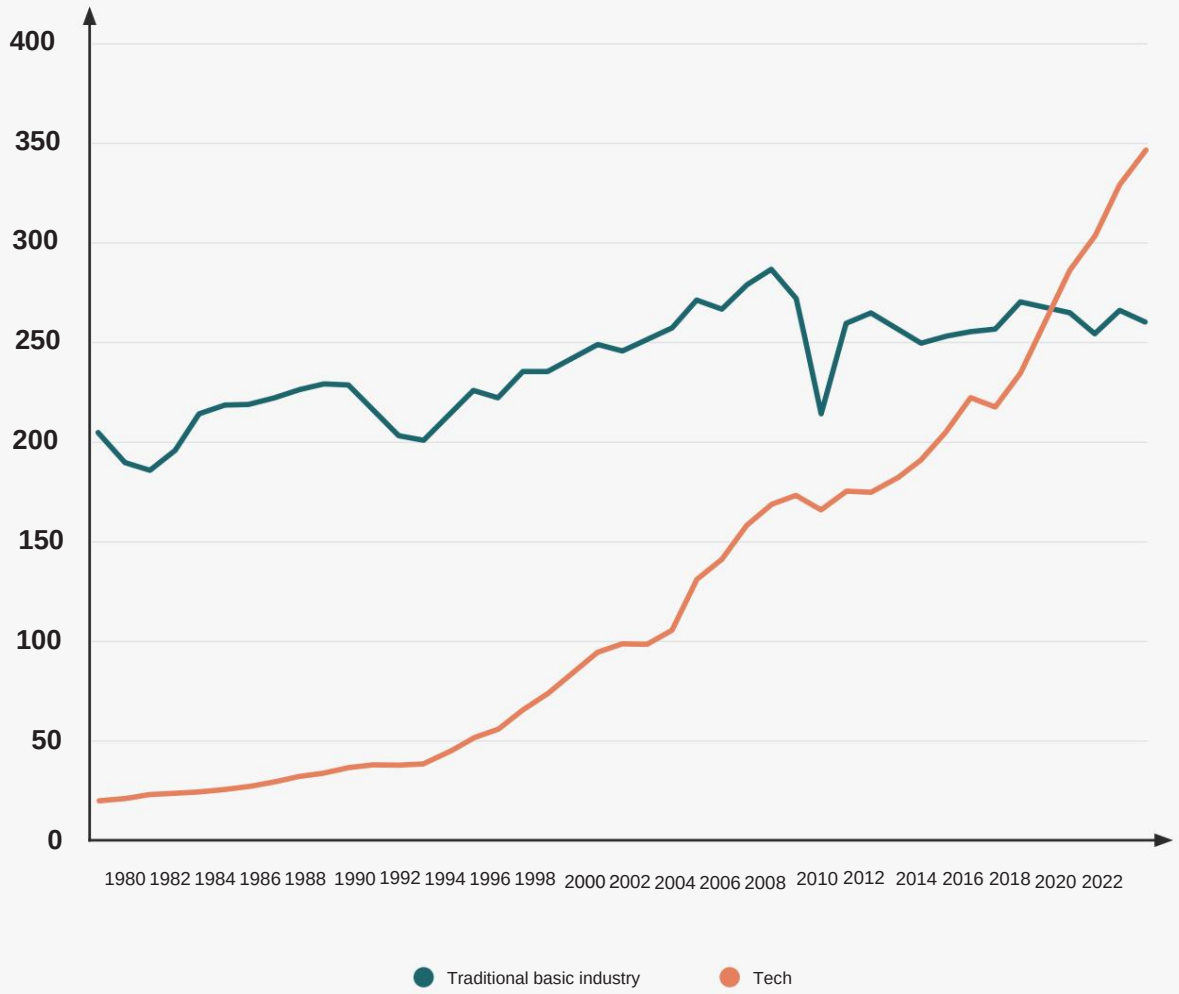
7 In current prices, the tech industry's value added was SEK 358 billion in 2022. The traditional basic industry's value added in current prices was SEK 399 billion. The level difference between tech and traditional base industry in fixed versus running prices is due to the fact that the tech industry has grown through increased volumes, while growth within the traditional base industry has been to a greater extent price-driven, especially in 2021 and 2022.

Diagram 5

GDP contribution for tech and traditional basic industry respectively.

The added value from the tech industry refers to SNI 26 + 61-63. The values refer to fixed prices with 2015 as the reference year.

In billions of kroner.



By traditional basic industry is meant the sum of the economic branches "agriculture, forestry and fishing", "mineral extraction", "wood pulp, paper and graphic industry", "rubber and plastic goods industry; and other non-metallic mineral products", "steel and metal production; and manufacture of metal goods (not machines)" according to the official industry classification of the business world.

The tech industry is defined in the diagram as "industry for computers, electronics and optics", "telecommunications" and "computer programming, computer consultants and information services." For technical reasons and as a result of how the National Accounts are designed, this results in a gross underestimation of the tech industry, as the definition excludes certain tech companies, including the resale and after-sales service of IT products and certain software development.

Source: Statistics Sweden's national accounts.

”Everyone is on the way to becoming a tech company.”

The large international consulting company Capgemini wants to be its strategic customers' reliable business and technology partner. The recipe for success, according to the company's Nordic CEO Anil Agarwal, is to understand the changes that affect customers and to have a deep technical understanding that makes it easier for them to change.

Three levels of productivity gains

Anil Agarwal was drawn to the tech industry and Capgemini when he realized the industry's "incredible opportunities for growth, learning and potential to improve people's lives". Technology and digitization raise productivity on three different levels, he believes. Productivity is increased for companies as well as for society and for individuals.

"For companies, for example, 5G-connected factories are now being activated that enable digital twins, which increases productivity not only in terms of production volumes but also in terms of product complexity. From a societal perspective, citizens gain access to new services, alternatively existing services that can be offered in more productive ways, for example automated matching of jobseekers with jobs or the possibility of receiving care remotely. The individual's productivity is raised, among other things, by the technology freeing up time for work or leisure, for example through self-driving cars or the possibility of e-shopping."

The economy shifts the focus of the business

From his helicopter perspective, Anil Agar-wal has witnessed a clear deceleration in 2023 in technology services reflecting the broader downturn in the economy. At the same time, there remains a strong appetite for technology-led transformation among the company's customers.

"We see reduced growth compared to last year when we grew by more than 15 percent. Therefore, it is important to us that we focus our investments into new technology areas where customers invest significantly more, in order to reach our goal of continuing double-digit growth in the coming years. We also see that staff turnover has decreased compared to last year, so currently we are not recruiting much," says Anil Agarwal.

Doubles its AI team

Despite the economic situation, Anil Argawal believes that the tech sector is the only part of the business world where large parts can grow in double digits during the coming decade. In a way, all companies are becoming tech companies: "Technology is becoming the core of the business", as Anil Agarwal puts it. Capgemini's clients will invest large sums in cloud technology, AI and data management but also in cyber security, "intelligent companies" and sustainability.

"AI has enormous potential to influence our customers' business. As a consequence, we are investing two billion euros to strengthen our leadership in AI over the next three years. We are doubling our global data and AI team, from around 30,000 today to close to 60,000 consultants," concludes Anil Agarwal.

Anil Agarwal
CEO at Capgemini in the Nordics

Three quick questions for Anil Agarwal about...

The green transition: How can new technology contribute?

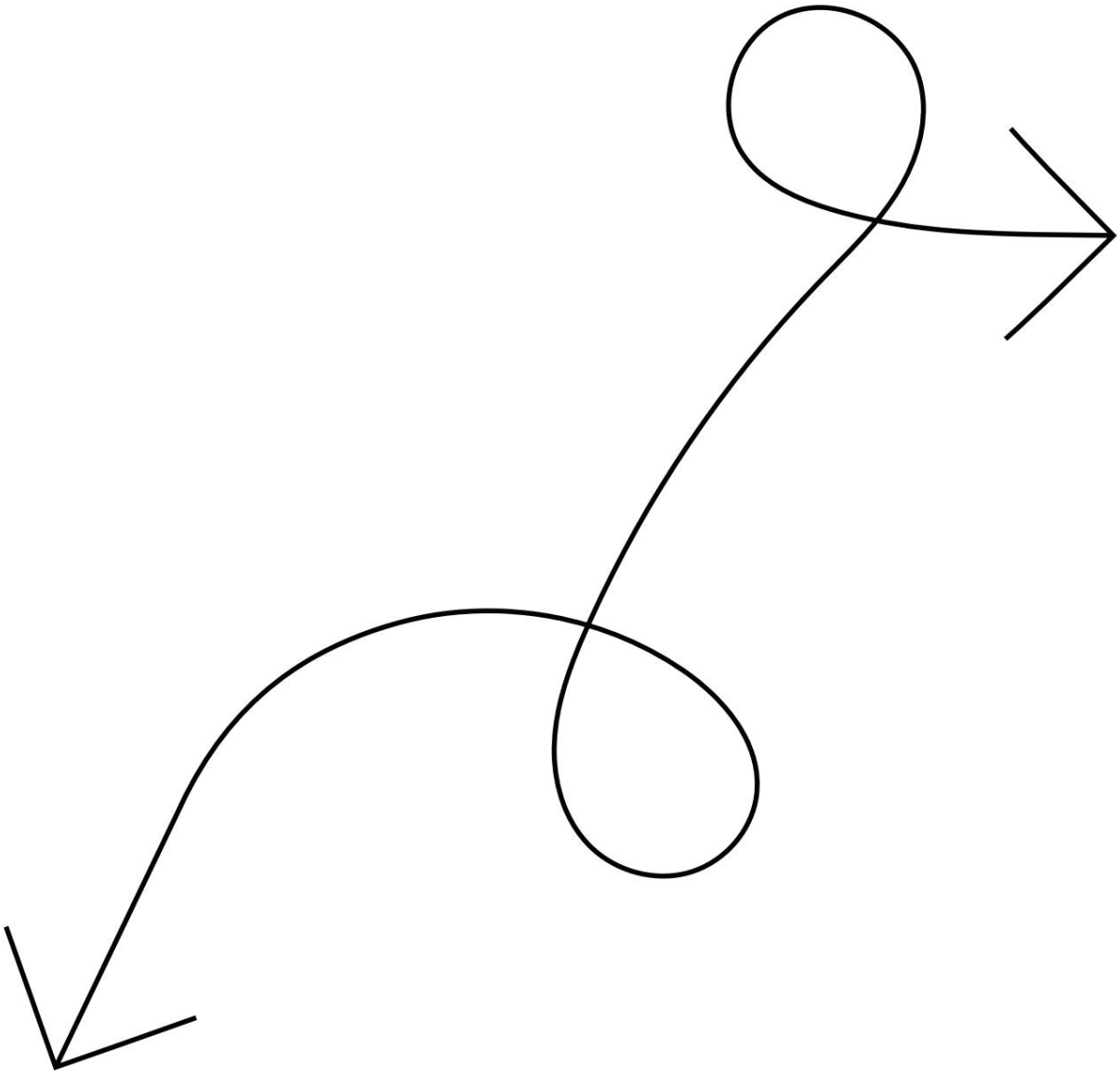
"In the construction sector, every ton of steel produces a ton of carbon dioxide. If one is to reach 'net zero', this carbon dioxide must be reduced to zero. But we still need steel. So the material issue is a large and technology-dependent part, which includes steel, cement and plastic. The other component that has a very large impact is energy production. Here, too, technology is of enormous importance, including through investments in smart electricity grids that provide better matching of production and demand and SMRs, i.e. small nuclear power reactors."

The use of 5G: When will it break through everywhere among companies?

“It is still early. Less than a third of our industrial customers are in the pilot stage or further along. Of the industrial companies, 40 percent plan to roll out 5G in at least one location within two years. So we're going to see significant progress in the coming years, that's something to keep an eye on."

The global tech race: Are the US and Asia running away from Europe?

"All hyperscalers in cloud technology are there.
It is a fundamentally enabling technology that attracts large investments. There have been some attempts to create alternatives in Europe, but in terms of leading technology partners they come from the US and to some extent from China.”



Servicing drives export opportunities

Sweden is a relatively small market, which means that Swedish companies must find attractive foreign markets in order to grow and be successful. The fact that Swedish tech companies - from startups and smaller IT consultants to global companies such as Ericsson and Spotify - have large sales abroad contributes strongly to GDP. It also makes it possible for Swedish households to consume an increasing amount of imported goods and services without Sweden building up a foreign debt.

Around a third of the tech industry's production value consists of exports. This meant an export value of SEK 346 billion in 2022, corresponding to 11 percent of Sweden's total exports.8 This means that tech products are one of Sweden's heaviest export segments.
At the same time, there is great potential to switch up future when, for example, the engineering industry still exports more than twice as much as the tech industry.

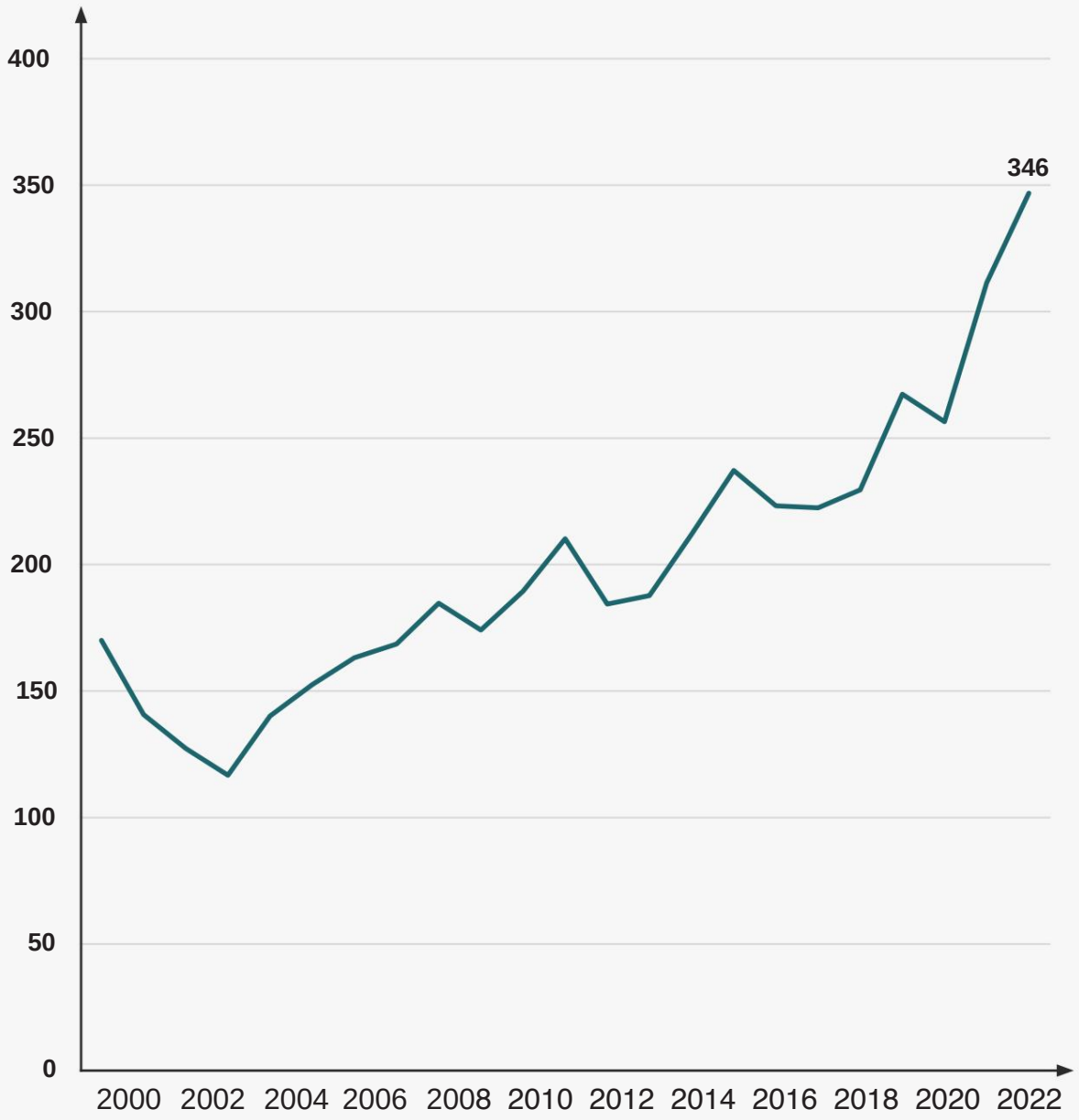
During the 2000s, it is primarily service production within the tech sector that has accelerated. This concerns, for example, services in mobile communication, software development, streaming services and game development. Since 2000, the growth rate for tech companies' service exports has been double-digit with an average growth of just over 12 percent annually, while goods exports have basically stagnated. Services have thereby gone from ten percent of the export value in 2000 to 61 percent in 2022. The new reality requires rapid knowledge development in the service area, but also for institutional regulations to adapt, for example to reduce barriers to trade in services.

8 Refers to the loss-adjusted export of goods corresponding to the SPIN15 codes 26.110, 26.120, 26.200, 26.300, 26.400, 26.510, 26.800, 58.290 and account item 9 (telecommunications, data and information services) within the export of services. According to Statistics Sweden, Sweden's total exports amounted to SEK 3,140 billion in 2022.

Diagram 6

Export of tech 2000-2022

Refers to both goods and service exports in billions of kroner, current prices.



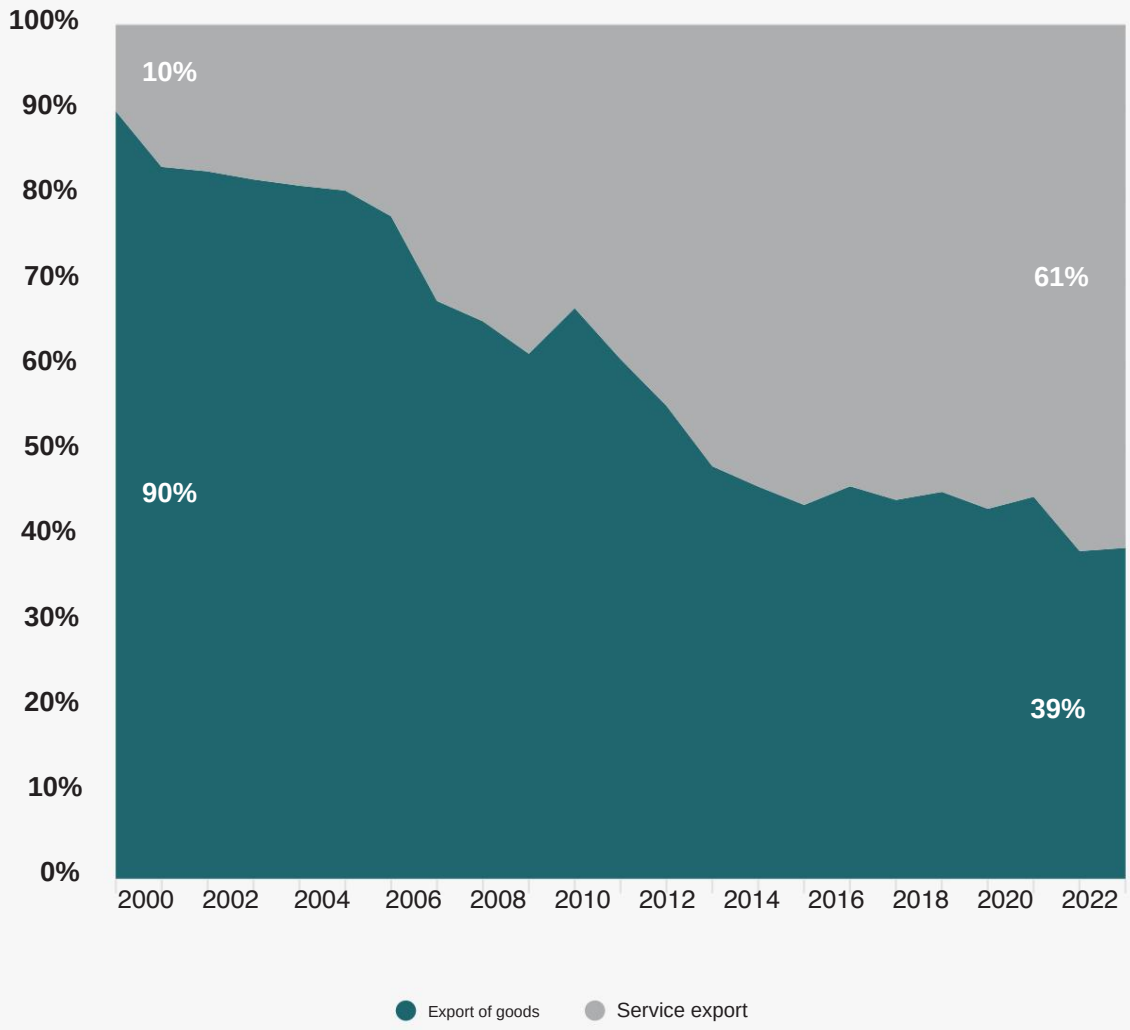
Source: Statistics Sweden's foreign trade statistics.

Around a third of the tech industry's production value is accounted for by exports. This means an export value of SEK 346 billion in 2022, corresponding to 11 percent of Sweden's total exports. Tech products are thus one of Sweden's heaviest export segments.

Diagram 7

Servicing of tech exports

Goods and services as shares of total tech exports

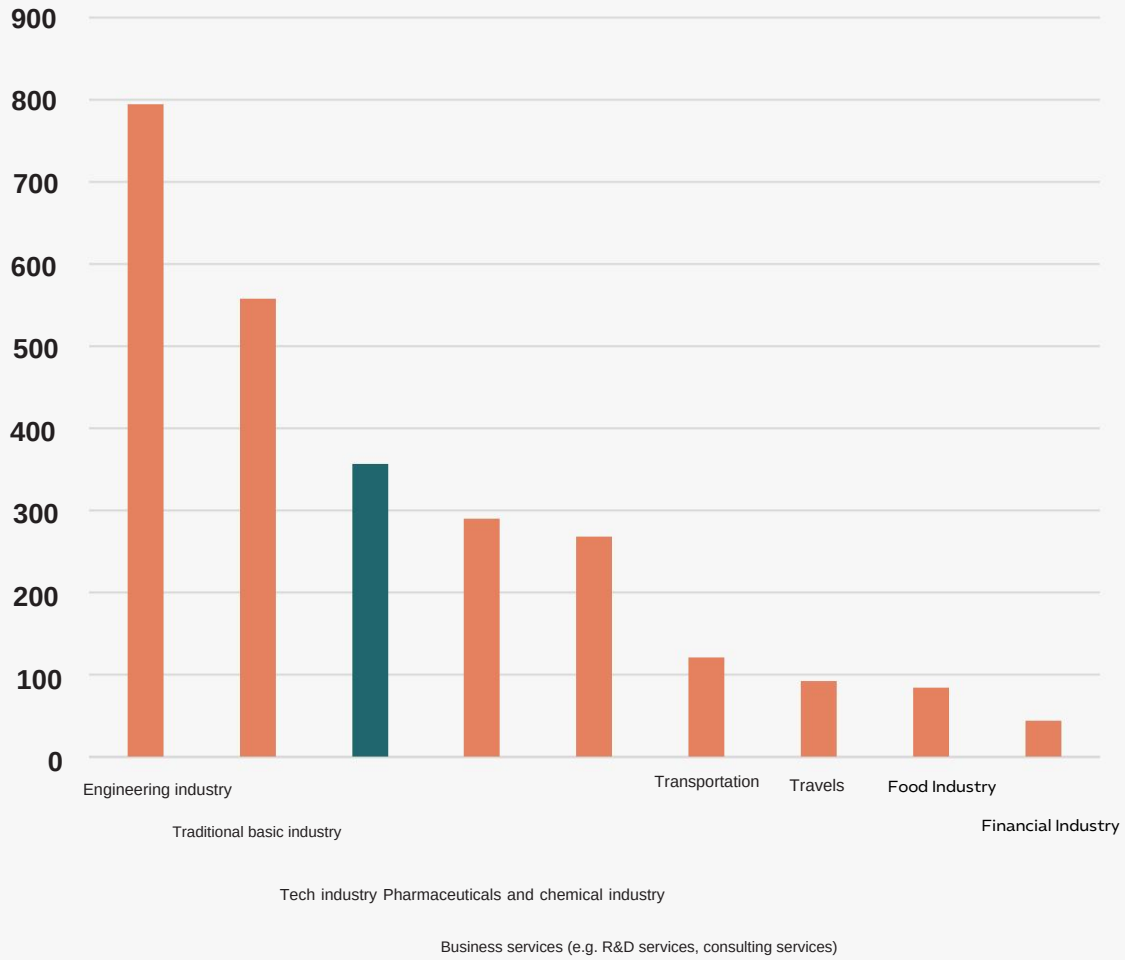


Source: Statistics Sweden's foreign trade statistics.

Diagram 8

Export value per industry9

In billions of kroner. Refers to the year 2022.



Source: Statistics Sweden's foreign trade statistics.

9 Definitions of several industries can be found in earlier footnotes, where the SNI codes here correspond to SPIN codes in the foreign trade statistics for goods. In addition to the industries mentioned earlier, the pharmaceutical and chemical industry is defined as export according to SPIN code 20–21 and the food industry according to SPIN 10–12. Within the framework of the service export statistics, transport is derived from account item 3, travel from account item 4, financial services from account item 7 and business services from account item 10.

Modern jobs for more than a quarter of a million people

In the tech industry, people are a central asset. In the second quarter of 2023, the tech industry employed more than 265,000 people, which meant an increase of 5.5 percent compared to the corresponding quarter of 2022. Since the pandemic year of 2020, 33,000 new tech jobs have emerged. The tech industry has thus created jobs at a rate that is 2.5 times faster than for the rest of the economy.

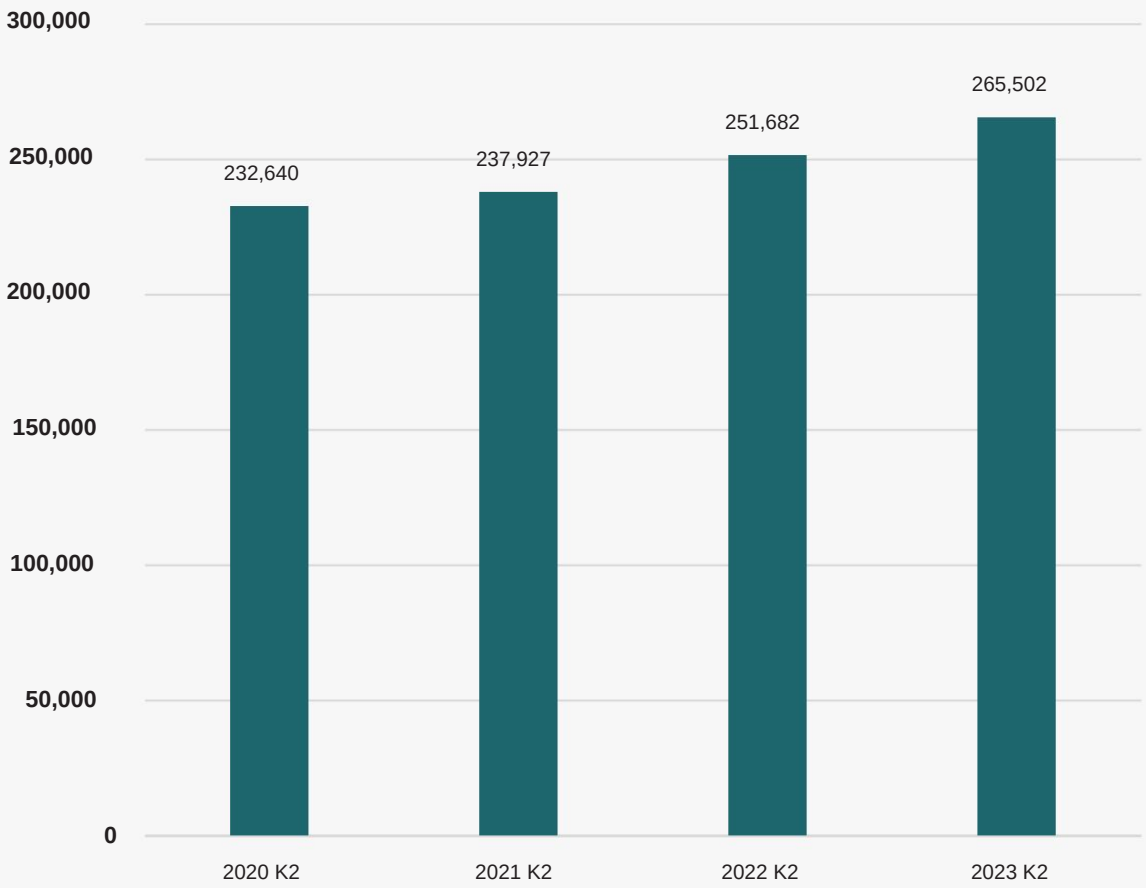
Those employed in the tech industry include employees as well as self-employed people. If you break down the numbers and focus solely on the number of employees, job opportunities have increased by 29 percent between the years 2007 and 2021, compared to 21 percent for business as a whole.

There are major challenges with the skills shortage in the tech industry. Many of the companies find it difficult to find the right workforce to grow, especially when it comes to filling roles with high demands on specialist skills. One reason is that the availability of skills has not increased at the same pace as the rapid technological development. The lack of competence is a major problem for companies as well as authorities and municipalities, which has increased the need to recruit international competence.

Chart 9

Number of people employed in the tech industry 2020-2023

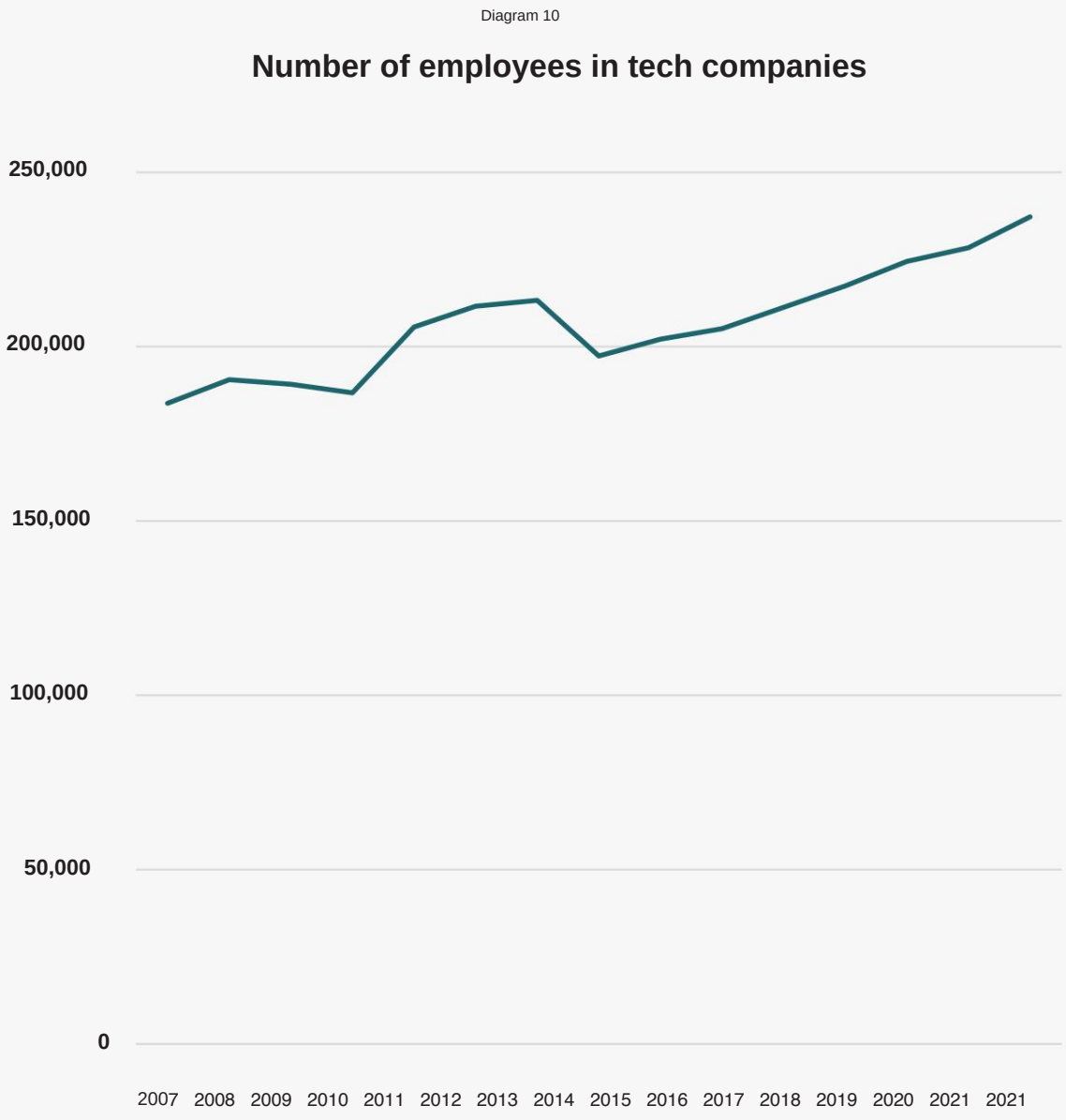
Number of employed persons during the second quarter for each year.
Refers to both employees and self-employed persons.



Source: Statistics Sweden The labor market status of the population

Since the pandemic year 2020, 33,000 new tech jobs have emerged. The tech industry has thus created jobs at a rate that is 2.5 times faster than for the rest of the economy.

Diagram 10



Source: Statistics Sweden, Business economics

INTERVIEW WITH ANNA KLEINE, CEO AT FELLOWMIND

Everyone's fishing in the same little pond.”

Fellowmind is a consulting company with its Swedish base in Malmö that helps other companies integrate Microsoft solutions into their operations. Managing Director Anna Kleine be-
stands out as an "ultrascan" from Ängel-holm who via a system science degree from Lund entered the tech scene in 1999, in the middle of the IT bubble's strongest fever pitch. A lot has happened since then. Anna Kleine vividly describes that the stereotypical image of "IT people as introverted math geeks who sit in a basement and drink Coke" is slowly being loosened:

"When I read a course in decision support systems on the system science line, the token fell - that this is going to be big. I remember when you were at dinner and told that you were working on it... People were dying of boredom! It has really changed. The industry has developed into something completely, completely fantastic with unimagined possibilities," she notes.

Does not notice the recession

Since her industry debut, Anna Kleine has gone from java developer to project manager, via sales as key account manager, global account manager and business manager up to CEO level. As CEO of Fellowmind, she has seen turnover increase by around 20 percent per year and profitability doubles in just a few years. The company has not yet felt that there is a low economy.

"Our industry is extremely fortunate in that the digital transformation is a way for companies to prepare for the future, to stand on the podium for both downturns and booms. They empty the piggy bank to invest in future-proofing their operations, reducing costs through automation and efficiency. So no, right now we are not directly noticing the recession.”

Human reality cannot keep up with technology

Anna Kleine describes the tech sector - despite all the challenges - as "hot". But the fact that paradigm shifts such as AI drive productivity development creates more than just opportunities. Anna Kleine tells us that another industry company asked the question of how many colleagues used ChatGPT in a work context. Three out of four raised their hands.

"For example, some companies use ChatGPT to write quotes. What everyone may not think about when using that service is that all data becomes public. The industry urgently needed to come up with some kind of standard or recommendation in this kind of matter, and set limits on what kind of data is okay to use in different AI services.”

The development of technology has therefore to some extent run away from the reality that people live in. This is also noticeable in the competence issue. As digitization penetrates more and more into homes and businesses, a broadening of the skills base is required and that companies like Fellowmind reach groups that have never previously considered looking for a job in tech. Every second recruit at the company and every third employee in total is a woman, but Anna Kleine sees that the industry needs to expand in many more ways than that.

"The tech industry needs to attract significantly more women, but also new employees who come from completely different industries. Or people who possess deep industry knowledge. Our industry would have to achieve that brewing to a much greater extent than today. Right now, everyone is fishing in the same small pond.”

Anna Kleine
CEO at Fellowmind

Three quick questions for Anna Kleine about...

The cyber security threat: how does it affect you?
"Those who want to do harm are becoming increasingly sophisticated. For example, they send emails to our economics department that should be from me as CEO. The emails are becoming more and more similar to how I actually communicate, which is unpleasant. Many have probably become less cautious over time and the criminals take advantage of people's habitual behaviour. It is very difficult to find security experts today, but in general we have to face the threat with knowledge and training".

Myths about the tech industry: what you want to debunk?
"That women are forced to work harder and receive lower wages. I have been in the business for 25 years and I absolutely do not think so. People are surprised said that the percentage of women in leadership positions is so low or that venture capital does not go to women, but it is not so strange if there are not that many. Instead, we should highlight how fantastic the industry is so that more people want to start."

The relationship between machine and man: how to understand it?
"With new efficient systems, automation and AI, people can be panicked to lose their jobs. You have to respect that. Therefore, it becomes a matter of management to help their employees, be honest with them and be prepared with further retraining so that they may be able to work with more qualified tasks than they did before."

Growth that benefits the entire country

The development of technology and the progress of **the digital economy leave a wide impression throughout the country**. Since 2000, the regional growth contributions from the tech industry have increased sharply in all 21 counties of the country. Viewed over these two decades, value added has grown fastest in Östergötland and Örebro counties, with increases of 427 and 325 percent, respectively. In this context, it should be borne in mind that the comparison is based on a relatively narrow definition of the tech industry. The growth of county-specific tech clusters that fall outside the statistical framework can in some cases be significant.

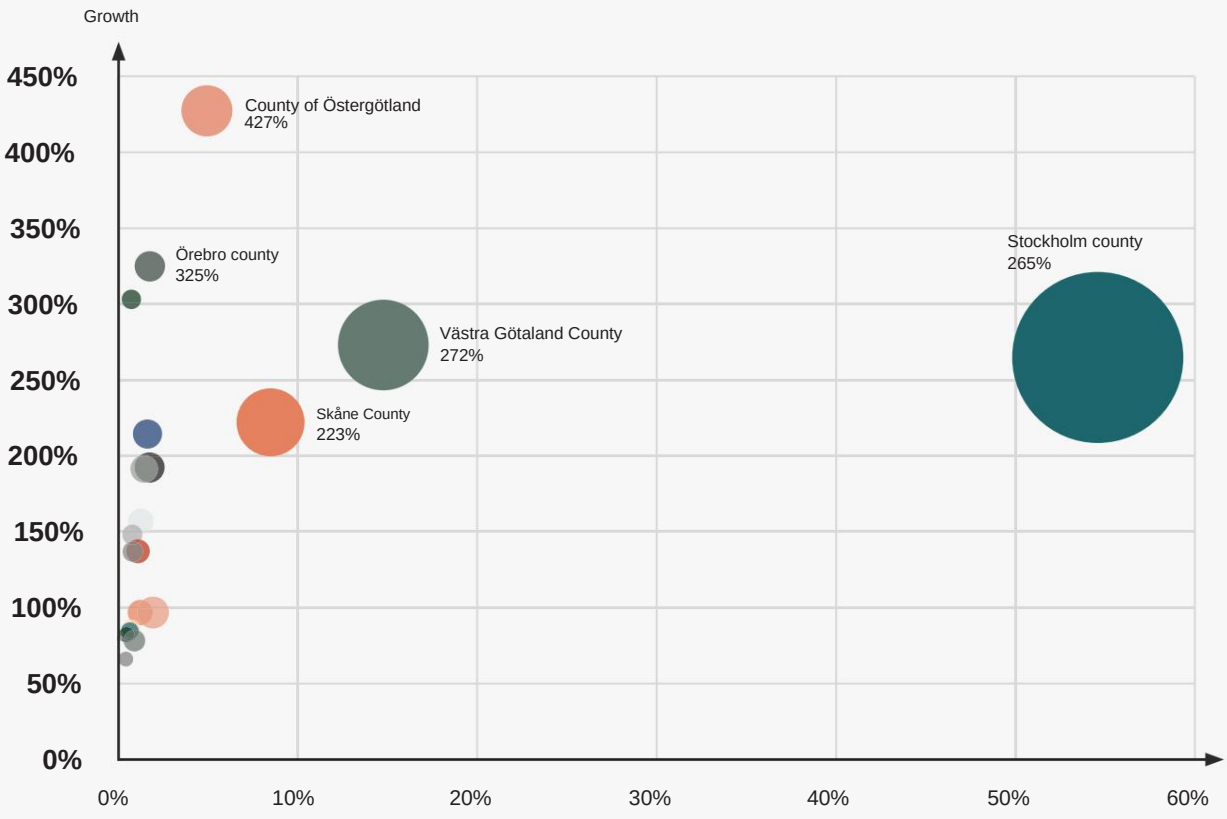
The country's big cities are natural hubs that attract both competence and capital. The three metropolitan counties (Stockholm, Västra Götaland and Skåne) account for roughly three-quarters of the national growth grant, which can be compared to the fact that roughly half of the country's population lives in these counties. The clustering around tech is particularly clear in Stockholm County, which accounts for just over half of the GDP contribution.

Since 2020, employment in tech has increased the most in Jönköping County, by as much as 42 percent. In second place we find Kronoberg County, which has increased by 22 percent, and in third place Skåne, which has increased by 19 percent.10

Diagram 11

Growth in tech 2000-2021 and share of the tech industry's GDP contribution

The growth refers to value added in current prices. Refers to companies classified by industry code as SNI 61-63. See appendix 1 for more county figures.



Source: Statistics Sweden Regional Accounts

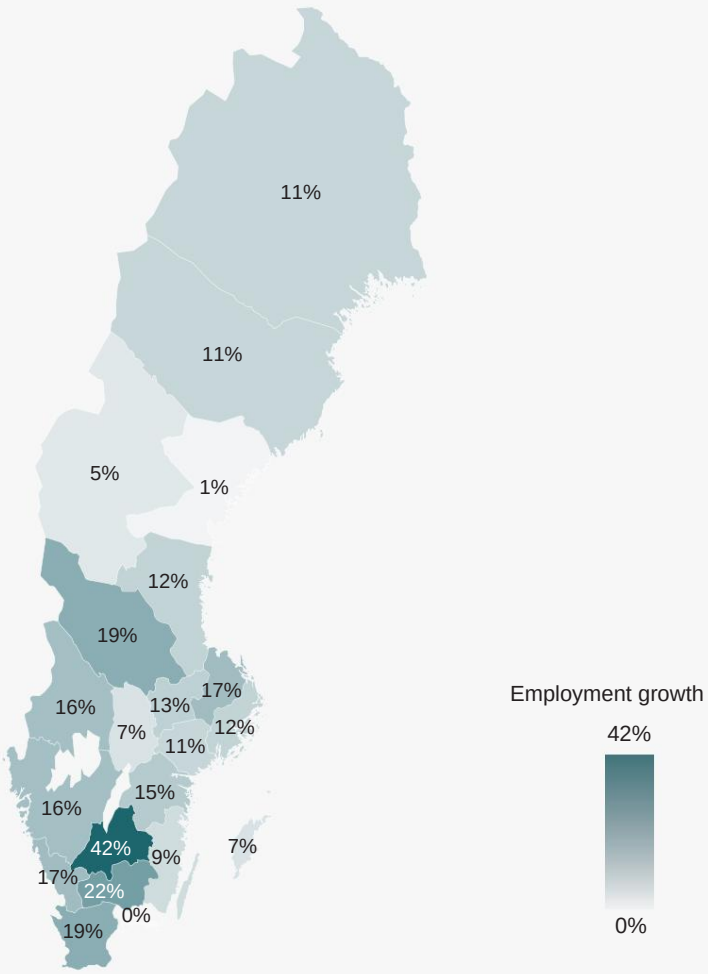
10 The expansion or new establishments of individual players sometimes have a significant effect on the regional figures. One reason for Jönköping's close position is, for example, that the solar cell supplier Sesol - headquartered in the region - grew from low levels to over 1,000 employees during the period.

Since 2020, regional employment in tech has increased the most in Jönköping County, by as much as 42 percent, followed by Kronoberg County, which has increased by 22 percent, and Skåne, which has increased

Diagram 12

Regional employment development 2020-2023

Growth in the number of employed people in tech, between the second quarters of the above three-year period. Refers to both employees and self-employed persons.



Source: Statistics Sweden, Labor market status of the population

Swedish patent applications in electrical engineering have increased from approximately 300 in 2011 to nearly 500 applications in 2022. The increase is mainly driven by activity in the subcategories digital communication technology, computer technology, telecommunications technology and elec

Innovation, prosperity and quality improvements

A core task for tech companies is to create value through innovation. Innovation can lead to the creation of completely new products or processes, alternatively to an improvement of existing products or processes. In this way, productivity in the economy and prosperity for consumers often increases. Innovations increase the range of available products, the quality of existing products or lower production costs.

A variable that gives an idea of the pace of innovation in the economy is the number of patents and patent applications. However, it should be borne in mind that not all innovations can be patented, for example program code for software. In terms of the number of patent applications in relation to the population, Sweden ranks eighth in the world (in 2021), with 645 applications per million inhabitants. Hay- at the top of the list are countries such as the USA (790 applications per million inhabitants), Germany (also 790), China (1,010) and Japan (1,770). However, all these countries must see themselves clearly distanced from South Korea, which peaks at 3,599 patent applications per million inhabitants.11

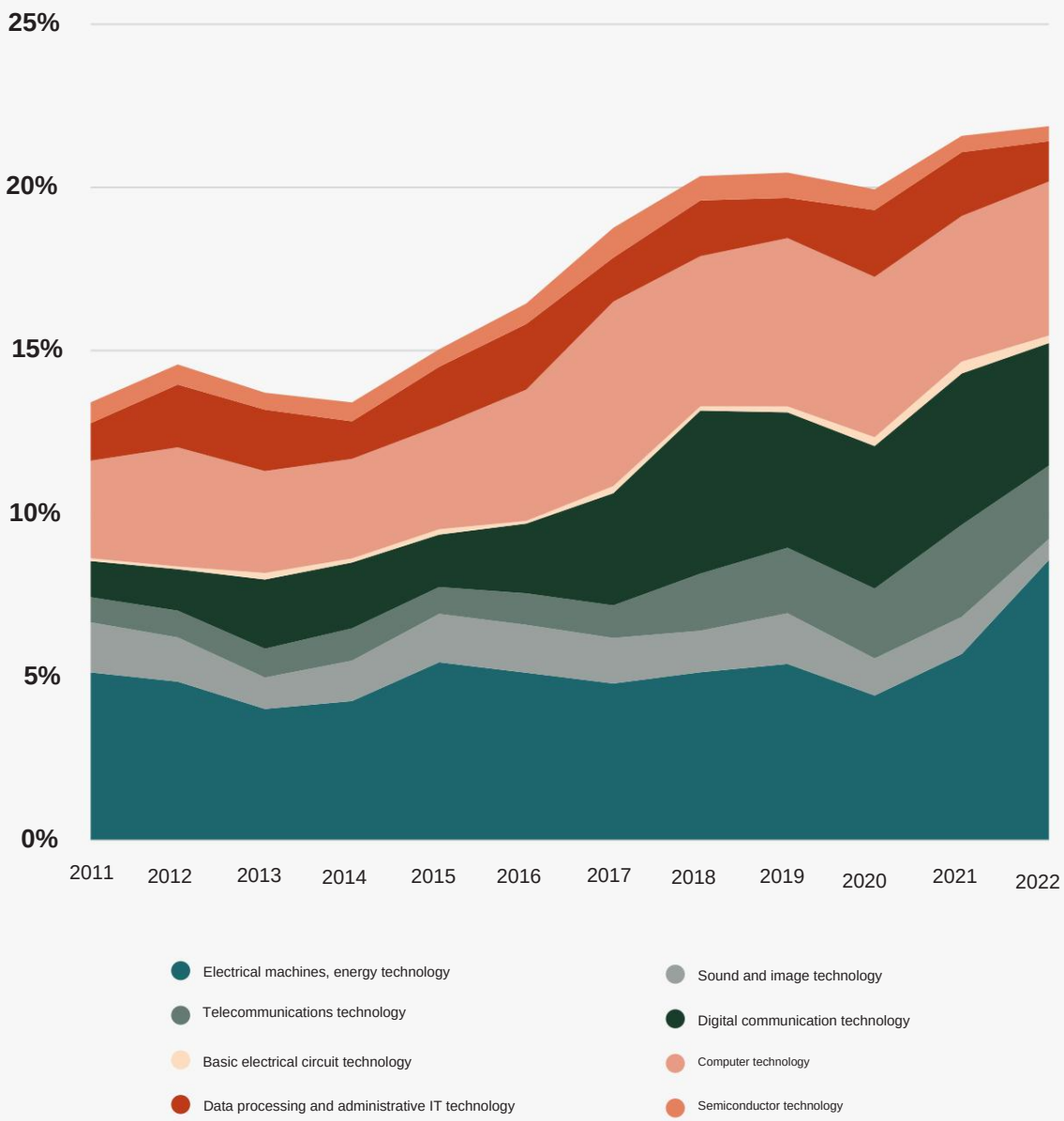
The patent field that overlaps the most with tech companies' operations is electrical engineering. Swedish patent applications in electrical engineering have increased from approximately 300 in 2011 to nearly 500 applications in 2022. This corresponds to an increase in the share of total patent applications from roughly 13 percent in 2011 to around 22 percent in 2022. The increase is primarily driven by activity in under- the categories of digital communication technology, computer technology, telecommunications technology and electrical machinery/energy technology.

11 Source: WIPO. The figures refer to the year 2021.

Diagram 13

Patent applications in electrical engineering 2011-2022

Share of the total patent applications



Source: The Swedish Patent Office

A major overhaul is required if Sweden is to be able to live up to its brand and not lose further ground as a leading force in tech.

Other countries run much faster than Sweden

Sweden has one of Europe's largest tech sectors in relation to the size of the economy. This means that there are many structures that work well, but Sweden is nevertheless losing momentum in relation to the outside world. Growth in tech has de facto been clearly lower in Sweden than in many competitor countries lately, both in and outside Europe.

In a comparison of the growth of the tech industry in 30 European countries between 2015 and 2020, Sweden ends up in fourth place from the end. The list is topped by Cyprus (+119 percent), which recovered from a banking crisis during the period and which has since attracted large investments, among other things through low corporate taxes. In addition to low taxes, Bulgaria and Romania have good access to IT skills at competitive labor costs. The Baltic countries also end up high on the list with purposeful investments in simplified company administration, IT training and special incentives for the startup sector. Not only Eastern Europe is running away from Sweden in the growth league. Even completely comparable economies such as Denmark, Finland, the Netherlands and Austria grew more than twice as fast as Sweden during the period in question.

As if it were not enough that Sweden is losing momentum in relation to other European economies, Europe is also losing momentum in relation to the USA and Asia. An example is that close to 60 percent of all external financing (that is, capital acquired outside the company such as venture capital or operating credits) for 5G investments goes to China, while 27 percent goes to the United States and only 11 percent to Europe. In the AI area, the USA has a share of 40 percent, Asia including China has 32 percent and Europe 12 percent.12

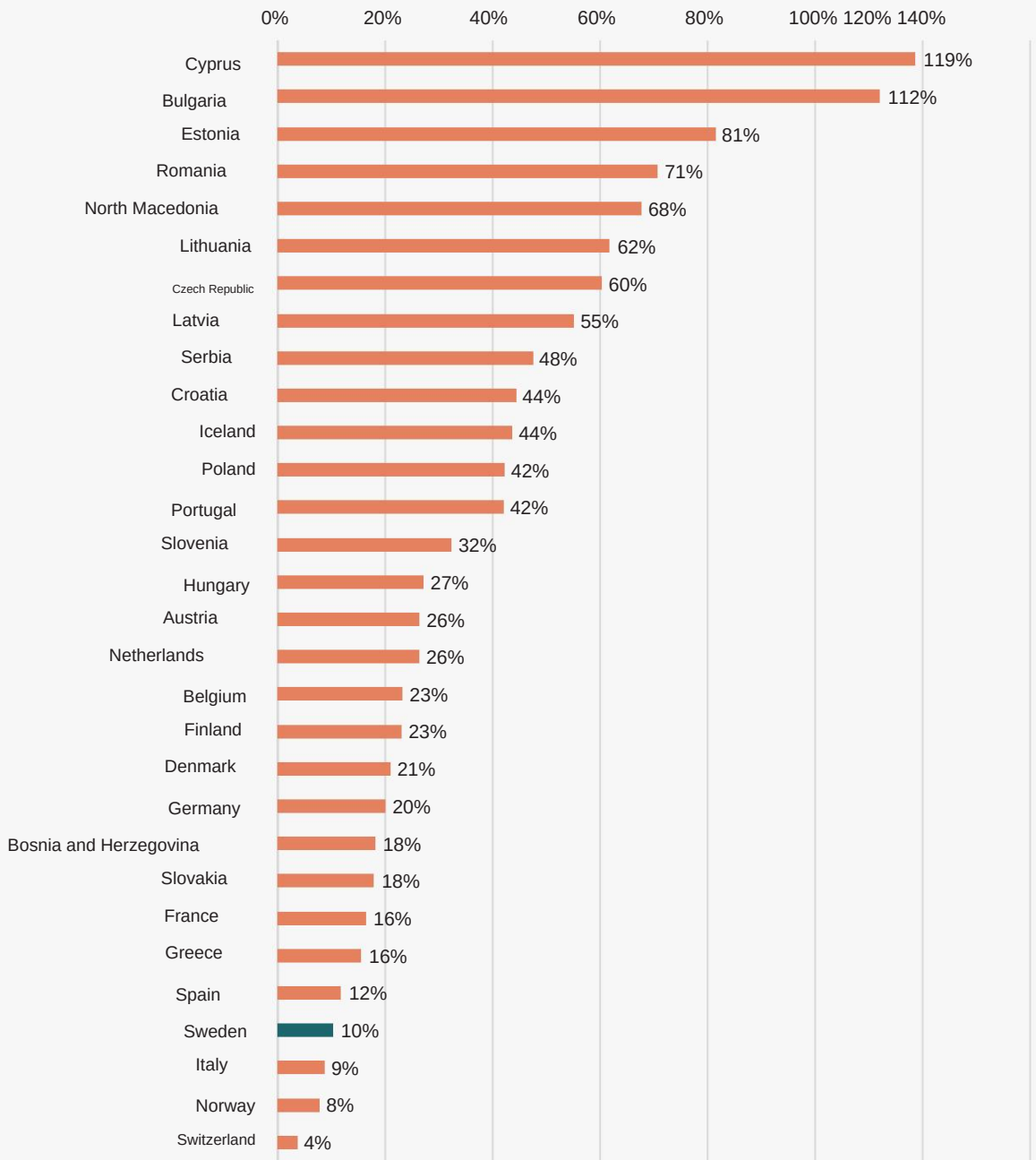
Both labor and capital are today more mobile across borders than ever before. Therefore, a major overhaul is required if Sweden is to be able to live up to its brand and not lose further ground as a leading force in tech.

[12] McKinsey Global Institute (2022).

Diagram 14

Growth of the tech sector in European countries 2015-2020

Refers to value added from companies classified within SNI 26 or 61-63.



Source: Eurostat

"Sweden has it in its DNA."

Recession, cyber threats and a Sweden that has fallen behind in 5G. When Haval van Drumpt, CEO of Tre Sweden, looks out over the tech horizon, he sees enormous challenges. Yet his attitude is characterized by confidence, grounded in the enabling power of technology and in the fact that problems can be overcome with national self-awareness, stronger visions and action.

Only the imagination sets limits

Haval van Drumpt speaks of the mobile phone as a "remote control of life" that enables everything from banking and government affairs to opening car doors. Previous stories have been about remote surgery using 5G, where the star surgeon operated from Singapore on a patient in Kiruna. 5G already has extensive industrial use and consumer use is increasing rapidly.

At Tre, AI-based customer interfaces are used which, under the Tre and Hallon brands, can serve 10,000 customers – at the same time.

"Today, technology has come so far that it in itself no longer constitutes an obstacle to what we want to achieve. Now we have to create strategies and services ourselves to streamline and digitize Sweden."

On 5G we are not even close

The issue of deployment and increased use of 5G is naturally a hot issue for Tre. 5G not only enables greater and faster data transfer than before, but operational reliability that enables the automation of many processes within, for example, industry and the healthcare sector. Where-because it is serious for Sweden as a nation that Sweden is far behind other countries in 5G expansion and connectivity. South Korea decided early on that it would be the best at 5G when it came to how much and how quickly the network would be expanded, where business and the public sector were interrelated and had a clear deadline for opening the network. There was never a similar plan in Sweden, which still hurts us.

"Sometimes we lean back on old merits. On 3G we were a leading nation, on 4G we were 'on par' with other European countries, on 5G we are not even close. It is too bad for a proud telecom nation like Sweden."

More action and bigger visions

During the 3G and 4G era, Sweden attracted the best competence from abroad but also within Sweden. Stockholm was deliberately made a home for "internet, music and design at the forefront". Everyone understood that Sweden had a well-developed, modern generation of telecom to offer. That in turn made the greatest talents come here to research things. According to Haval van Drumpt, Sweden now needs to regain its place among the stars, with more action and bigger visions:

"We must be in tough times right now. But we have always made it through difficult times and come out stronger. We must dare to say that we will be a superpower in IT and telecoms matters. Unfortunately, I don't think we've decided yet... But it's in our DNA!"

Haval van Drumpt
CEO at Tre Sweden

Three quick questions for Haval van Drumpt about...

The recession: how is it affecting you?
"We notice it, of course. A large part of the calls to customer service are about invoice questions and people want to ensure that they have the right subscription. We have our tentacles out and notice that the rush to shops and the demand for some services has decreased, but telecom is grateful as everyone needs a mobile phone."

AI: will we lose our jobs?
"New technology always raises voices that the technology is dangerous to life and concerns that all jobs will disappear. Now, instead, we have completely new jobs such as social media managers, web developers and drone pilots. The risk is that when the US, China and India wants to win the AI match and is very innovative and business minded, so the EU is betting on winning the regulatory match. It's like playing a game where the goal is for the referee to win."

The cyber security threat: what should be done to counter it?
"We must help each other. A hub is needed for anonymized information sharing about security threats, especially for companies in critical infrastructure such as electricity, banking, telecom and water. Second, the competence issue. What if Sweden decided to be a focal point for cybersecurity competence or cyber defense?"

CHAPTER 2

Theme:
Can digitization increase productivity growth?

Mårten Blix* August 2023

In this chapter, Mårten Blix gives - file. dr in economics - a thematic deepening in what productivity is, how it has developed over time and the effects of digitization and new technology on productivity growth. The chapter also touches on how digitization can be a stabilizing force in times of economic headwinds and who they are the real effects of technology on employment. The chapter concludes with a summary and discussion of policy implications.

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1. Introduction: Why is productivity growth important?

Productivity is about how much result we get from our resources. Correspondingly, productivity growth is about improvements over time (see fact box page 39). Or more directly, to do more with less.

Much has been written about productivity growth because it is central to long-term economic development. Without growth, the country's prosperity does not increase and society does not become richer. With good productivity growth comes many of the advances that have increased men's living standards and extended the average the lifespan. Rising productivity is also a prerequisite for wages to increase. Although high productivity growth is not a guarantee for a good society, it is a necessary condition for a continued rise in standards and prosperity.

The improvement takes place through the fact that the growth over the decades gradually leads to a higher standard of living. An illustrative example of this is given by comparing the development of South Korea and South Africa. In the end of In the 1980s, both countries had roughly the same gross national product (GDP) per capita, but three decades later, South Korea is about three times richer than South Africa, as a result of good and stable growth driven by strengthened institutions and strong technological development .

Unfortunately, productivity growth has slowed down, both in Sweden and abroad, measured as the total production (i.e. GDP) per hour worked, see Diagram 15. It is worth noting that the decline began a few years before the financial crisis of 2007–2009 , which however further diluted the weakening. For Sweden, the reduced labor productivity was particularly noticeable. Compared to the beginning of the 2000s, Swedish productivity growth in 2022 is roughly halved.

When productivity growth is combined with the change in the number of hours worked, GDP growth is obtained, and it too has developed weakly. Sweden even had the second lowest GDP growth of all EU countries in 2022.13

13 Eurostat (2023). March 8th.

Diagram 15

Labor productivity growth, 1975-2022.

GDP per hour worked, five-year moving average of annual changes.

Source: OECD

Another concept is also often used to understand growth and its driving forces, the so-called total factor productivity, abbreviated TFP (see fact box page 39).
Roughly speaking, this measure can be said to capture the effect of the economy's aggregate improvements over time. TFP does not exist as a separate statistical series from the statistical authorities, but must be calculated through a number of assumptions. A study from the government agency Tillväxtanalys shows that digitization accounted for almost half of the increase in TFP during 2006–2013.14 A report published by the European Central Bank (ECB) shows that even TFP's growth rate has slowed down in Sweden and other countries compared to the rate of increase during the 1960s, see diagram 16.

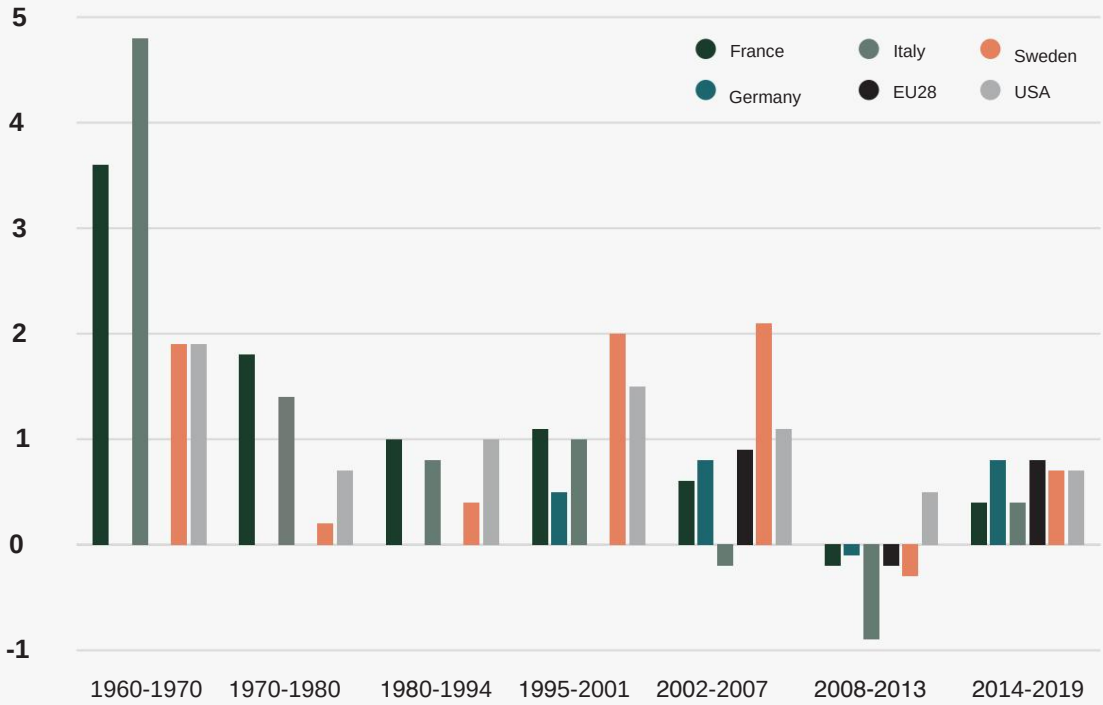
The effects of weak productivity growth become dramatic over time. During the period 1960–1970, Sweden's TFP increased by almost 2 percent per year, but in recent years the rate of increase has fallen to just under 1 percent during the period 2014–2019 according to calculations from the ECB.

The effect can be illustrated by using these two different growth rates in a simple calculation example. Over a period of 30 years, 1 or 2 percent growth per year leads to a level improvement of approximately 35 and approximately 80 percent, respectively, through an "interest-on-interest" effect. In other words, the higher growth means that a country's production increases more than twice as much. For South Korea, as mentioned above, this has meant the country climbing out of poverty and becoming a rich OECD country.

It happens that politicians try to "talk up" productivity. It is true that productivity largely depends on policy and measures we ourselves have at our disposal. But there are also other trends and changes that affect development. Unfortunately, better productivity growth is not something simple that can be ordered by prescription or achieved with the push of a button. Instead, it is about structural reforms to strengthen the way the economy functions. The measures often take time to implement and have an effect, questions we will return to below.

Diagram 16

Development of total factor productivity 1960–2019



Source: ECB (2021). "Key factors behind the productivity trends in EU countries." European Central Bank. Occasional Paper. no. 268. P. 150.

14 Growth analysis (2014). "Digitalisation's contribution to growth and competitiveness in Sweden." The authority for growth policy evaluations and analyses. Report 2014:13.

FACTS

What is productivity growth and how is it measured?

Productivity is the relationship between resource input in production and the production result. The greater the production result, the added value, in relation to the resource input, the more efficient the production. Productivity is measured by relating value added, the value of what is produced, to the number of hours worked. If the production creates a large value per working hour, the productivity is high and vice versa.

In order for work productivity to increase, work must be carried out in a more efficient manner than the year before. Aggregate productivity can also increase if demand and output shift from industries with a lower level of productivity to industries with a higher level of productivity. In modern times, productivity improvements and growth are often taken as an obvious part of development, but this is not the case in a longer perspective. Economic historical research shows that growth in the world was close to zero until the beginning of the industrial revolution in Great Britain during the 19th century.15

Innovations can drive productivity growth for many years, but sooner or later new technology or work methods are required to maintain the annual improvements. The classic example of increased work productivity is automation in industry, where robots have successively replaced humans over several decades. With increased digitization, robots become cheaper and more versatile, while humans avoid many repetitive work steps. In modern mines, for example, mining is controlled from the surface by remote-controlled robots, and humans do not have to perform what were previously dangerous and heavy work steps.

However , **labor productivity is affected** by a large number of factors. In order to better understand what drives productivity, there is therefore an additional measure. A more specialized concept that is often used is the so-called multifactor or total factor productivity (TFP). Sometimes beg- it is also referred to as the Solow residual because it is defined as the part of GDP growth that cannot be explained by the development of capital or labor. With a few assumptions, it is possible to divide labor productivity into how capital is used ("capital deepening"), capacity utilization and TFP.

Both labor productivity and TFP are affected by several common factors such as technological development, regulations, infrastructure, economic uncertainty, demographics, workforce skills, management and education. Productivity development also varies over the economic cycle. Because employers often choose to keep staff in a recession when production, and thus also productivity, drops.

There is extensive literature on this. 16

The fact that productivity is driven by many factors means that good measurements are required to interpret the development. For this, the national accounts are used, and especially GDP. GDP measures the value of all production within the economy and was developed in the 1940s, partly as a way of measuring the production of war materials.17 It is therefore a measure that captures the aggregate activity of the econor GDP is a good measure because it is universally accepted and calculated by independent statistical authorities.18 However, it is not a perfect measure that can be used for anything, for example the direct damage effects on nature or the environment are not measured.

It is also important to note that digitization has brought difficulties in terms of measuring and interpreting the development. BNP only measures goods and services where there is a price, but several digital services are free of charge – e.g. e-mail and social networks.19 Instead, consumers pay indirectly by approving that personal data is used, for example, for marketing. That there are measurement problems is undisputed, but that it would explain the decline in productivity growth is unlikely.20

15 Calculations from the so-called Maddison project are often used here. For a short description see Blix, Mårten (2015). "Productivity growth - threats and opportunities." Economic Debate. No. 5. Volume 43. S. 56–66.
16 For an overview, see Blix, Mårten (2015). "Productivity growth - threats and opportunities." Economic Debate. No. 5. Volume 43. S. 56–66. See also Syverson, Chad (2011). "What Determines Productivity?" Journal of Economic Literature. 49:2. pp. 326–365.
17 See e.g. Coyle, Diane (2015). GDP – A Brief but Affectionate History. Princeton University Press. For questions about how TFP is measured in OECD countries, see e.g. Égert, Balázs (2017), "Aggregate multi-factor productivity: Measurement issues in OECD countries." OECD Economics Department Working Papers. no. 1441, OECD Publishing, Paris.
18 See e.g. Sichel, Dan (2019). "Productivity measurement: Racing to keep up." Annual Review of Economics. Vol. 11. pp. 591–614.
19 See e.g. De Loecker, Jan and Chad Syverson (2021). "Chapter 3 - An industrial organization perspective on productivity." in Handbook of Industrial Organization. Vol. 4, Issue 1. pp. 141–223.
20 See e.g. Syverson, Chad (2017)."Does mismeasurement explain low productivity growth?" Business Economics. Vol. 52, issue 2, No. 3, pp. 99–102.

2. Why has the productivity growth rate decreased despite digitization?

That the productivity growth rate falls is serious because productivity is so central to increased prosperity. It is therefore important to understand what can explain the development and which policy measures could reverse the development.

However, there is no consensus as to why the growth rate has slowed. Roughly simplified, one can distinguish two camps regarding the view of the importance of technology, optimists and pessimists. Robert J. Gordon at Northwestern University is one of the more vocal technology pessimists. In a book and other writings, he argues that the technological achievements made during the industrial revolution and during the 20th century had far greater significance for economic development than today's technological development and digitization.21 More concretely, Gordon believes that inventions such as the car, airplanes and not least electrification meant a growth journey that cannot be repeated. "We wanted flying cars but got 140 characters instead" is entrepreneur Peter Thiel's summary of the problem. Gordon believes that the slowdown in GDP growth is explained by five macroeconomic headwinds: 1) demographics and the aging population; 2) high public debt, 3) reduced returns on education, 4) environmental costs and 5) reduced returns from outsourcing.

There is hardly any doubt that its headwinds dampen economic development. Global warming leads to more natural disasters and human costs around the world. For example, record-high temperatures have been measured during the summer of 2023 and affected the populations of many countries.22 Even when it comes to demographics, there are clear negative effects on GDP. In Japan, with the world's oldest population, the number of residents is declining as the birth rate is low and life expectancy is increasing. More people of non-working age mechanically mean fewer hours worked, which contributes negatively to GDP growth and to GDP per capita (headwind 1). Although Japan has the world's oldest population, many other OECD countries, including Sweden, are not far behind in the demographic challenge.23

The aging population and demographics can indirectly impair the economy's productivity development by impairing the transfer of job-specific knowledge on the labor market between generations (far-re young people who will take over from large retirements). However, the effect is not clear-cut. The effects can be counteracted if, for example, companies improve working methods and make better use of new technology and digitization. The other headwinds in Gordon's list may have a more direct negative effect on productivity growth.

There are also technology optimists who argue that there are tailwinds in technological development that can counteract the drop in productivity. The technology optimists are a multifaceted group and do not have the same self-assured representatives from academia. Two researchers who, however, early discussed the possibilities of digitization and can be contrasted with Gordon are Eric Brynjolfsson and Andrew McAfee, perhaps especially in their book from 2014, The Second Machine Age. In the second half of the 2010s, a wave of research on digitization began and scores of studies were published. A little simplified, you can say that there are at least three forms of objection to technology pessimism:

- Digitization leads to improvements in all aspects of the economy, but the achievements are not measured correctly in the national accounts.
- It takes time for digitization to have a full impact on productivity, in the same way as electrification and other significant technological advances.
- Digitization's gains are dampened by red tape and obstacles to scaling up operations, not least in the service sector.

It is worth noting that all the above-mentioned arguments have a bearing on the final effect on productivity growth. The question, however, is how big the various effects are and over what period of time. The technology optimists have many good arguments, but still face an educational uphill battle because productivity growth is actually low, see diagram 15 (page 36).

However, it is possible to reconcile the arguments of technology optimists and technology pessimists. The macroeconomic headwinds weigh on productivity but can be counteracted by digitization over time. The extent to which this happens depends on the innovations that are made, how they are spread and, above all, on how decision-makers develop the regula

21 Gordon, Robert J. (2017). The Rise and Fall of American Growth. Princeton University Press.
22 High temperatures can be dangerous for health but also have a direct dampening effect on work productivity, see e.g. Lai, Wangyang, Yun Qiu, Qu Tang, Chen Xi and Peng Zhang (2023). "The effects of temperature on labor productivity." Annal Review of Resource Economics. 15. 11.1–11.20.
23 See e.g. Blix, Mårten (2013). Future welfare and the aging population. Partial investigation by the Future Commission. Ds 2013:8. Government Office: Cabinet Committee.

3. How can digitization counter the macro-economic headwinds?

Digitization is one of several tools. Just like other tools, digitization can be used in good or bad ways. In step with increased digitization, several disadvantages have had extensive consequences on the rest of society, including increased political polarization through social networks, fake news, digital exclusion as well as fraud and cyber attacks. It is important to reduce these risks as far as possible without hindering digitalisation's opportunities to support economic development. It is primarily through two channels that digitization affects the economy. By

- streamlining existing work processes and methods there
- create new services that were not previously possible.

The effects of digitization can be discussed based on many dimensions24 but it is practical to start from an economic model in which GDP is created through the way in which capital and labor are combined.25 Digitization leads to capital being used at a lower cost and to improvements in many work steps.

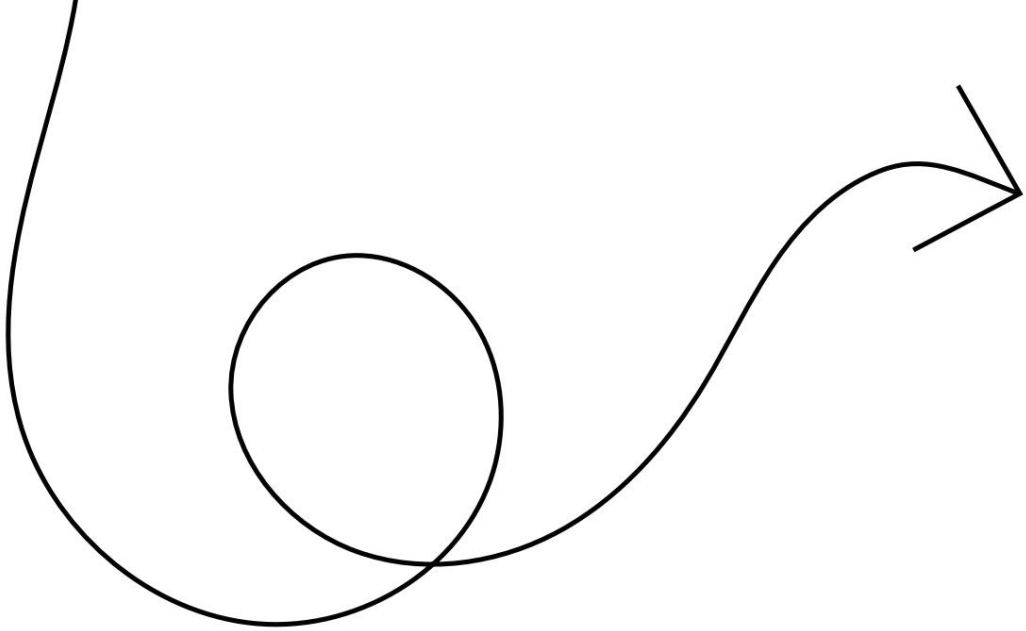
Digitization leads to lower capital costs

It can perhaps be seen as somewhat paradoxical that IT can lower capital costs. Today's technology has, after all, required extensive IT investments in business over the years. Even the latest successes in AI with ChatGPT from Microsoft, Bard from Google and others. has required billions of investments and not least extensive energy costs to cope with the heavy calculations required to calibrate and use the models.

However , **for many small and medium-sized companies,** not least in the service sector, digitization has reduced the costs of starting and running companies. Even sole proprietorships can rent tools at a relatively low cost to build and provide an advanced website, offer sales, payment services and provide carry out targeted marketing. The company can also rent computing power to analyze data and carry out sophisticated analyzes in the cloud.26 The improvements occur in many business activities, in everything from architectural services to agriculture. With modern IT tools, even small companies can scale up operations at low cost and reach markets - nationally and internationally - that previously involved large costs. In summary, digitization has significantly reduced the capital requirement required to conduct business in many industries, especially in the service sector. Even small companies with few employees can use digital tools to manage operations that were previously the preserve of large companies.

The improvements occur in many business activities, in everything from architectural services to agriculture. With modern IT tools, even small companies can scale up operations at low cost and reach markets – nationally and internationally – that previously involved large costs.

24 See e.g. Adler, Gustavo, Romain Duval, Davide Furceri, Sinem Kiliç Çelik, Ksenia Koloskova and Marcos Poplawski-Ribeiro (2017). "Gone with the headwinds: Global productivity." IMF Staff Discussion Note. SDN/17/04.
25 For a more detailed description, see e.g. Blix, Mårten (2015). The Economy and Digitalization – opportunities and challenges. Swedish business.
26 As e.g. Amazon Web Services, Google Cloud or Microsoft Azure.



Digitization leads to increased labor productivity when capital replaces labor

The manufacturing industry is perhaps the clearest example of productivity growth when capital replaces physical labor. In factories, robots continue to take over monotonous and sometimes dangerous tasks. This means increased production with less staff, i.e. a higher labor productivity. It is a development that largely explains why industry continues to be a central part of the economy, despite the fact that the percentage of employed people has decreased sharply for a long time.

Digitization is also a central part of development in many service industries. Digital booking systems, scheduling and invoicing facilitate in all industries in everything from home care, financial services or transport. This means that "middle-level" jobs in terms of salary levels in industry and the service sector are increasingly exposed to competition from digital tools (more on this below in the section Effects of digitalisation on employment).

Anecdotes are also beginning to emerge that the new chatbots (such as ChatGPT and Bard) are beginning to affect professions with a high cognitive content that were previously less exposed to competition from the robots. Bots can be used to improve computer programs, fill in forms and other activities that save time for staff in various parts of the service sector.27 One study showed, for example, that programmers using AI completed tasks roughly 55 percent faster than a control group .28

In order to take advantage of the possibilities of digitization, the staff needs to continue to increase their knowledge in order to be able to, for example, ensure that the robots work and shift to work tasks where humans are better than the robots.

For human labor, technological development has meant increasing demands on competence (so-called skill biased technological change). There is research that shows that the ability of small and medium-sized companies to make use of excellence is of great importance for work productivity.29 In the case of companies that provide only digital services, including social networks, it is physically possible for a small number of people to run a business with millions of users and customers, when much is handled by the software without manual intervention. Even for companies that sell physical products or services, the opportunities for improvement are significant, although not as high as fully digital busin It is possible to have very advanced cloud services and pricing, but it (still) requires, for example, drivers for trucks and taxi services. Fully automated vehicles on our streets may be relevant in the future, but for now there remains some technology and regulatory development.30

In summary, digitization has led to it being easier and cheaper to conduct many different forms of business, in both industry and service industries. Another way of describing the same thing is that an input factor – capital – is utilized in a better way.

27 At the American company AT&T there are reports that chatbots have increased productivity by 20–50 percent, see Lu, Yiwen (2023). "As businesses clamor for workplace AI, tech companies rush to provide it." New York Times. July 5.

[28] Peng, Sida, Eirini Kalliamvakou, Peter Cihon and Mert Demirer (2023). "The impact of AI on developer productivity: Evidence from GitHub copilot." arXiv:2302.06590.

29 Lodefalk, Magnus and Aili Tang (2020). "The impact of hiring top workers on productivity: What is the role of absorptive capacity?" Applied Economic Letters. Vol. 25(20). P. 1402–1406.

30 In some large cities in California, there have been trials with driverless taxis from Waymo and Cruise for some time, see e.g. Metz, Cade (2023). "Self-Driving Car Services Want to Expand in San Francisco Despite Recent Hiccups." New York Times. February 1.

In order to take advantage of the possibilities of digitization, the staff needs to continue to increase their knowledge in order to be able to, for example, ensure that the robots work and shift to work tasks where humans are better than the robots.

Digitization leads to more efficient resource utilization – how inputs are combined

Better use of capital is a channel through which digitization improves business. Another is the way in which different input factors (labor and capital) are combined into a whole. With digitization and automation, the use of labor and capital is improved, i.e. the use of resources becomes more effective. If it happens in one step, productivity is raised to a higher level (a one-time effect). More likely, the improvements are gradual as companies implement the changes at different times and at different rates. Certain companies refrain from the changes and then risk being outcompeted by new players, which happened with e.g. camera and film manufacturer Kodak in the transition from analog to digital images. Although the company was prominent in technology for digital images, the internal resistance within the analogue business was too strong. However, when the company tried to change it was too late, a phenomenon that is sometimes called incumbent's curse .

Digitization has a major impact on the economy, but certain parts that are entirely based on data are fundamentally changing. The reason for this is that data has a very special property. It is a so-called commodity, non-rival which means that one person's use does not prevent someone else's use at the same time. It is typically not possible for physical capital, such as machines or buildings, to be used simultaneously in several places. A consequence of this is that the use of data in the economy can lead to increased returns to scale and network effects.31 However, it can be difficult for traditional service companies to fully use data, either because of the characteristics of the business or because the data may contain privacy-sensitive information. Differences in the ability to make better use of data is a factor that can lead to greater growth and productivity from innovative companies on the technology front.32

It is not possible here to give an exhaustive description of how digitization affects resource utilization and productivity in all parts of the economy, but a few examples illustrate the breadth of the effects that can occur:

First, digital platforms facilitate the matching in time and place between consumer and business (C2B), between different companies (B2B) or between consumers (C2C). Digital platforms have drastically reduced search costs in the economy. It has become easier to sell goods and services and to reach out to larger geographical areas. This also applies to advanced services in management, law and payment services. Even in healthcare, search costs are reduced through telemedicine (so-called online doctor services) where doctor and patient can meet digitally and thereby avoid incidental costs and travel. Without digital platforms, it would not have been possible in practice to carry out many of today's platform services because analog interfaces would have been prohibitively expensive. Platforms and software also enable more efficient supply chains and r

Secondly, digitization makes it easier to measure and optimize production processes. Through so-called Internet of Things (IoT), companies can acquire and analyze information. It can, for example, be used to identify bottlenecks or vulnerabilities in production. Measuring production and output in real time is a possibility. The development is further strengthened by the 5G networks with even faster and more stable connections. This, in turn, enables applications in businesses with high demands on availability and precision, including in industry or for autonomous vehicles. Even within certain service industries, IoT can make operations more efficient. Modern trucks and vehicles, for example, generate large amounts of data that can be used to reduce t

31 That data is non-rival gives rise to so-called increased returns to scale in the economy, see Jones, Charles I. and Christopher Tonetti (2020). “Nonrivalry and the economics of data.” American Economic Review. 110(9). P. 2819–2858.

32 Cong, Lin William, Wenshi Wei, Danxia Xie, and Longtian Zhang (2022). "Endogenous growth under multiple uses of data." Journal of Economic Dynamics and Control. Vol. 141.

Third, digital models can reduce material use in several ways. Before production begins, it is possible to investigate which materials have the least climate or environmental impact. In addition, it is possible to specify in advance exactly what is needed and thereby reduce production waste. In architecture, it is for example possible to generate in 3D models a complete printout of all the required material, such as fittings, screws and other things. This leads to lower material costs. Opportunities to build production models digitally are also important. In this way, problems can be avoided at an early stage and production processes strengthened through digital experiments. This happens, for example, by software designing microchips from start to finish, which leads to a faster and less expensive development process.33 With 3D printers, it is also possible to reduce inventory costs and lower the cost of customizing products.

Fourth, AI can be used to analyze large amounts of data and in a short time identify connections that are difficult or impossible for humans to detect. For example, AI can be used in cancer care to quickly analyze X-ray images and compare these with images of previous cancer diagnoses. Studies have shown, for example, that AI has higher precision and is faster than doctors in identifying the most common and deadliest form of skin cancer.34 Cancer care is just one of many applications with large amounts of data where AI can mean significant improvements. Another example is chatbots that use so-called large language models (LLM). Chatbots have been around for a long time but attracted a lot of attention with the launch of ChatGPT in the fall of 2022. The bots make it easier to write and analyze text. In several areas it means efficiency and time savings, not least in programming where software engineers can quickly and easily carry out troubleshooting and improve their code.

Finally, digitization has made it possible to work remotely or from home. Although the technology for video meetings has been around for a long time, it had not reached wide acceptance and utilization until the pandemic forced new ways of working. Remote work can be seen from many points of view that affect productivity. A direct effect is that flexibility in work increases, which means that work and capital lead to better resource utilization. For many, the opportunity to work from home also leads to indirect effects, such as less stress and a simpler life puzzle. It also enables work from sparsely populated areas for certain services. However, it is not obvious that remote work automatically leads to higher productivity. The research has no clear answers to that question. One guess, however, is that the productivity effects of remote work are closely linked to the leadership in the company or organization. For example, it is likely that weak leadership and remote work are a bad combination. And conversely, functioning teams may be able to improve.

All **in all, digital tools enable** increasingly better opportunities to combine resources into a whole. New working methods and methods will probably also be required for the gains to be fully achieved. Not least within the school, teachers will adapt teaching and assessment of essays when students use AI tools.

Digitization has a major impact on the economy, but certain parts that are entirely based on data are fundamentally changing. The reason for this is that data has a very special let non-rival property: it is such a cold commodity, which means that one person's use does not prevent

33 The Economist (2023). "If it can be designed on a computer, it can be built by robots - Powerful new software rewrites the rules of mass production." 9th of August.
34 See e.g. Blix, Mårten and Charlotta Levay (2018, p. 13). Operation digitization – an ESO report on health care. Report to the Expert Group for Studies in Public Finance. Government Office: Ministry of Finance.

4. The effects of digitization on employment

Ever since the industrial revolution, there has been concern that robots will take over work from humans. Although many jobs have disappeared, at the same time roughly the same number of new jobs have been added. A study on the Swedish labor market shows, for example, that approximately 190,000 new jobs were created net during the period 1990–2009. Behind that change hides about 3.4 million new jobs and about 3.2 million jobs that disappeared.35

More generally, there is no evidence that jobs and total employment would be threatened.36 Human beings and the labor market have proven to be very adaptable. However, the changes in the labor market can lead to certain groups being disadvantaged, depending on education, age, or industry. For a long time, technological development has favored the highly educated and a large part of the automation has taken place in industry, where manual work, often performed by men, has been replaced by robots. Roughly simplified, one can say that work tasks that tend to be repeated in a predictable or monotonous way have been particularly exposed to automation. It has often been about simple physical work. On the other hand, it has proven more difficult to automate jobs that contain many different and difficult to define work steps that are rarely repeated in the same way, such as janitors, electricians or construction workers. Nor have professions where social competence is important, such as hairdressers, been automated.

On the other hand, there has been an extensive redistribution within the workforce, depending on the degree of knowledge, cognitive requirements and social competence. Slightly simplified, it can be said that the development is characterized by a job polarization, where the proportion of "middle-level" jobs has gradually decreased while low- and high-skilled occupations have increased.37 The development can lead to an uneven wage trend and large wage differences in a time of strong structural transformation. Research into economic history shows, for example, that real wages in Great Britain hardly increased at all during the period 1750–1850.38 Even in modern times, there are differences in wage premiums between those with top skills and others, even if the development is not as extreme as during the industrial revolution. nen. In Sweden, real wages have rather increased sharply after the 1990s, when the Riksbank introduced the inflation target at the same time as the economy underwent a strong structural transformation. It is not until 2022 and the war in Ukraine that the real wage trend has been pushed back and in some cases turned negative.

Extensive research on the effects of digitization on the labor market points to essentially two conclusions:

- When technology is complementary to humans, it strengthens work productivity. In some cases, however, a substitution occurs where some jobs disappear.
- Jobs that disappear tend to be fully offset by the labor market creating new jobs. Employment does not fall, but certain groups are negatively affected.

Overall, there is no evidence that employment would be threatened due to robots. However, there have been concerns that recent advances in AI would change this historical relationship. Of course, it cannot be ruled out that the effects of AI differ from previous periods' experiences on the labor market. Jobs with higher cognitive content have largely avoided the negative effects of automation. Instead, digitization has become complementary to cognitive work.

However, this may change with the development of AI. Even the highly educated will be exposed to more competition from AI. However, it takes time and rarely happens as quickly as it is portrayed in some newspaper headlines. Even in times where the technology front is rapidly moving forward, it takes many years before the technology is spread and Some companies or industries will face the change early and quickly, but in large parts of the economy the changes will take place gradually, which gives time for adaptation and further training for the workforce. Often it is instead a labor shortage, in both simple and skilled occupations, which is the major challenge for companies and the non-public sector.

The technical development is important for how the composition of works develops. In many cases, it is factors other than digitization that are significant for the demand for work. Demographics and the aging population in particular are important to consider. In various reports, Sweden's Municipalities and Regions have shown an extensive recruitment need in the welfare professions, where the young people entering the labor market are not on par with today's and the future's extensive retirements.39 In some industries, the lack of labor is particularly difficult, for example in elderly care.

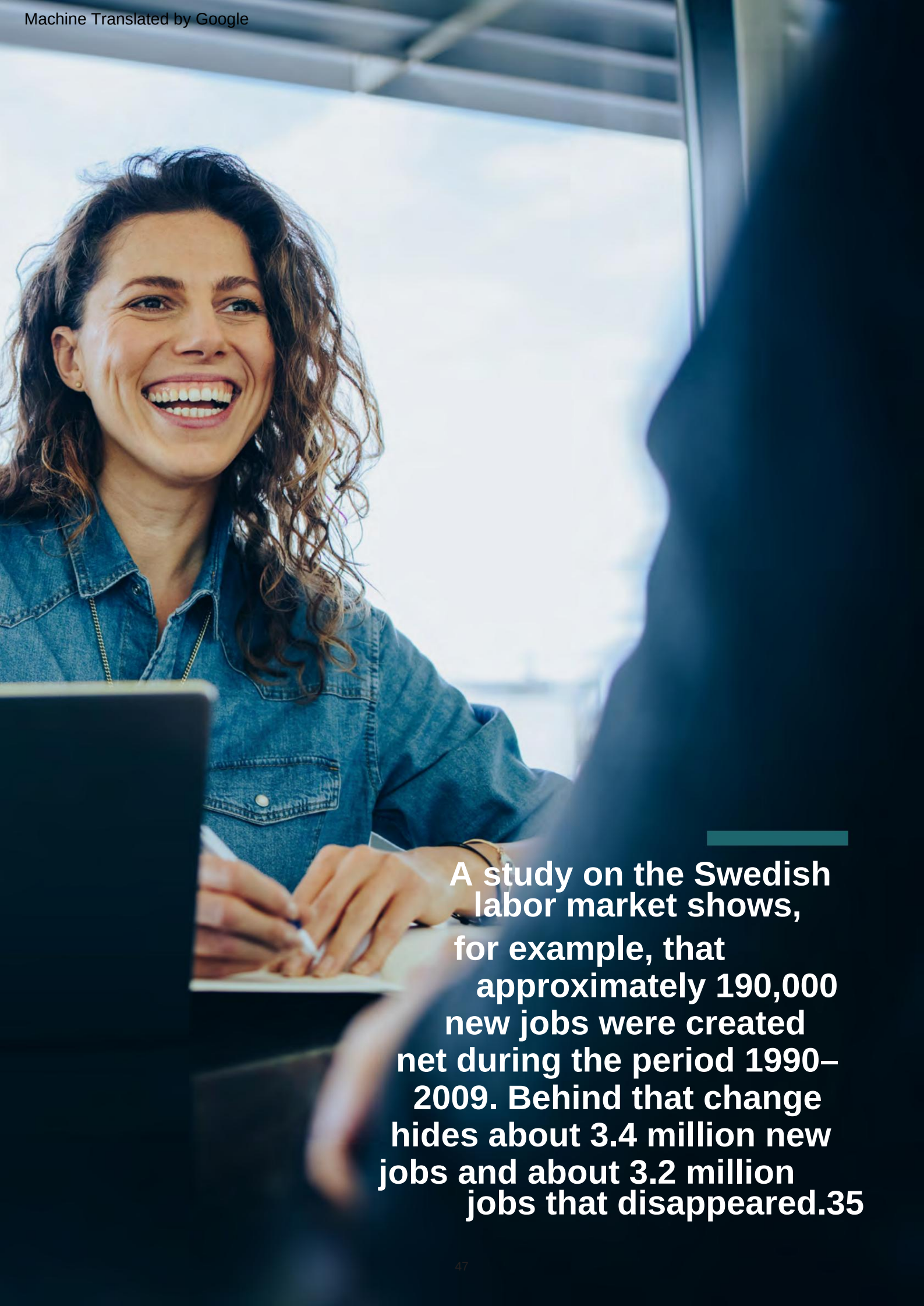
[35] Heyman, Fredrik, Pehr-Johan Norbäck and Lars Persson (2013). "Where are the jobs created? An ESO report on the dynamics of Swedish business life from 1990 to 2009." Report to the Expert Group for studies in public economics. 2013:3. Government Office: Ministry of Finance.

[36] Author, David H. (2015). "Why are there still so many jobs? The history and future of workplace automation." Journal of Economic Perspectives. Vol. 29. No. 3. Summer. pp. 3–30.

37 There are several studies on job polarization. One of the most influential is: Goos, Maarten, Alan Manning and Anna Salomons (2014). "Explaining Job Polarization: Routine-Biased Technological Change and Offshoring." American Economic Review. 104(8). pp. 2509–2526.

[38] Mokyr, Joel (2004). "Accounting for the Industrial Revolution." in Floud, Roderick and Paul Johnson: The Cambridge economic history of Britain. Vol.1 Industrialization, Cambridge University Press, 3.

SEK 39 (2021). Economic report October 2021 - About the finances of the municipalities and regions. Sweden's Municipalities and Regions.



A study on the Swedish labor market shows, for example, that approximately 190,000 new jobs were created net during the period 1990–2009. Behind that change hides about 3.4 million new jobs and about 3.2 million jobs that disappeared.35

5. Summary and policy conclusions

From the beginning of the 2000s, there was a slowdown in productivity growth throughout the OECD area. The fall in productivity is largely explained by lower total factor productivity (TFP), which is a measure of the economy's overall improvements, i.e. factors that are not captured in any other way in the national accounts. Sweden has also had a big loss in TFP. When productivity is combined with hours worked in the economy, GDP is obtained. For Sweden, the preliminary GDP growth for 2022 was the second worst of all EU countries. The weak growth has occurred despite Sweden's extensive investments in skills development.

The low economic growth is serious. The longer it lasts, the worse the development of prosperity and the opportunities to strengthen welfare, as well as the living situation of households. This applies not least in times when living costs increase as a result of inflation and higher costs from amortization, interest and energy.

Productivity is weighed down by several macroeconomic headwinds. There is no natural law that means that productivity growth rates will automatically return to the high levels noted in the second half of the 20th century. The period after the Second World War saw the introduction of several key technologies in transport, infrastructure, energy and telecommunications which had a major positive impact.

Studies from the OECD show that productivity has increased unevenly in companies depending on the industry and the degree of IT use. For companies with high IT use, the differences between leading companies and other companies have increased significantly. The differences are also large for companies with lower IT intesity, even if TFP is lower than for those with IT-intensive activities.40 A study from the European Central Bank points out that the use of digitization in Europe has been poor, and that adaptations have been too slow to counteract the drop in productivity growth.41

Even in Asia, there is a large difference in productivity between different companies, including among those with a high proportion of research and development. It is above all in companies on the technology front, which are exposed to high competition and internationalization, where productivity growth is the highest.42 Results from the Swedish authority Till-växtanalys show results in line with international studies: companies that have a high IT intensity and high AI use continues to have faster productivity growth than those who do not use AI.43 The use of AI is also largely concentrated in the Stockholm region.

A study shows that anti-competitive regulations reduce TFP, and that higher innovation intensity and openness strengthen it.44 Another conclusion is that research and development yields better returns with better institutions and less regulatory hassle.

When technology develops rapidly, the importance of competence development increases. The Swedish labor market has been well equipped to cope with rapid structural transformation because, somewhat simplified, the focus is to "save workers," not to "save work." By encouraging new skills within the same sector or within new sectors, the effects of the labour market

40 OECD (2019). Economic Outlook. OECD publishing: Paris.
41 ECB (2021)."Digitalisation: channels, impacts and implications for monetary policy in the euro area." European Central Bank. Occasional Paper. no. 266.
42 Dabla-Norris, Era, Tidiane Kinda, Kaustubh Chahande, Hua Chai, Yadien Chen, Alessia de Stefani, Yosuke Kido, Fan Qi and Alexamdre Sollaci (2023). "Accelerating innovation and digitalization in Asia to boost productivity." International Monetary Fund. Asia and Pacific Department. DP/2023/01.
43 Growth analysis (2023). "A survey of AI use and productivity among Swedish companies." The authority for growth policy evaluations and analyses. Report 2023:02. 44
44 Égert, Balázs (2016). "Regulation, Institutions, and Productivity: New Macroeconomic Evidence from OECD Countries." American Economic Review, 106 (5). pp. 109–13.

is mitigated.45 This reduces the short-term costs of the transition while at the same time favoring the long-term conditions for stronger growth.

But more is required for GDP growth to recover. Digitization can counteract the drop in productivity growth, but to what degree depends to a large extent on the policy measures that are taken. In the US, Congress has so far had a permissive attitude, although there have been discussions about legislation for digital companies, AI and handling of data. To some extent, the development in the USA has been characterized by the concept of "move fast and break things". In Europe, the strategy has been more activist and restrained. In 2018, the so-called data protection regulation (GDPR) entered into force, which has a major impact on all businesses and people who use digital tools. There are also a large number of regulations and regulations on digitization that are being introduced, or are about to be introduced, in the EU.46

Several of the EU's regulations target current and important issues around cyber security, resilience, personal privacy and damages. One hope is that the regulations can reduce some of the downsides of digitization with false information, political polarization, fraud and more.

A large part of the regulations around digitization are developed at EU level, but there is much that can, and should, be done nationally. Sweden's digitization strategy has so far been for the country to be "the best in the world at utilizing the possibilities of digitization". However, it is a problematic goal formulation because it is imprecise about which measures where needed and what concrete needs to be achieved. It provides limited guidance to decision makers. A new digitization strategy is reportedly under development in the Government Office. It needs to be more concrete in order to provide guidance to authorities and businesses. Not least, it needs to contribute to removing uncertainty as far as possible regarding the application of the regulations for the private business world. The lack of digitization in the public sector also needs attention.47 Despite the fact that the digitization of Swedish business life has been successful in many respects, the public sector has lagged behind, not least when it comes to the possibility of integrating IT into healthcare.

Complicated rules and slow implementation in the public sector risk complicating and delaying digitization opportunities to strengthen productivity. Not least, there is a significant risk that the regulations in the EU inhibit digitization and make it more difficult to strengthen productivity growth again. When the regulations are designed, it is therefore important to carefully weigh the effects on competition and innovation capacity in order not to weaken Eu It is the USA and Asia that drive the technology front and Europe must relate to this in order not to fall behind. It is therefore central that the application of new regulations does not increase uncertainty for companies or entail a heavy administrative burden. As the regulations cement the rules of the game for a long time to come, management will be crucial for Europe's opportunities to improve productivity and growth going forward, in competition with Asia and the US.

45 Digital competence is important in the labor market but also for others in society. Not least, the problem of digital exclusion has been noticed, especially among the elderly. The difficulties with a digital exclusion are strengthened when more and more services require, for example, mobile BankID, knowledge and not too old IT tools.
46 The EU cyber security directive NIS2 applies from 2023; The EU law on data governance DGA was introduced in 2022. The EU legal act on digital markets and the legal act on digital markets, DSA and DMA, were also introduced in 2022 with different timetables for when and how the regulations should apply. The European Parliament adopted the AI Act in June 2023 and its content is now subject to negotiation with the European Council. There is also a political agreement on the so-called data file to be formally adopted by the European Council and Parliament; also under negotiation are the cyber resilience act CRA, the e-Privacy regulation and the AI liability directive AILD.
47 OECD (2018). Going Digital in Sweden. OECD Reviews of Digital Transformation. OECD Publishing: Paris.

CHAPTER 3

Global outlook, future scenarios and forecasts

In this chapter, the global situation is analyzed in relation to the tech industry and future prospects in the coming years.

The analysis partly considers structural factors that affect the tech industry in the long term, partly the cyclical forces that in the shorter term characterize the industry and the economy as a whole. The world view results in forecasts for the turnover development and GDP share for Swedish tech up to 2026.

The historical context: the rise and maturity of the tech industry

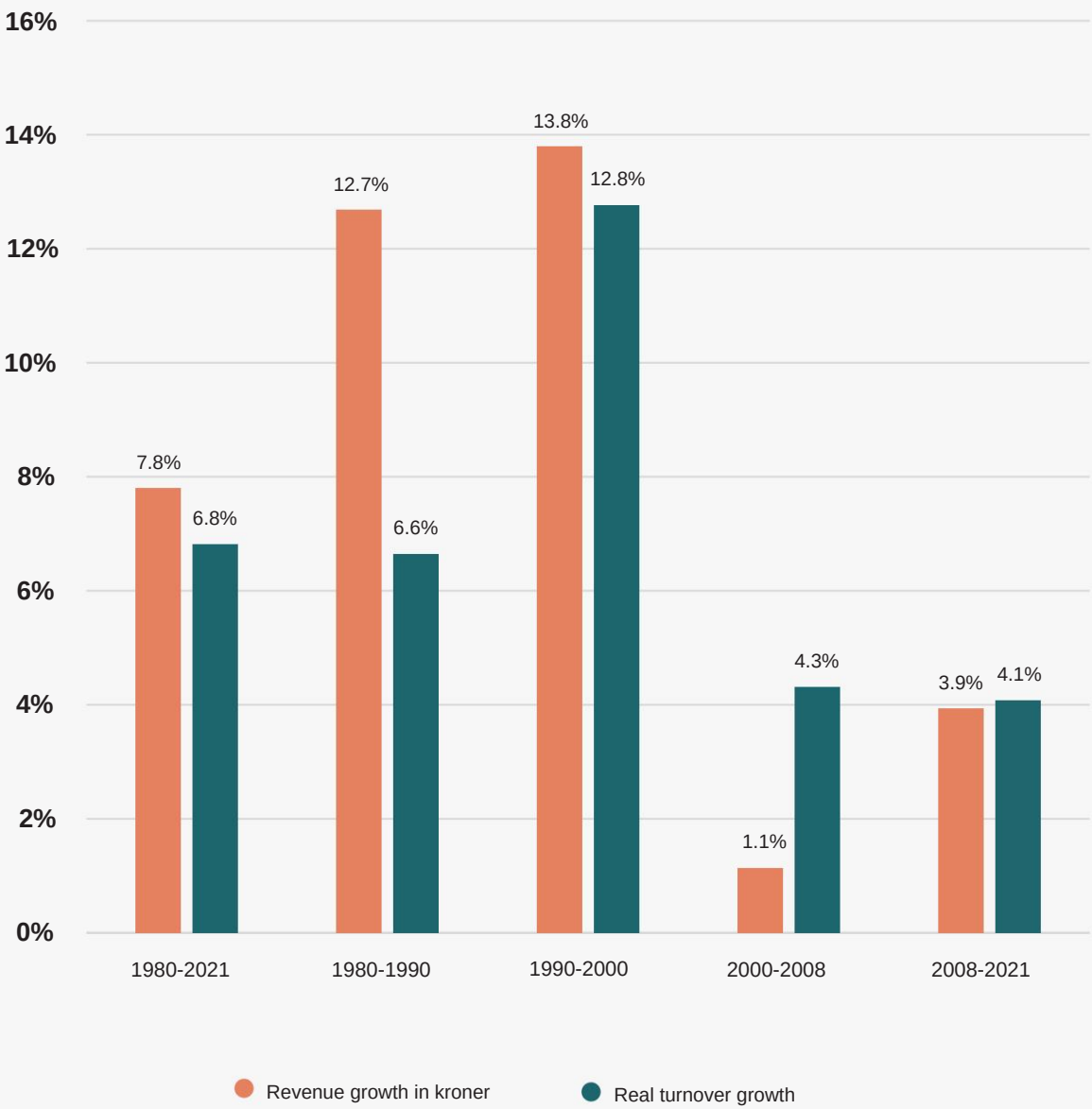
The historical growth in the Swedish tech industry can be divided into different phases. In the introduction phase of modern information technology in the 1980s, the industry grew at a relatively high rate (by an average of 6.6 percent in real terms) from low levels. The impact of the Internet economy then, together with a series of major institutional reforms in Sweden in the 1990s, laid the foundation for digitization's first golden age. The growth figures were in double digits (an average of 12.8 percent) and the tech industry drove large productivity increases in the business world, which resulted in downward price pressure for consumers and the introduction of many new goods and services.

After the IT crash around the turn of the millennium, growth declined dramatically. Technological maturity has increased and the industry has grown by an average of just over four percent during the 2000s. This applies to both the period between the IT crash and the great financial crisis in 2008 and the period that followed the financial crisis until 2021. Growth has stabilized at a level that is almost twice as high as for business as a whole. The growth variation within the industry has been relatively large from year to year,depending on the phase of the economic cycle and the timing of various technology

Diagram 17

Annual average growth within the tech industry 1980-2021

Refers to production value according to the national accounts regarding companies classified according to SNI 26 and 61-63



Source: Statistics Sweden

The big inflation and the slowdown of the tech industry in 2022-2023

During the first half of 2022, the world's central banks began to act against an alarmingly high and rising inflationary pressure. The strong economic recovery that had taken place since the bottom of the pandemic was largely credit-driven, at the same time that problems with the supply of goods in world trade gradually subsided. The central banks' increased policy rates take effect with a long delay and have led to a broad slowdown in the economy during 2023. Russia's full-scale invasion of Ukraine and a slowdown in world trade have also contributed to this picture.

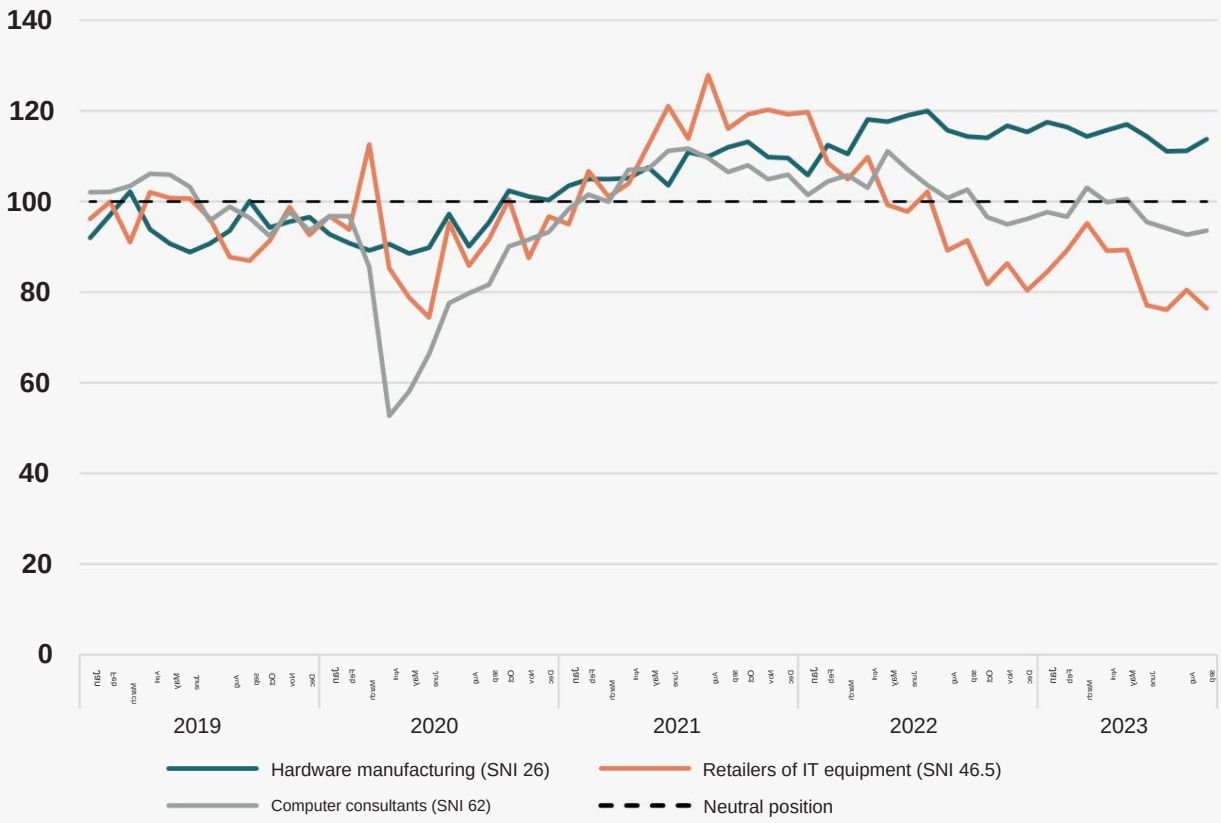
The tech industry consists of a variety of different types of companies that are affected in different ways by the economic downturn. The retail division of IT and technology products was affected early and as retail consumption slowed. The mood in the retail sector, according to the Economic Institute's barometer indicator, turned from optimism to pessimism already in the middle of 2022. The economy for data consulting companies - a business within the tech industry's largest segment "software and IT services" - was good well into 2023, but slowed down from and with the second quarter. Hardware manufacturers, on the other hand, experienced high pressure as late as September 2023. Thus, the economic picture in tech has varied significantly.

The labor market within the industry is generally strong, but employment growth began to decelerate in mid-2022. As a result of competition

Diagram 18

Diversified economic picture for different parts of the tech industry

The state of the mood in some different parts of the tech industry 2019-2023
according to the Norwegian Economic Institute's barometer indicator
Neutral position = 100



Source: Konkunkturinstitutet

about key skills, temporarily falling real wages due to high inflation and the experiences during the pandemic, there are strong elements of labor hoarding. This means that many companies are expected to hold on to their employees despite falling demand, in the hope that the recession will be short-lived.

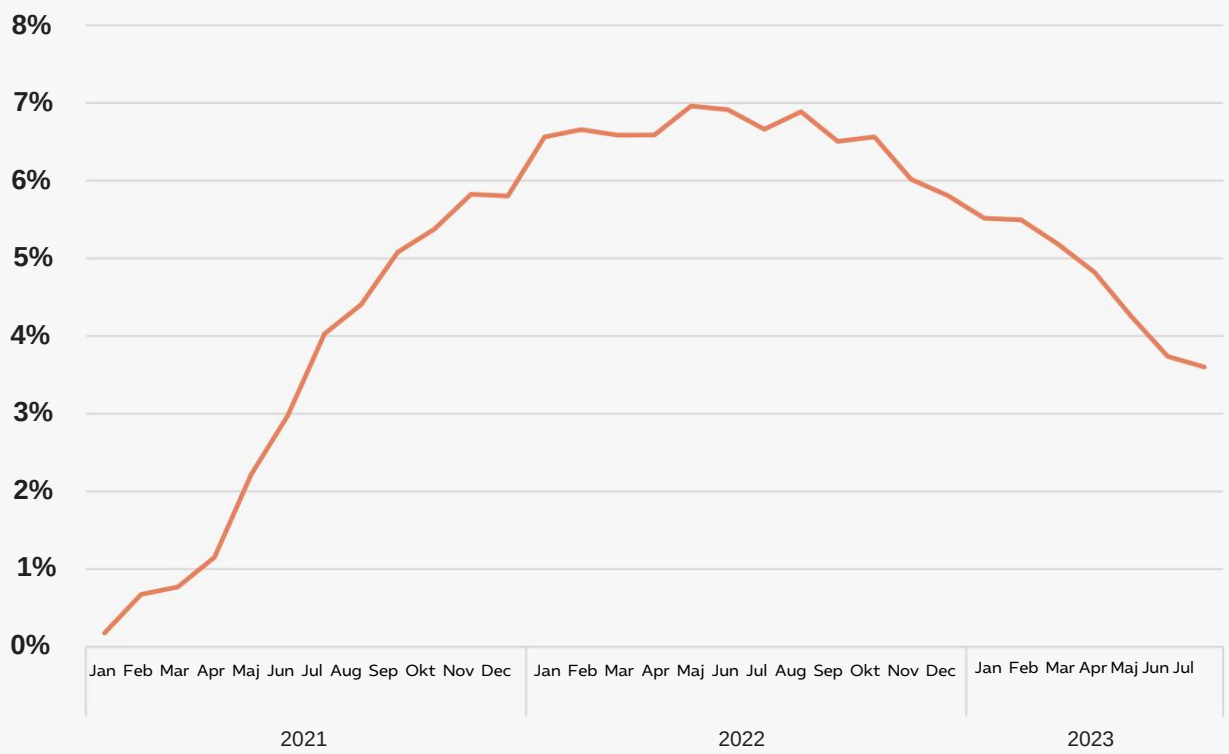
The historical industry development in tech, in combination with the brief economic situation analysis outlined above, constitute pieces of the puzzle that enable a better understanding of where we are headed in the coming years. The role of the tech industry in society and the conditions for productivity gains according to the longer thematic chapters also constitute valuable background knowledge that has been factored into the scenario analyzes and forecasts that follow.

Appendix 2 describes a number of path choices and assumptions for the forecasts. It should be pointed out that the forecasts refer to the tech industry as a whole. The various industry segments (software and IT services, telecommunications and infrastructure, hardware manufacturing and retail and service) will likely develop very differently over the forecast horizon. In other words, the forecasts are designed to explore the direction of the tech sector in a broad sense but less well suited as benchmarking for individual players.

Diagram 19

Slowdown in the labor market

Development of the number of employed persons at an annual rate. Refers to information and communication companies (SNI 58-63), 15-74 years.



Source: Statistics Sweden The labor market status of the population

Future scenario 1 – Stable growth with economic pause

Tech will grow by SEK 187 billion until 2026

In the first forecast scenario – which can be described as a base scenario – the tech industry as a whole grows by 18 percent until 2026. This means that the tech industry will have a turnover of SEK 1,245 billion in 2026, an increase of SEK 187 billion. Thus, the average turnover growth will be 4.1 percent per year between 2022 and 2026.

Despite the tech industry's cyclical sensitivity, industry growth remains solid and higher than other sectors of the economy over the entire forecast horizon. The growth of 18 percent is roughly twice as high as for business life in general. This is as a result of good structural growth in tech, which is supported by a significant rate of innovation and continued gradual adoption of new technology among both consumers and companies.

Tech is establishing itself even more than today as a kind of basin industry and constitutes a growth prerequisite for other industries. This gradual shift brings significant productivity gains in a limited number of important sectors of the economy, primarily in the private sector.

Despite the above, the technological progress in the base scenario can be described as gradual for the large mass of companies. This is because weak demand means that growth will be put on pause in 2024 and a continuation high cost situation holds back larger investments and new recruitments. Certain bottlenecks arise, where higher growth would have required a stronger inflow of competence and capital. The focus of many companies is on cost control and consolidation, which means that technology shifts such as 5G-enabled factories, generative AI, IoT and green technology development do not blossom to their full potential.

The global situation is assumed to be unstable during the forecast horizon. The recession, geopolitical unrest and protectionist tendencies are limiting technology investment significantly until early 2025, holding back the pace of growth in the industry and the economy. Therefore, the economic situation reduces the growth rate in tech to close to zero in 2024.

The economic recovery is assumed to give growth a boost only in the second half of 2025 and in 2026. When the recovery does come, it is assumed to be robust. This means that structural and economic factors reinforce each other during the second half of the forecast period so that growth for the tech industry will still be good. The GDP share increases as a result from 7.9 percent in 2022 to 8.6 percent in 2026.

Diagram 20

Growth 2022-2026
Scenario 1 (base scenario)
"Stable growth"

Index 100 = turnover level in 2022

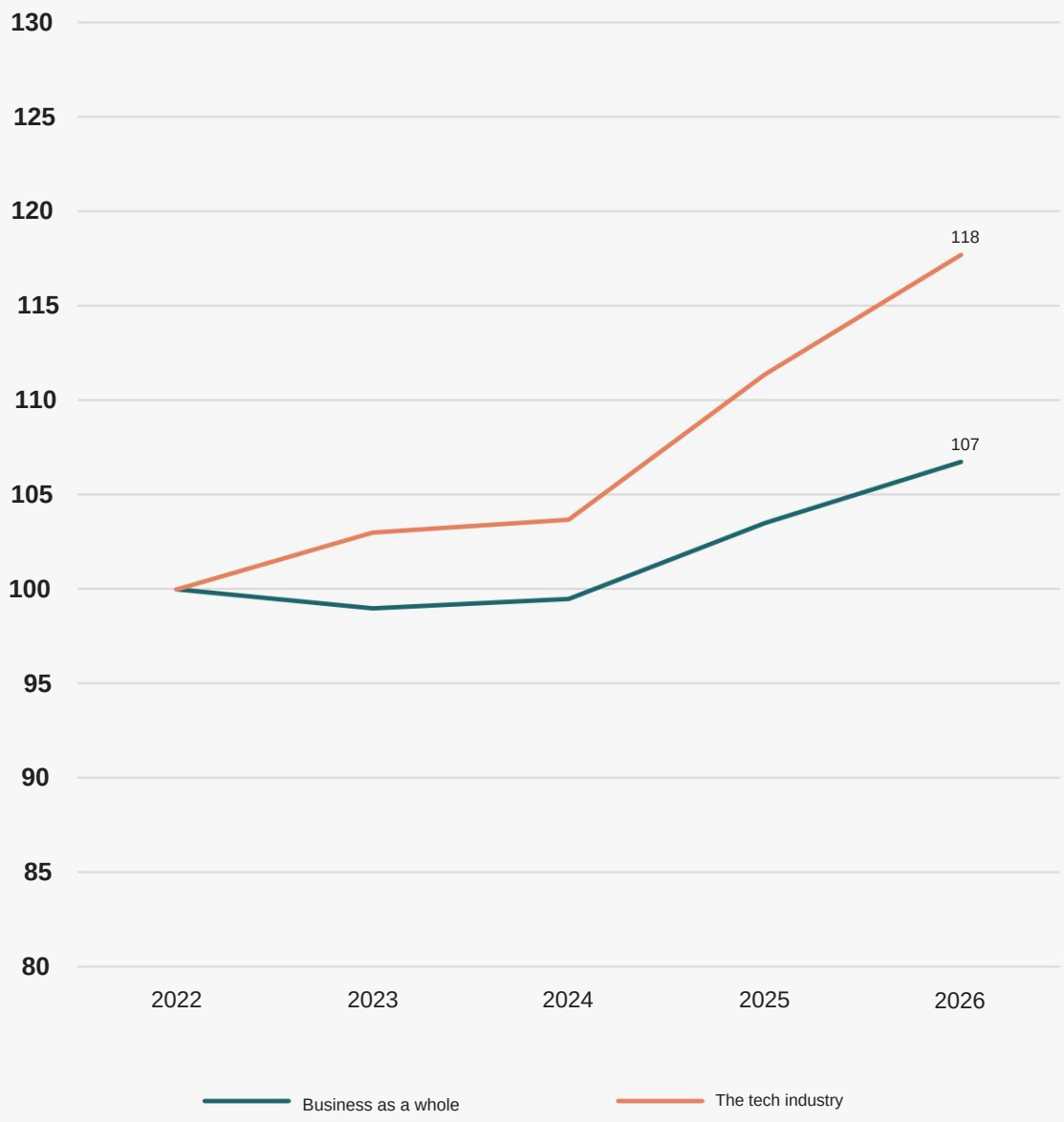


Diagram 21

Revenue forecast for the tech industry
Scenario 1 (base scenario)
"Stable growth"

In billions of kroner.

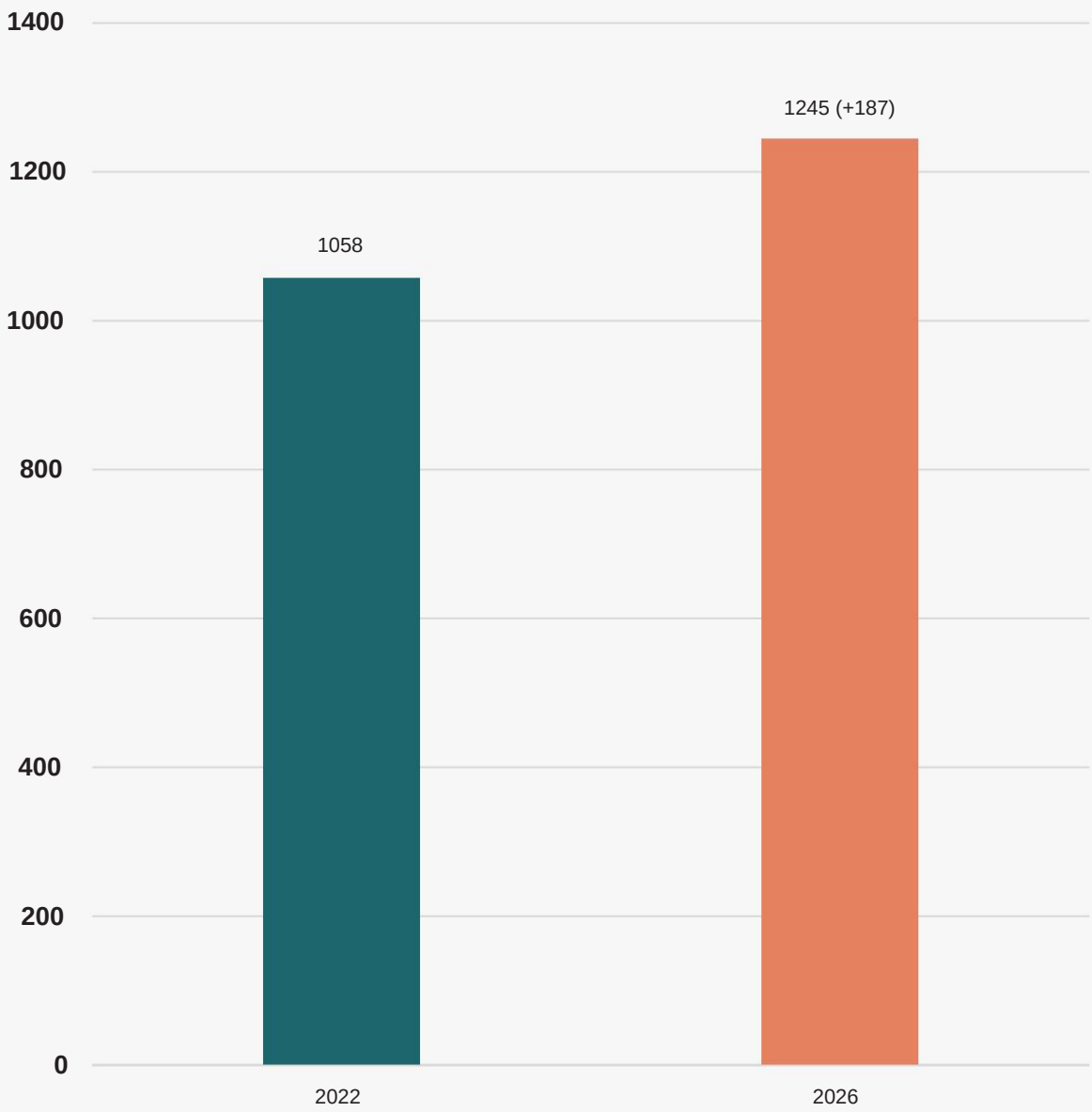
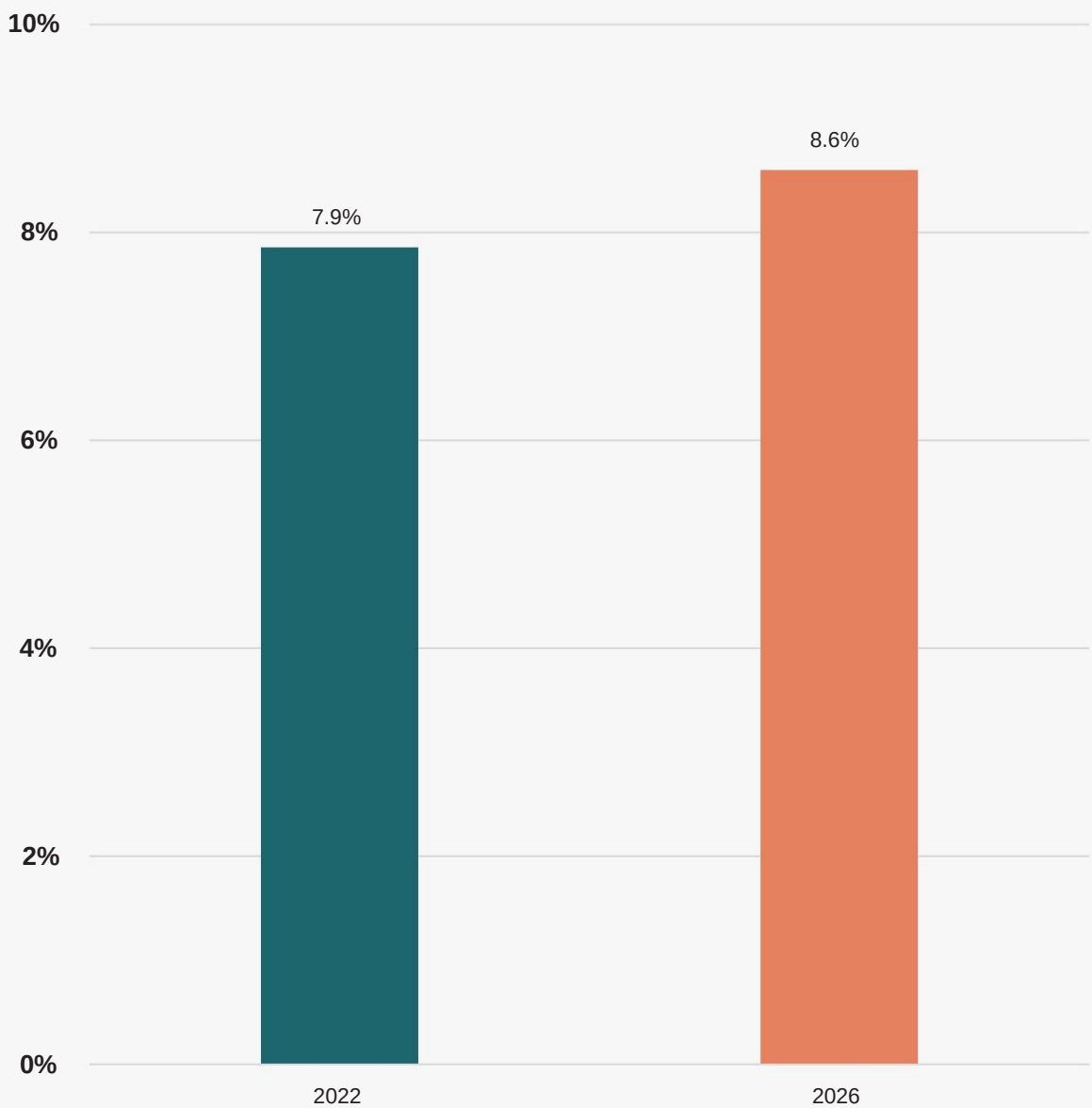


Diagram 22

The tech industry's share of GDP
Scenario 1 (base scenario)
"Stable growth"

Refers to the tech industry's value added (SNI 26 and 61-63)
relative to GDP at base price, in 2015 prices



Future scenario 2 – Disruptive growth defies recession

Tech will grow by SEK 272 billion until 2026

In the second forecast scenario – which can be described as an alternative scenario – the tech industry as a whole grows by 26 percent until 2026. This means that the industry has a turnover of SEK 1,330 billion in 2026, an increase of SEK 272 billion. The increase corresponds to an average annual growth of 5.9 percent between 2022 and 2026.

The above means that tech companies will grow nearly three times as much as the total business sector during the forecast period. Industry growth accelerates after some slowdown in 2024. High and growing structural growth in 2025 and 2026 is supported by new innovations, increased receptivity to new technologies. This presupposes an active digitization policy with the ambition for Sweden to be at the forefront and which supports innovation and promotes the use of new technology.

In the alternative scenario, tech consolidates even more the role of a new base industry and also enables other industries to defy the recession and create new highly qualified jobs. Large productivity gains are being made in a number of important sectors of the economy, including the public sector.

In the alternative scenario, the technological advances can be described as disruptive – that is, ground-breaking and revolutionary – for a broad mass of companies. Technological changes such as 5G, generative AI, IoT and green technology development are leading the way towards a new golden age. McKinsey predicts, for example, that generative AI can lift labor productivity by between 0.1 and 0.6 percent annually until 2040, an example of technology development's potential to make a big difference.[48] The World Economic Forum predicts that 24 percent of Swedish jobs will fundamentally change over the next five years as a result of industry transformation, but that, for example, AI, big data, digital platforms and cloud services at the same time will create significantly more new jobs than the other way around.[49]

In the alternative scenario, the temporary economic downturn will be much more noticeable in other industries. Employment in tech increases strongly during the second half of the forecast period. The skills shortage in the industry is alleviated through labor hoarding, training efforts, improved matching and labor migrating from other industries where demand is falling.

Even in the alternative scenario, the environment is assumed to be characterized by high uncertainty. Despite the downturn in the economy, however, technology investments are kept up with only a brief dip in 2024. The recession, geopolitical unrest and protectionist tendencies certainly limit the economy's development potential, but the strong technological development leads the way towards increased optimism and growth picks up again in 2025 and 2026.

A clear turnaround in the economic development can already be seen towards the end of 2024. This means that structural and economic factors reinforce each other during most of the forecast horizon so that growth in tech will be very strong over the entire period.

[48] McKinsey (2023). The Economic Potential of Generative AI: The Next Productivity Frontier.

49 World Economic Forum (2023). Future of Jobs Report 2023.

Diagram 23

Growth 2022-2026
Scenario 2 (alternative scenario)
"Disruptive Growth"

Index 100 = turnover level in 2022

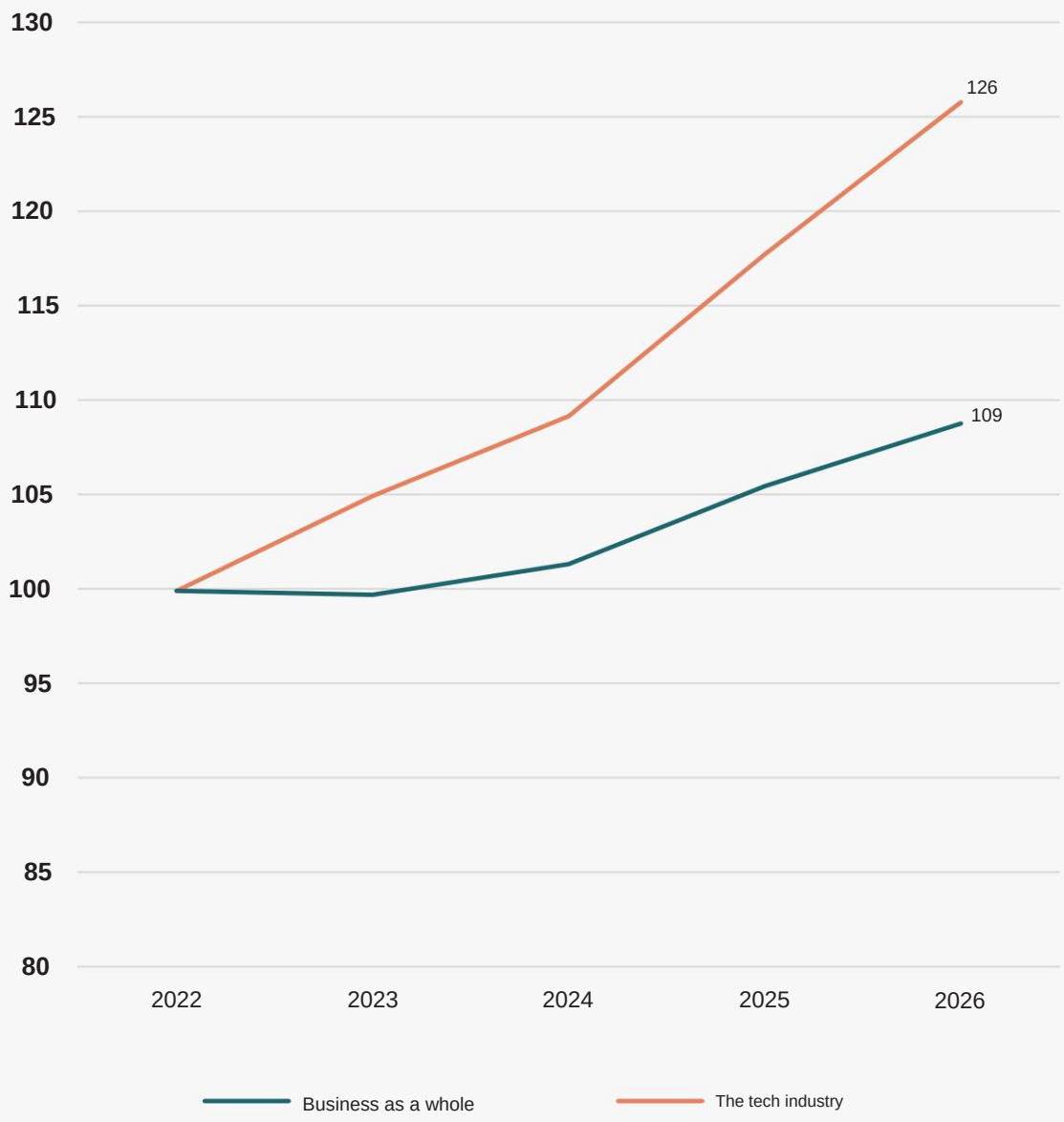


Diagram 24

Revenue forecast for the tech industry
Scenario 2 (alternative scenario)
"Disruptive Growth"

In billions of kroner.

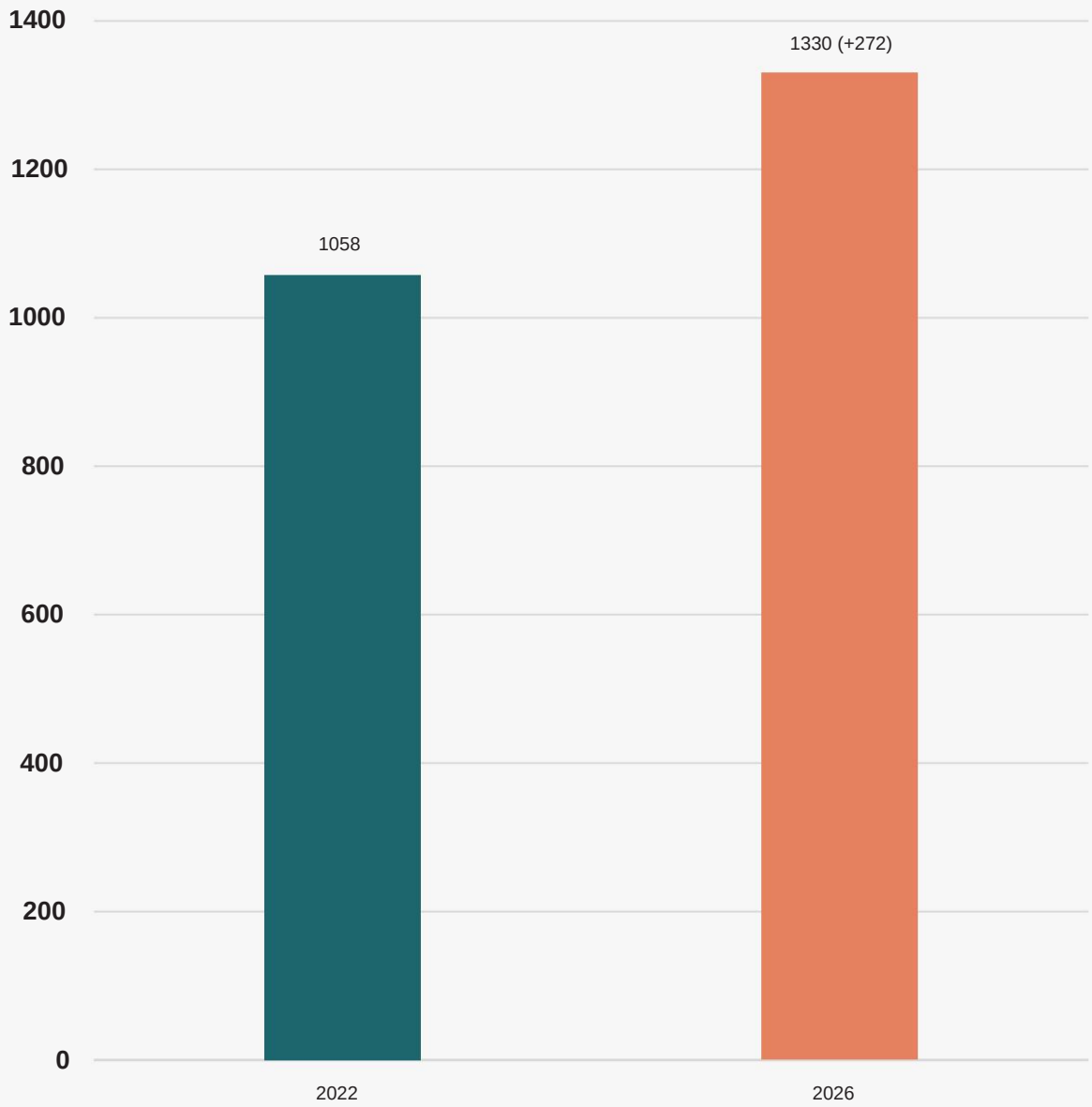
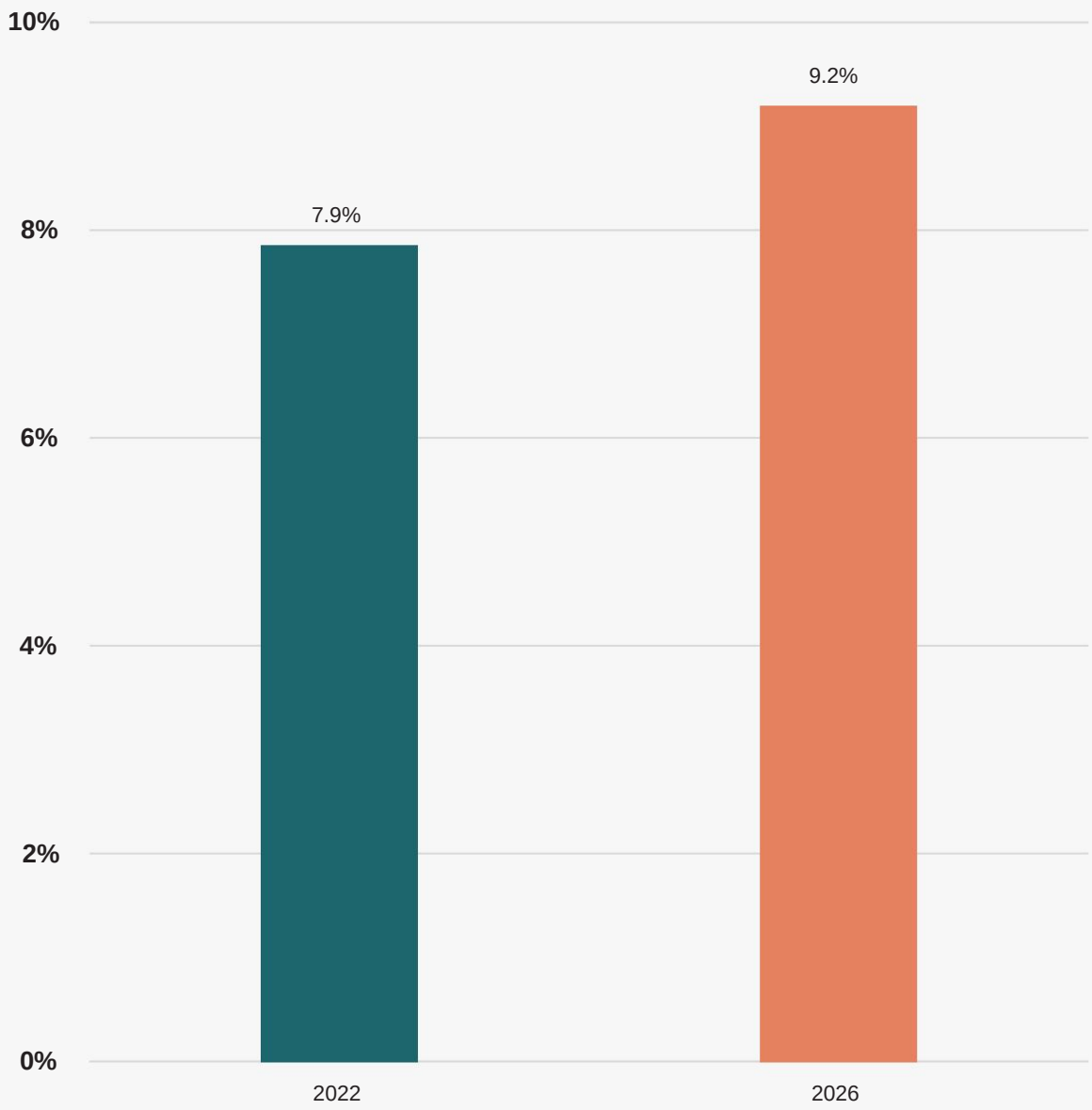


Diagram 25

The tech industry's share of GDP
Scenario 2 (alternative scenario)
"Disruptive Growth"

Refers to the tech industry's value added (SNI 26 and 61-63)
relative to GDP at base price, in 2015 prices



Summary: good growth prospects despite tough times

The forecasts on the previous pages for the period 2022 to 2026 are summarized with a scenario comparison in the charts below. As can be seen, both future scenarios mean that the tech industry will significantly advance its position in the coming years, both in terms of the company's turnover and the share of GDP. The alternative scenario (disruptive growth) means that the tech industry's turnover increases by an extra 85 billion compared to the base scenario (stable growth). In that case, the industry reaches a GDP share of 9.2 percent, instead of 8.6 percent as in the base scenario.

The prospects for growth are therefore good, despite the fact that times are tough right now. There is, of course, a risk that the current downturn could develop into a longer and deeper more recession than most analysts think. In that case, the economic recovery may take longer than the forecasts suggest. However, the reverse possibility of a "soft landing" and unexpectedly strong growth also exists.

There is therefore every reason to create good conditions for innovation, tech entrepreneurship and growth.
Great efforts are required if Sweden is to keep pace with the rapid development taking place in other countries. The conditions for running a business must improve, competence must be secured and investments in digitization must be intensified if Sweden is to be a tech nation to be reckoned with in the future as well.

Diagram 26

Scenario comparison: tech industry turnover

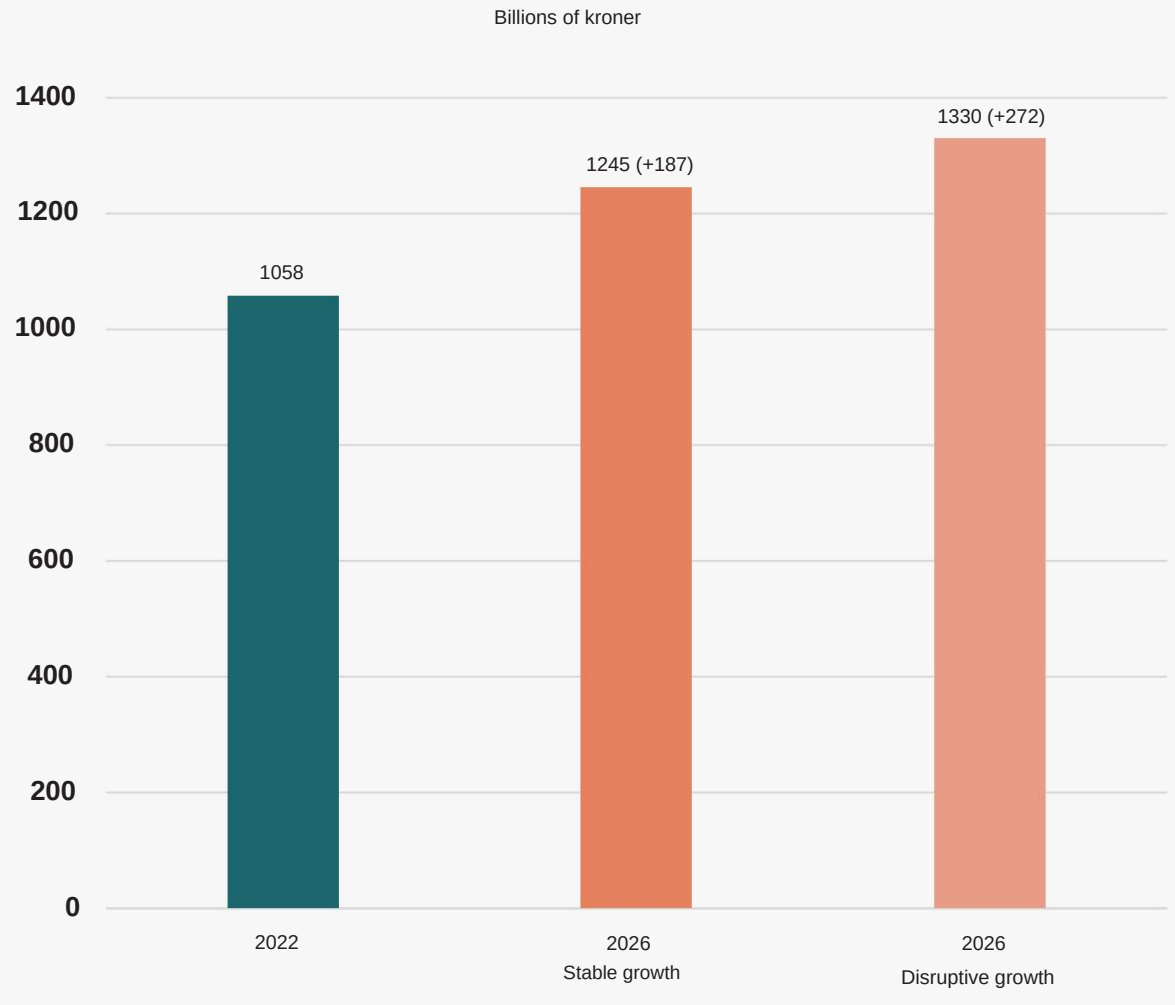
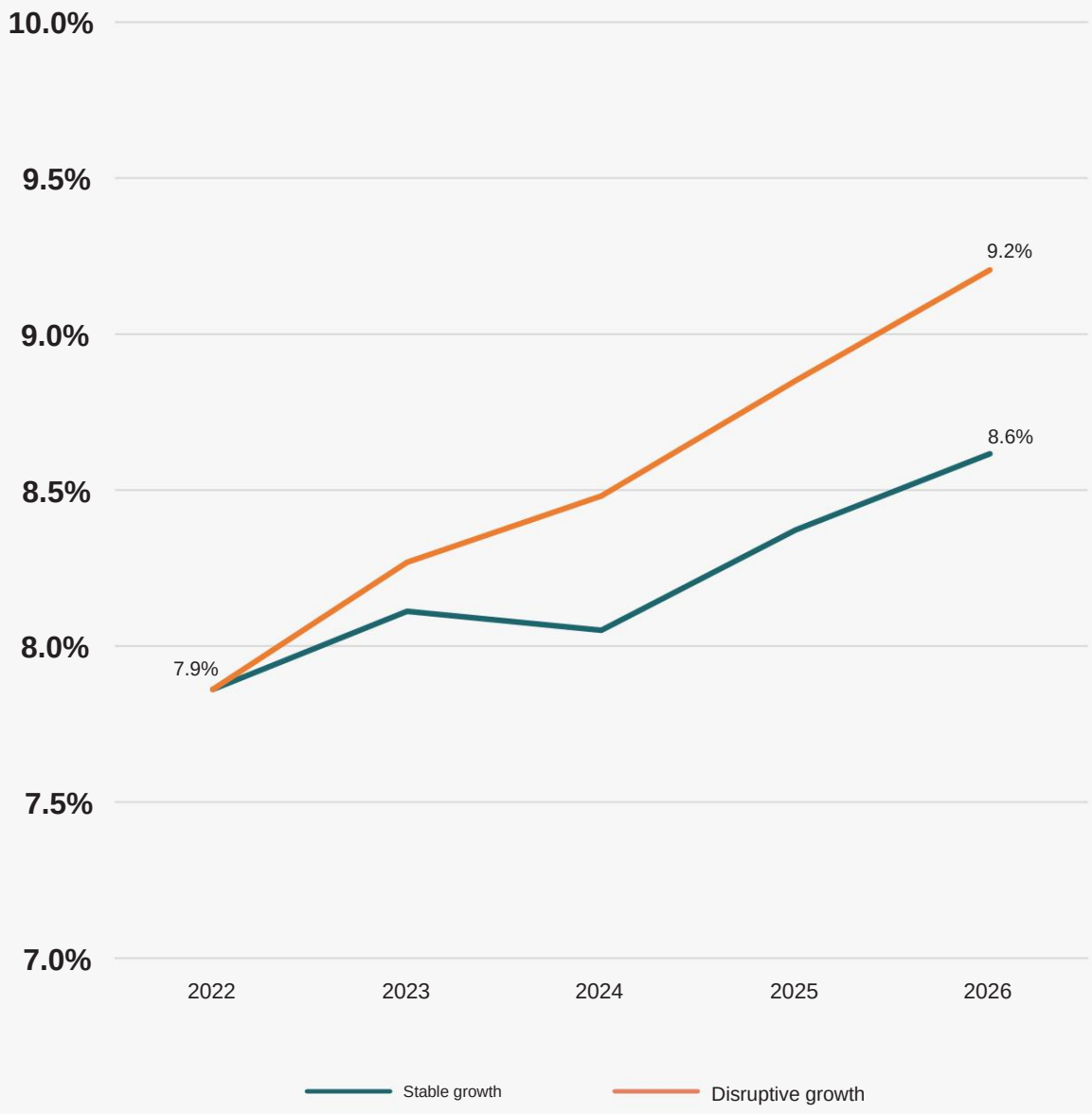


Diagram 27

Scenario comparison: that of the tech industry GDP share 2022-2026

Refers to the tech industry's value added (SNI 26 and 61-63)
relative to GDP at base price, in 2015 prices



Chart

Appendix 1 – Regional growth figures in tech

Growth 2000-2021 refers to growth in value added in current prices according to Statistics Sweden's regional accounts.

County	Growth in tech 2000-2021	Share of the tech industry GDP contribution 2021
Östergötland county	427%	4.9%
Örebro county	325%	1.7%
Halland County	303%	0.7%
Västra Götaland county	272%	14.8%
Stockholm county	265%	54.5%
Skåne County	223%	8.5%
Blekinge county	214%	1.6%
Uppsala county	192%	1.7%
Västerbotten County	191%	1.4%
Jönköping County	157%	1.2%
Gävleborg County	148%	0.8%
Värmland county	137%	1.1%
Kronoberg county	137%	0.8%
Norrbotten county	99%	1.2%
Västernorrland county	97%	1.9%
Dalarna county	86%	0.7%
Kalmar County	84%	0.6%
Jämtland County	82%	0.4%
County of Gotland	80%	0.1%
Västmansland county	78%	0.9%
Södermanland county	66%	0.4%

Appendix 2 – Forecast conditions and related in-depth information

To understand and forecast the future development of the tech industry, revenue growth can be viewed as a result consisting of three growth components:

- The structural growth that consists of an under-
  horizontal, trend growth rate.
- The cyclical growth, a growth rate that depends on the general economic situation in the economy and the covariation of the tech industry with the conjunc-
  clean.
- Economic shocks, events or phenomena of a one-off nature that can either increase or decrease the rate of growth.

The forecast scenarios in the report are based on a structural growth in tech that is on par with the development during the last two decades. The long reference period means that variations over the economic cycle largely even out. In order to estimate the impact of the economic situation on the industry's development, the forecasts have partly weighed existing macro forecasts from the Norwegian Institute of Economic Research and other assessors (published in the third quarter of 2023), and partly the normal co-variation between the general economic situation and the tech industry's production value on a historical basis.

In the forecast's alternative scenario, an economic development is assumed during the forecast horizon that is something stronger than in the base scenario. In the alternative scenario, it is also assumed that new technologies such as AI and 5G are gradually phased in and increase structural growth. As disruptive technologies, these are assumed to bring about significant productivity gains in the economy, which increases turnover per employed worker and therefore the structural growth rate.

A possible source of error for industry turnover during the forecast period is, in addition to the forecasted growth rate, the data from which the forecasting work was based regarding industry growth in 2022. The data is a preliminary outcome based on calculations based on the Swedish Tax Agency's VAT statistics. If growth turns out to have been significantly lower or higher than the preliminary figure shows, the level in 2026 will also be affected.

In the forecasts, an assumption is also made of zero-point development for the price development for tech products seen over the entire forecast period. This means that the growth seen over the entire forecast period refers to both the growth in kroner (current prices) and the price-adjusted growth (in volumes). The assumption is on par with how the long-term development has looked over the past 10 to 15 years, but constitutes a possible source of error. This applies not least if the economic development turns out to be different compared to what was assumed in the forecasts, because the economic development is usually significant for the general price development.

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A REPORT FROM TECHSWERIGE

The Swedish tech industry in 2023

Strong growth and good future prospects despite tough times

TechSverige is an industry and employer organization for all companies in the tech sector, with the task of creating, together with the members, the best possible conditions for a world-leading tech industry in Sweden. Among our more than 1,400 member companies - which in total have close to 100,000 employees in Sweden - everything from small startup companies with a few employees to large, multinational companies with thousands of employees around the world can be found.

TechSverige is one of nine cooperating associations within Almega. Our members are also members of the Swedish Confederation of Business. Feel free to visit us at techsverige.se

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