INVESTMENT REPORT 2024/25

INNOVATION INTEGRATION AND SIMPLIFICATION IN EUROPE

European Investment Bank | Group

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Investment Report 2024/2025: Innovation, integration and simplification in Europe

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This is a publication of the EIB Economics Department.
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About the Economics Department
The mission of the EIB Economics Department is to provide economic analyses and studies to support the Bank in its operations and in the definition of its positioning, strategy and policy. The department and its team of economists is headed by Debora Revoltella, director of economics.

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About the report

The annual EIB report on investment and investment finance is a product of the EIB Economics Department. The report provides a comprehensive overview of the developments and drivers of investment and investment finance in the European Union. It combines an analysis and understanding of key market trends and developments, with a thematic focus explored in greater depth. This year, the focus is Europe's ability to marshal the investment needed for the green transition and to support innovation. The report draws extensively on the results of the annual EIB Investment Survey (EIBIS) and the EIB Municipalities Survey, combining internal EIB analysis with contributions from leading experts in the field.

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KEY MESSAGES FROM THE INVESTMENT REPORT 2024/25

1 There are three key drivers to consolidate Europe as a global leader in new technologies: market integration, simplification and large-scale investment in innovation.

Integration: European firms need market scale at home to remain globally competitive

- 60% of exporting European firms – and 74% of firms with cutting-edge innovation – say that the intra-EU market fragmentation (due to different national consumer protection standards, value-added tax, labelling, and licensing requirements) is an obstacle to business opportunities.
- Larger capital markets are key to mobilising large-scale and higher-risk finance for innovation.
- Financial integration in Europe remains lower than it was before the financial crisis, when it reached a peak. If the gap with that peak level were to be halved, cross-border financial flows could increase by 3% of gross domestic product (GDP), and GDP itself could increase by 1%.
- Being able to raise equity finance makes firms 13 percentage points more likely to innovate.
- EU scale-up firms have raised, on average, 50% less capital than their US counterparts in the last ten years.

Simplification: The cost of bureaucracy is a significant burden for EU firms

About 86% of EU firms employ staff specifically to deal with regulatory compliance, at an average cost of 1.8% of turnover. The cost increases to 2.5% of turnover for small and medium-sized enterprises (SMEs). As a comparison, EU firms' spending on energy after the energy shock is equal to 4% of turnover.

Large-scale investment in innovation and economic transformation

- The significant boost to private investment derived from strong public support during the COVID-19 pandemic and the energy crisis is slowing down. This makes the creation of a favourable business environment rich in opportunities even more important.
- Improving the business environment by reducing barriers to investment is associated with higher economic growth, especially for investment-intensive industries and high-tech sectors.
- 79% of EU firms cite uncertainty as a barrier to investment, with the scarcity of skilled staff and energy costs similarly significant, at 77%. The most dynamic firms are more likely to report constraints.

2 Europe's strong industrial, research and trade base creates an opportunity to exploit the next phase of artificial intelligence (AI) development, which will focus on the integration of AI and other digital technologies into industrial and service processes.

- The European Union is the second largest economy in the world and the largest trader of manufactured goods and services. European firms already showed their agility in responding to trade shocks in 2022 and 2023 by investing in resilience and digital tracking, increasing inventories and diversifying suppliers. This served as a test for the new wave of trade shocks.

- Europe is a research powerhouse. It issues 24% more research publications than the United States, according to the Nature Index. This is an indicator of the strength of Europe's research base and an asset to exploit for more industrial and service applications.

- European firms are positioned to exploit the opportunity presented by the integration of AI into industrial and service processes. So far, AI investments have largely focused on two basic components: infrastructure, such as data centres, and models. Both are highly energy intensive, while the latest developments suggest their use is becoming a commodity. Progress has been much slower in a third component – integration, or the adoption of AI in manufacturing and services – where productivity gains are large.

- The share of firms using big data analytics and AI in the European Union is 6 percentage points lower than it is in the United States. However, preliminary analysis shows that EU firms in manufacturing and services that integrate AI into their processes have a higher productivity compared with other firms. Correlation is not causation, but this initial result indicates a potential upside for EU firms going forward.

- To seize this opportunity and accelerate AI adoption, the European Union can leverage its ongoing investment in cheap and clean energy, its focus on data centres and digital infrastructure, a consistent regulatory framework (which ensures the integrity and security of company and personal data), a favourable competition-policy environment for market consolidation, and more integrated product and services markets.

- Digital and AI adoption will be supported by Europe's strong university system. Enhanced investment in employee skills also presents an opportunity.

3 Europe's climate leadership is paying off.

- In a global context of high uncertainty, Europe can provide certainty, maintaining ambitious goals with a realistic and pragmatic roadmap for companies to seize the opportunities of the green transition. Climate policies that are ambitious, but also consistent, are a key incentive for firms to enhance energy efficiency, delivering a triple win: lower energy prices, more security and sustainable growth.

- The energy revolution is in full swing. Renewable energy supplied almost half (48%) of Europe's electricity demand in 2024, with emissions from power generation falling 13% during the year.

- Europe remains at the forefront of greentech patenting and is at the centre of global patenting networks on greentech.

- European firms are profiting from export growth in low-carbon technologies. European exports in those products are expanding fast: 65% since 2017, compared to 79% for China and only 22% for the United States.

4 Europe's social investment acts as an enabler, bringing economic returns.

- Over half of EU firms (51%) reported that the scarcity of skilled workers was a major barrier to investment in 2024 – up from 38% in 2016 – and that not enough was being done in terms of training.

- Social investment is critical for labour force participation. If female labour force participation in all EU countries were to be raised to the highest EU standards, EU GDP could increase 4%.

- Particularly in fast-growing cities, rigidity in the supply of affordable housing increases labour misallocation and impedes growth in output and productivity.

- In light of the many social needs, efficiency in spending is important. By matching the efficiency levels of the best in class, EU members could achieve the same level of educational and health outcomes while spending 2.5% of GDP less.

5 Maximising the impact of public support: Investment is more effective with targeted instruments and with EU-level coordination.

- 16% of EU firms benefited from policy support in 2024, in the form of subsidies or finance with favourable conditions.

- EU firms are more likely to respond to targeted policy incentives. The probability that EU firms will invest in energy efficiency, cleantech or innovation is 20 percentage points higher when support is targeted.

- Furthermore, a pan-European approach to industrial policy minimises distortions to the single market and enhances effectiveness.

The EIB's role in Europe's transformation

The EIB Investment Report 2024/2025 confirms that the EIB Group's strategic priorities contribute to Europe's competitiveness and security, in particular by:

✓ Consolidating the EIB Group's leadership as the climate bank

More than 60% of the EIB Group investments made in 2024 contributed to the green transition, with record investment in energy and a doubling of investment in power grids and interconnectors.

✓ Mobilising investment for Europe's tech champions

In 2024, the EIB Group mobilised a record EUR 100 billion in higher-risk investment for Europe's innovators.

Work is ongoing to start a TechEU programme that closes the financing gap throughout the innovation and company growth cycle, in particular through venture capital and venture debt, scale-up finance and an exit platform for late growth and more mature companies.

✓ Contributing to the integration of Europe's markets

The EIB Group is a capital market union instrument in itself, issuing debt under a single European signature to channel savings into productive investments.

From energy to transport, from AI to healthcare technologies, the EIB ensures targeted financial support that is directed by EU policies, ensuring the maximum impact for investment mobilised, innovation and economic growth.

✓ Contributing to stronger partnerships around the world

Executive summary

Market integration, simplification and large-scale investment in innovation

The EIB Investment Report 2024/2025 focuses on the solutions that will make the European economy more productive, innovative, green and secure. It highlights how market integration, simplification and focused policy efforts can catalyse large-scale investment in innovation, digitalisation and the green transition, building on Europe's existing strengths. The report draws on the EIB Investment Survey (EIBIS), which provides detailed information from more than 12 000 European companies.

Europe could reinforce its position as a global technology leader by focusing on three areas: market integration, simplification and large-scale investment in innovation. European firms need to be able to benefit from the full scale of the internal European market to remain globally competitive. Larger and more integrated capital markets are instrumental to mobilising large-scale and higher-risk finance for innovation. Meanwhile, the cost of bureaucracy is a significant burden for EU firms. Simplification and reduced barriers will improve business opportunities. Combined with well targeted policy support, these measures could give a big boost to transformative investment.

Europe can build on its strengths: its strong industrial, research and trade base; its climate leadership; and its enabling social model. Europe is a trade and research powerhouse with a strong industrial base. European firms are agile and responsive. Confronted with trade disruptions in recent years, they managed to react, investing in resilience. The next phase of artificial intelligence will bring unique opportunities, as integrating these technologies into manufacturing and services could significantly improve productivity. At the same time, Europe's climate leadership is paying off through progress on the energy transition and its prominent position in greentech innovation and trade, creating opportunities going forward. Europe's social model acts as an enabler, bringing economic returns and providing the skills needed to enhance competitiveness.

With large investment needs and constrained resources, maximising the impact of public support is crucial. Europe has experience using financial instruments to leverage scarce resources to achieve policy objectives. During the COVID-19 pandemic and the energy crisis, strong public support significantly lifted private investment. Going forward, a sustained policy focus on investment will be critical. The effectiveness of public support for investment is greater with targeted instruments and European-level coordination.

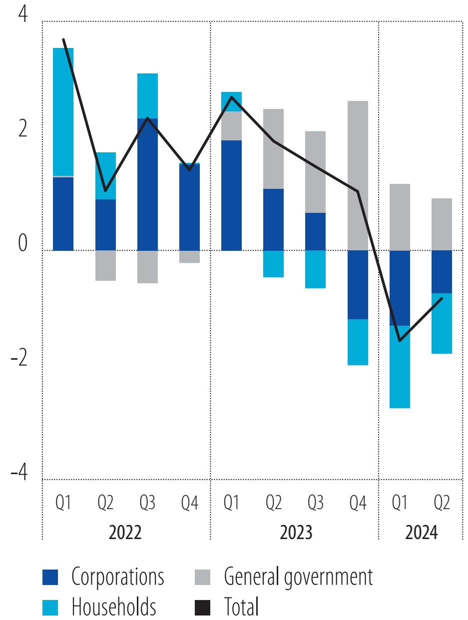
The European economy could substantially accelerate innovation, productivity and transformative investment

In a polarised global environment, it is even more important that the European economy becomes more productive, innovative, green and secure. This transformation can only be achieved with significant investment in critical areas. Estimates of additional investment needed for the green transition alone amount to 2% of gross domestic product (GDP). The need to respond to the innovation and AI revolutions, skills gaps and new security and defence challenges adds to this amount. The European economy needs to undergo a structural shift that enables it to invest significantly more in its future.

Since the COVID-19 pandemic, investment has been supported by a strong European policy focus, but investment is now slowing. The post-COVID-19 rebound in investment was backed by strong public-sector intervention, along with dynamic spending and investment by households and businesses. Private investment, however, has begun to subside in the last two years (Figure 1). Overall, the latest data for 2024 show a contraction in total investment.

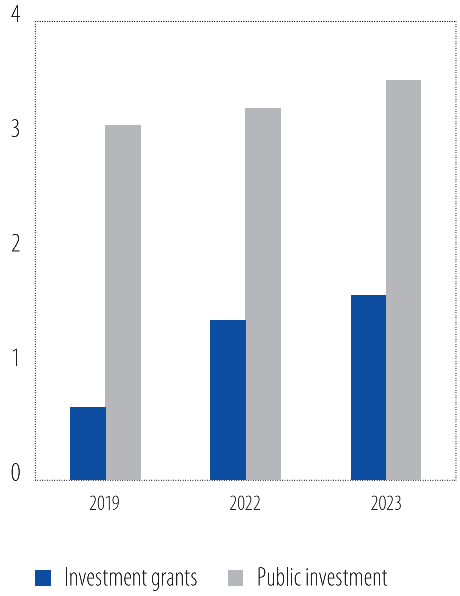
Investment growth currently depends on the public sector. In the first half of 2024, government investment grew by 7.2% year-on-year, helping to offset a 2.5% decline in private investment. As a share of GDP, public investment reached 3.5% in 2023 (Figure 2). Over the same time period, public subsidies for investment rose from 0.6% to 1.6% of GDP. The deployment of the Recovery and Resilience Facility and other EU funds contributed significantly to these trends.

Figure 1
Investment growth and contributions (% change from the prior year), **by sector**



Source: *EIB staff calculations based on Eurostat.*

Figure 2
Public investment and investment subsidies in the European Union (% GDP)



Source: *Eurostat and EIB staff calculations.*

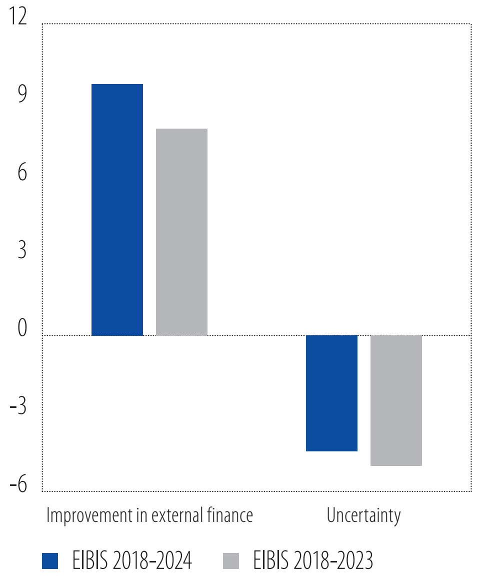
Prospects for an immediate pick-up in investment are mixed

On the positive side, cyclical macroeconomic conditions have been improving, and the Recovery and Resilience Facility and EU structural funds are still making their presence felt. Investment is likely to be buoyed by looser monetary policy feeding through the economy (Figure 3). Falling inflation may also bolster real income growth and private consumption, and therefore overall demand. Meanwhile, growth among the European Union's major trading partners may contribute to investment opportunities. The Recovery and Resilience Facility will continue to provide support until the end of 2026 and EU structural funds will do so until 2030 in recipient countries. Somewhat encouragingly, expectations for investment growth are positive, and they are being driven by high and mid-tech industries (Figure 4).

On the negative side, heightened uncertainty, the threat of new barriers to trade and tighter national budgets are likely to weigh on investment. At the global level, the United States' "America first" policy – with its questioning of international norms and established alliances – is creating a high degree of uncertainty that is particularly acute in areas like the green transition and critical technologies. Further global polarisation, new trade barriers and value-chain disruptions have the potential to undermine investment prospects in critical industries. As the fiscal rules of the EU Economic Governance Framework are reinstated after being paused during the pandemic, governments will increasingly face hard trade-offs, which in the past often led them to reduce investment. The end of the Recovery and Resilience Facility in late 2026 will add to these constraints.

Figure 3

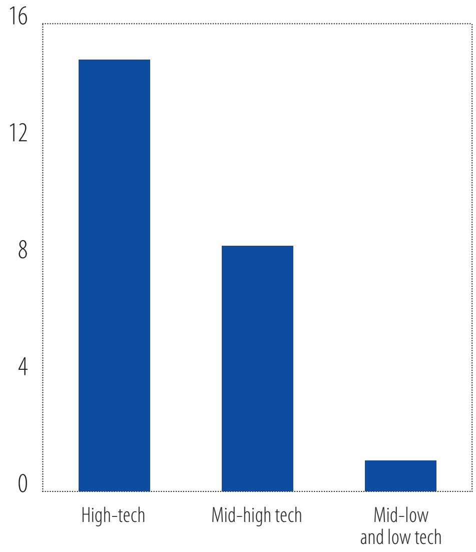
Impact on the probability of firms accelerating investment (in percentage points)



Source: EIB staff calculations based on EIB Investment Survey (EIBIS) 2018-2024.

Figure 4

Balance of firms expecting to increase investment (in %)**, by sector**



Source: EIBIS 2024.

Note: The percentages refer to the share of firms expecting to increase investment minus those expecting to decrease investment.

Market integration: European firms need market scale to remain globally competitive, and larger capital markets are instrumental to mobilising large-scale and higher-risk finance for innovation

Increasing the depth of the single market will help Europe's firms to remain globally competitive by expanding markets and incentives to invest. 60% of exporting European firms – and 74% of innovators – say they face barriers from different national regulations and consumer protection standards when exporting to another country within the European Union. These differences may, for example, relate to how they document value-added taxes, safety and environmental certifications or simple requests for credentials, permits and professional qualifications. This reduces trade, creating a barrier equivalent to a 60% tariff on goods and 110% on services, according to the International Monetary Fund (IMF). Tackling these barriers – and thereby taking full advantage of the benefits of a market of 450 million consumers – is even more critical against a backdrop of global trade uncertainties.

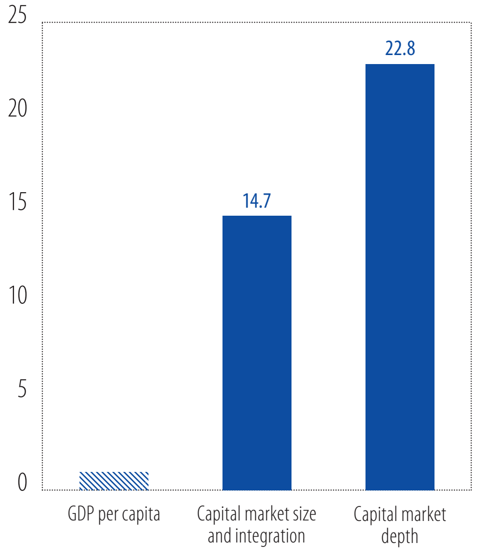
Reducing the fragmentation of EU capital markets is crucial to making better use of Europe's substantial savings. EU financial integration peaked before the global financial crisis and has never returned to that level, which has been a lost opportunity for Europe. Cutting that gap in half could boost cross-border financial flows by 3% of GDP and raise EU real GDP by up to 1%.

Integration increases financial markets' size and depth, which makes it easier for firms to finance innovation by issuing equity. Our analysis suggests that the probability of firms issuing equity is not related to GDP per capita but rather to financial market size, integration and depth (Figure 5). Meanwhile, firms that have access to equity finance have investment growth rates that are 7 percentage points higher. They are also 13 percentage points more likely to be developing innovative new products (Figure 6). Improving the availability of finance through more integrated EU financial markets is crucial to supporting innovation.

There are various stages to financial market integration. EU households' savings are conservatively invested with a strong bias for investments in their home country and low returns, calling for innovation in the retail savings and pension products available. The corporate sector remains a net lender to the rest of the economy, showing that excess corporate savings are not always finding their way into productive business opportunities. Pension and insurance funds can play a stronger role in directing EU savings towards innovation. Both pension and insurance intermediaries would benefit from better investment opportunities in equity or innovation within Europe. Stronger European capital markets might prevent a sizeable share of EU savings from going abroad.

Figure 5

Impact on the probability of issuing equity (in percentage points)

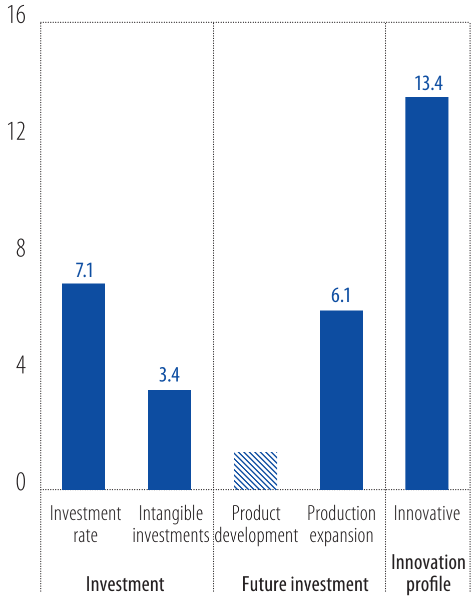


Source: *A sample based on EIBIS 2016-2023 and Bureau Van Dijk's Orbis database of companies, based on Betz, Pál, Sapir and Tran (forthcoming).*

Note: *Market size and integration includes total market capitalisation and a composite indicator measuring market integration for the rest of the world. Market depth includes public market financing (market capitalisation relative to GDP) and capital raised through initial public offerings (IPOs) relative to GDP, as well as pre-IPO risk capital (venture capital investment relative to GDP).*

Figure 6

Estimated impact of equity issuance on firm performance (in percentage points)



Source: *EIBIS-Orbis 2016-2023 sample based on Betz, Pál, Sapir and Tran (forthcoming).*

Note: *Investment rate is the average net investment rate for the coming three years. Intangible investment is the rate over total assets. Results that are not statistically significant at the 90% confidence level are indicated with diagonal stripes.*

Simplification enhances business opportunities: The cost of bureaucracy is a significant burden for EU firms

Simplification is crucial. The cost of bureaucracy is a significant burden for EU firms, particularly for smaller enterprises. About 86% of EU firms employ staff to deal with regulatory compliance, with an associated cost of 1.8% of turnover. The cost increases to 2.5% of turnover for small and medium companies. By comparison, EU firms' spending on energy after the energy shock amounted to just 4% of turnover.

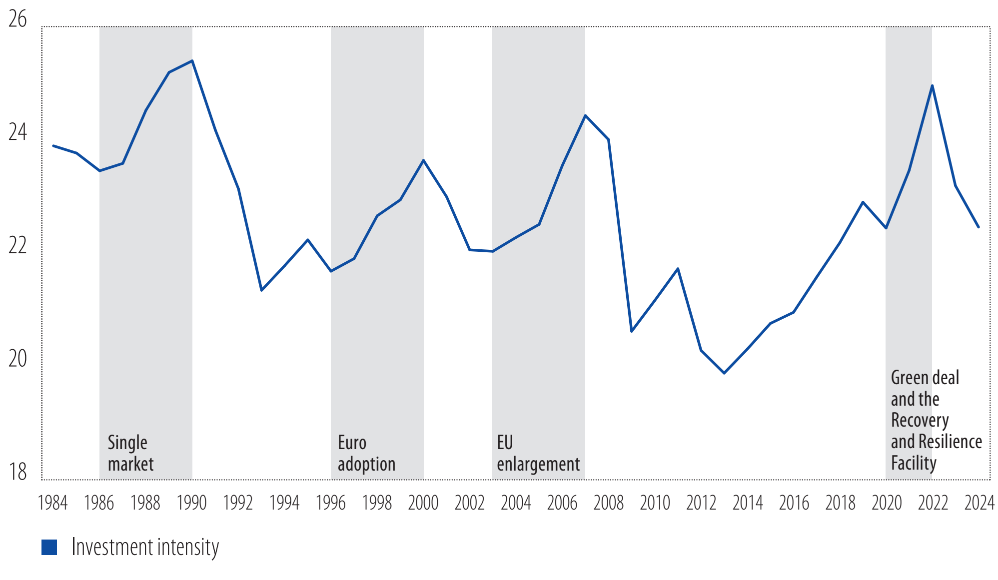
Reduced barriers combined with European support would be a boon for transformative investment

Past episodes of a sustained acceleration in EU investment were driven by structural changes to the economy that unlocked new business opportunities. These include the formation of the single market, waves of EU enlargement and the introduction of the euro (Figure 7). By expanding markets, removing barriers and facilitating substantial capital flows and access to finance, these events contributed to a large expansion in business opportunities, which also spurred a significant and sustained acceleration in investment.

More recently, a strong EU policy focus on investment provided a similar boost. Since 2015, the European Union has put investment at the centre of the EU policy framework with the Investment Plan for Europe. However, the real turning point was arguably the business impetus created by Europe's green and digital ambitions, supported by the European Green Deal, the Recovery and Resilience Facility and the response to the energy crisis. These policy shifts again contributed to another rise in the investment share of GDP, despite major shocks such as the pandemic and the energy crisis.

Periods of rising investment in the past 40 years point to the power of combining an investment push with an increase in business opportunities. During these episodes, investment accelerated in response to a combination of structural and regulatory shifts that created business opportunities, the availability of finance and policy incentives. As the debate continues on how Europe can best achieve its common goals, this history points to the way forward.

Figure 7
Investment rate in the European Union (% GDP)

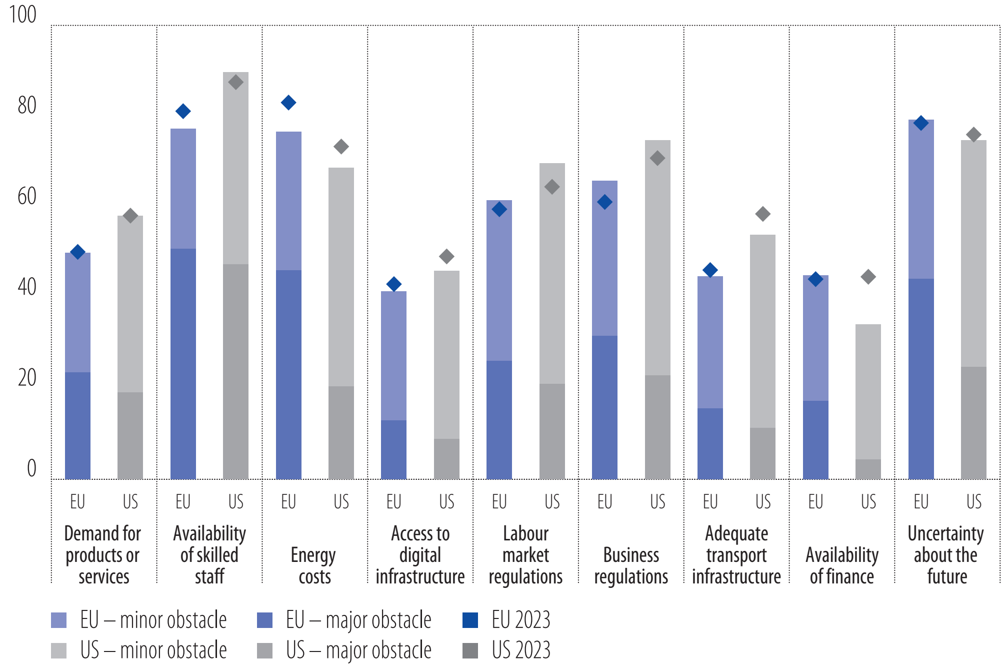


Source: *EIB staff calculations based on the International Monetary Fund's World Economic Outlook for October 2024.*
Note: *The rate is calculated for countries that are currently members of the European Union.*

Improving the business environment by reducing barriers to investment is associated with higher economic growth, especially for investment-intensive industries and high-tech sectors. 79% of EU firms cite uncertainty as a barrier to investment, with the scarcity of skilled staff and energy costs similarly important, at 77% (Figure 8). The most dynamic firms are more likely to report constraints. An analysis comparing the number of major barriers reported by firms and growth in value added in each sector shows that the increase in value added is significantly higher in industries in which firms report fewer barriers. Just by eliminating one major obstacle, the value added of the sector improves by 3.3 percentage points over four years. High-tech sectors are particularly sensitive to the number of barriers they face. The share of firms in high-tech sectors is greater in countries where fewer obstacles are reported. Ultimately, an improved business environment will spur growth overall and will contribute to further unleashing the potential of Europe's companies.

Figure 8

Share of firms (in %) **reporting different obstacles to investment**



Source: *EIBIS 2024.*

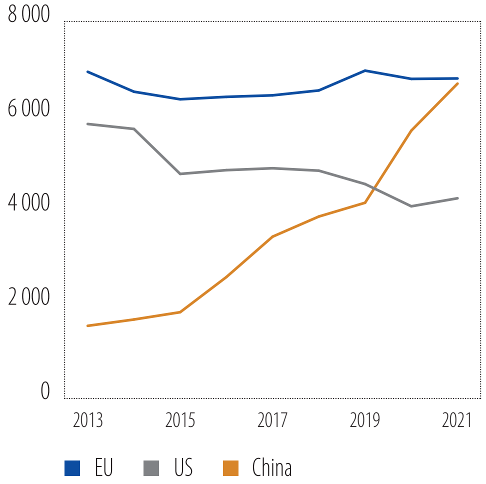
Building on Europe's strengths: A strong industrial, research and trade base creates an opportunity to lead in technological innovation and increase productivity

Europe is on the cutting edge of basic research, but this is not reflected in patenting for important technologies, and it does not necessarily lead to industrial applications. Europe publishes 24% more research publications than the United States, according to the Nature Index. In patent issuance, the European Union still competes on the greentech frontier (Figure 9), but is falling behind in biotech, digital technologies and artificial intelligence, despite some areas of excellence. Large European players dominate in a handful of more traditional sectors, but their dependency on foreign companies for digital technologies and services is causing concern as artificial intelligence comes to the fore. Looking at the adoption of innovations, the share of EU firms taking up advanced digital technologies in general, and artificial intelligence in particular, is rising in parallel with the trend in the United States, although Europe is still slightly behind (Figure 10).

European innovators need a business environment that is open to disruptive opportunities and financing that allows firms to grow. For innovation to flourish, Europe needs to provide business opportunities for young, innovative firms – which would encourage them to stay in Europe – as well as adequate financing opportunities tailored to each stage of the firm life cycle. EU scale-up firms have raised, on average, 50% less capital than their US counterparts in the last ten years (Figure 11). Europe must address these gaps, particularly those related to scale-up finance when a company's business is established and the time has come to expand activity and markets. Solutions include reinforcing debt and equity-type products targeting specific critical technologies and reinforcing opportunities at (and before) the exit stage. More exit opportunities through acquisition or initial public offerings (IPOs) exist in the United States, where firms attract greater valuations. This encourages promising firms to relocate abroad, often well before investors exit the company (Figure 12).

Figure 9

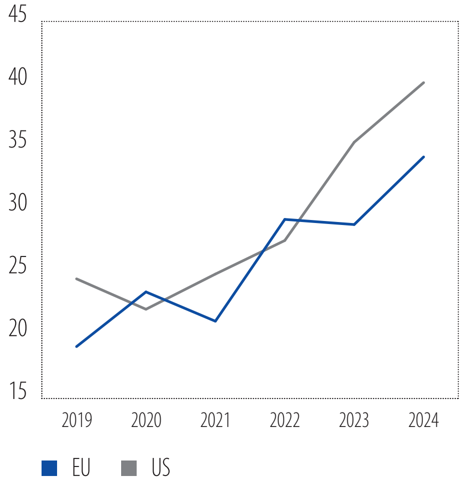
Number of patents in green technologies (count)



Source: EIB staff calculations based on Patent Cooperation Treaty (PCT) patents (PATSTAT) in collaboration with Expertise Centre for Research and Development Monitoring (ECOOM) at KU Leuven University.

Figure 10

Use of artificial intelligence (% of firms)



Source: EIBIS 2019-2024.

Figure 11

Cumulative capital raised by scale-ups since establishment (USD million, an average)

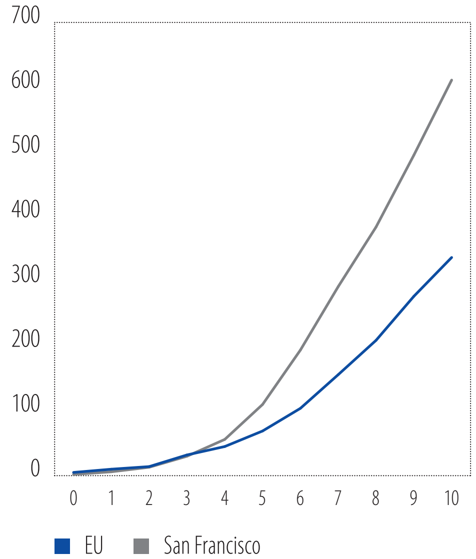
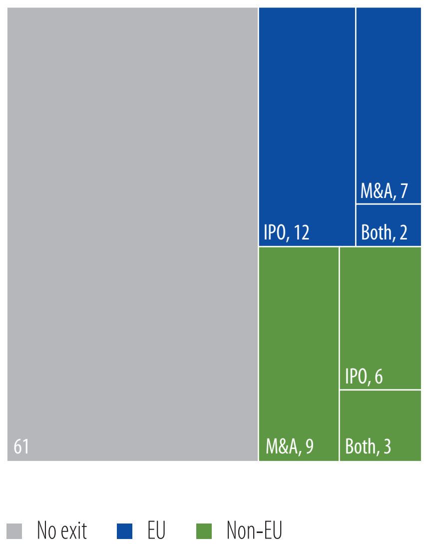


Figure 12

Location and type of exit among EU scale-ups (in %)



Source: Fratto et al. (2024)[1] based on PitchBook Data, Inc data.

Note: The sample consists of companies that had a market valuation of USD 500 million to USD 10 billion for 2013-2023. Figure 11: San Francisco is the US benchmark. The numbers in the x-axis represent the number of years since the firm was established. Figure 12: Type of exits: initial public offering (IPO) and mergers and acquisitions (M&A). The 0.8% of scale-ups that were bought out are included in "no exit."

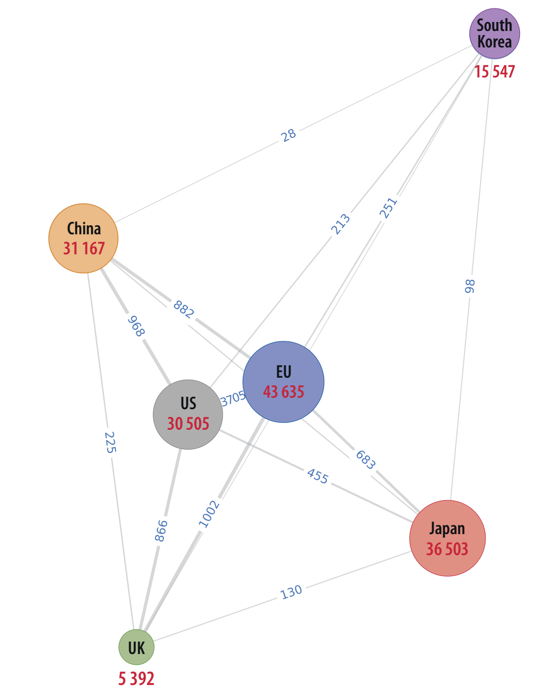
1 Fratto, C., Gatti, M., Kivernyk, A., Sinnott, E., & van der Wielen, W. (2024). *The scale-up gap: Financial market constraints holding back innovative firms in the European Union*. https://doi.org/10.2867/382579

Building on Europe's strengths: Europe's climate leadership is paying off

Europe's climate ambitions have made it a leader in the green transition. The European Union has set out a bold long-term vision to achieve carbon neutrality by 2050, with binding commitments and regulatory measures that mandate the adoption of renewable energy, emissions reduction and energy efficiency; carbon pricing, through mechanisms like the EU Emissions Trading System; and financial incentives, including subsidies and tax breaks, to foster green innovation. Together, these measures are successfully driving the adoption of green technologies by EU firms, promoting innovation, encouraging the transformation of energy-intensive industries, and laying the foundation for a competitive and sustainable green economy. The long-term commitment, consistency of signals and sufficiently fast deployment of infrastructure (such as for electricity generation and transmission) will be critical to preserving the advantage Europe has secured.

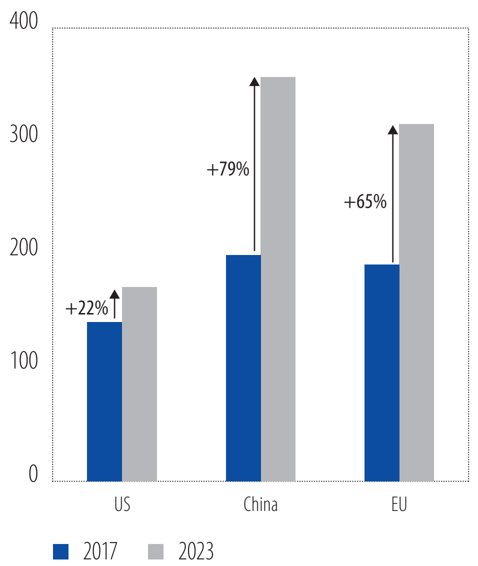
Europe's green ambition is behind its success in greentech innovation. Despite fierce global competition, Europe is still on the cutting edge of greentech innovation and is well positioned at the centre of global patenting networks (Figure 13). European firms preserve a degree of comparative advantage and Europe's exports in low-carbon technologies are expanding, having grown by 65% since 2017, compared with 79% for China and only 22% for the United States (Figure 14). With geopolitical changes threatening to re-order global value chains, European firms have an opportunity to find the right positioning to balance efficiency, resilience and security.

Figure 13
Co-patenting networks for green technologies
(2016-2022)



Source: *PCT patents (PATSTAT), calculated by ECOOM, KU Leuven.*

Figure 14
Exports of low-carbon technologies
(EUR billion)



Source: *EIB staff calculations based on UN Comtrade data.*

A policy framework consistent with Europe's ambition encourages energy efficiency investment and firm transformation. 77% of EU firms see energy costs as an obstacle to investment (Figure 8). But this alone is not always enough to encourage investment in energy efficiency and transformation. The policy framework plays a crucial role. Firms in countries with more ambitious climate policies are significantly more likely to invest in energy efficiency and benefit from such investment, with higher profitability, productivity and innovation (Figure 15). In countries that enforce climate policies less stringently, however, the benefits of energy efficiency efforts are less apparent, particularly in energy-intensive industries. Our analysis shows that firms in energy-intensive industries do not reap significant returns from their efforts to transform when climate policy enforcement is weaker (Figure 16). The lesson is clear. Policy certainty and stringency are critical for the green transition. At the same time, Europe's green transition also requires the transformation of the power generation and transmission sector, as well as targeted and result-based incentives in some cases to ease financial constraints for the firms most at risk.

There is a growing gap between firm investment in mitigation and adaptation. 66% of European firms now say they have been affected by extreme weather events in some way, but only a fraction of these companies have invested in adaptation measures or have bought insurance. As with energy efficiency investments, finance and a lack of skills pose barriers to action.

Figure 15

Factors affecting the energy performance index (ranging from 0 to 1)

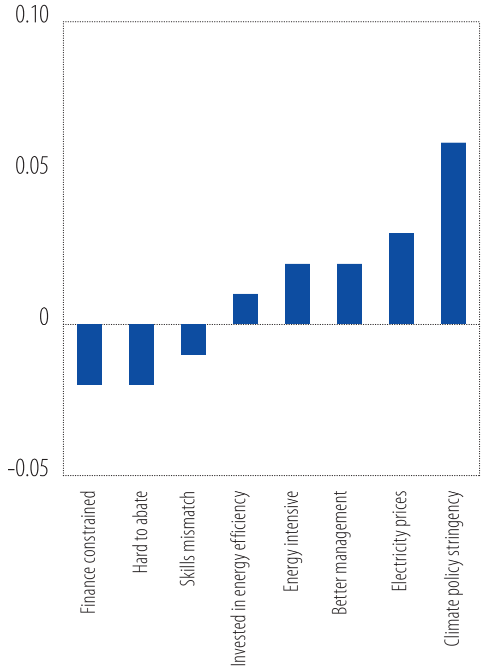
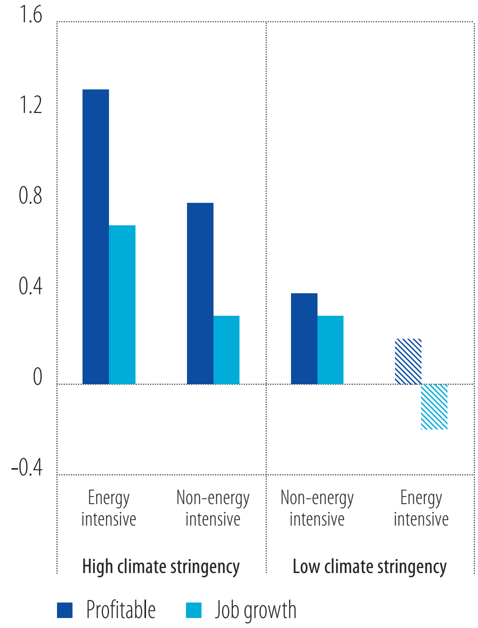


Figure 16

Predicted probabilities of returns from energy efficiency improvements (in %)



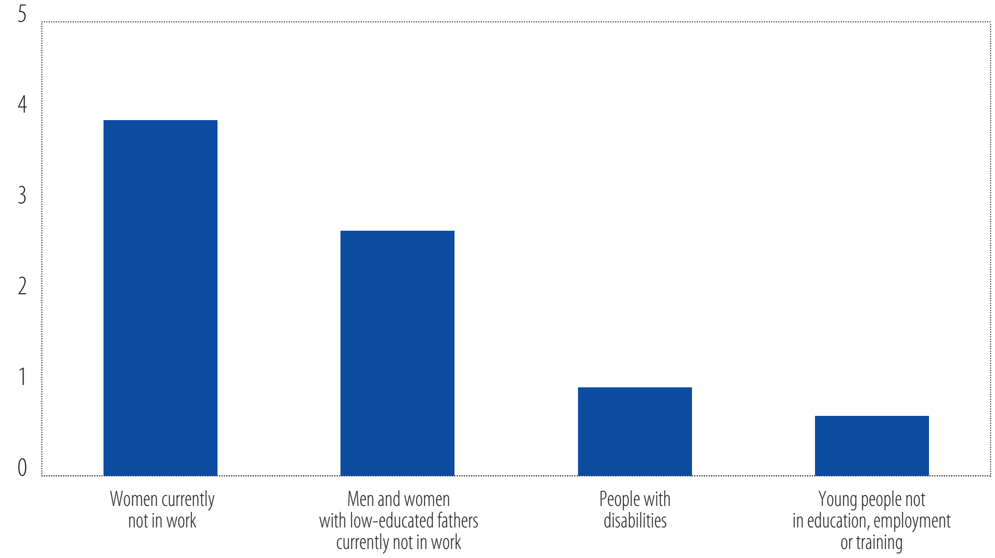
Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *Climate policy stringency refers to a normalised sub-indicator from the Climate Change Performance Index. Results that are not statistically significant at the 95% confidence level are indicated with diagonal stripes. Figure 15: The bars represent the intensive marginal effects of various determinants on energy efficiency, as represented by a meta score (see Chapter 6), accounting for year and size effects. Figure 16: The bars represent the probability of different returns to firms from energy efficiency efforts, depending on specific determinants.*

Building on Europe's strengths: Social investment can bring economic returns and provide the skills needed to enhance competitiveness

Often taken for granted, Europe's inclusive social model is one of its strengths. Rising labour market participation, particularly among women, and growing equality of opportunity have been a source of growth. However, 51% of EU firms reported the scarcity of skilled workers to be a major barrier to investment in 2024, up from 39% in 2016. This has not resulted in a higher share of firms investing in training. An ageing population and the skills demanded by the green and digital transition are set to exacerbate this issue. In this environment, continued social investment is critical, as it helps people develop skills and encourages participation in the labour force and labour mobility. If female labour force participation in all EU countries were raised to the highest EU level, EU GDP could increase by 4% (Figure 17). The addition of 1.5 million additional places in childcare would reduce the male-female employment gap by 5%.

Figure 17

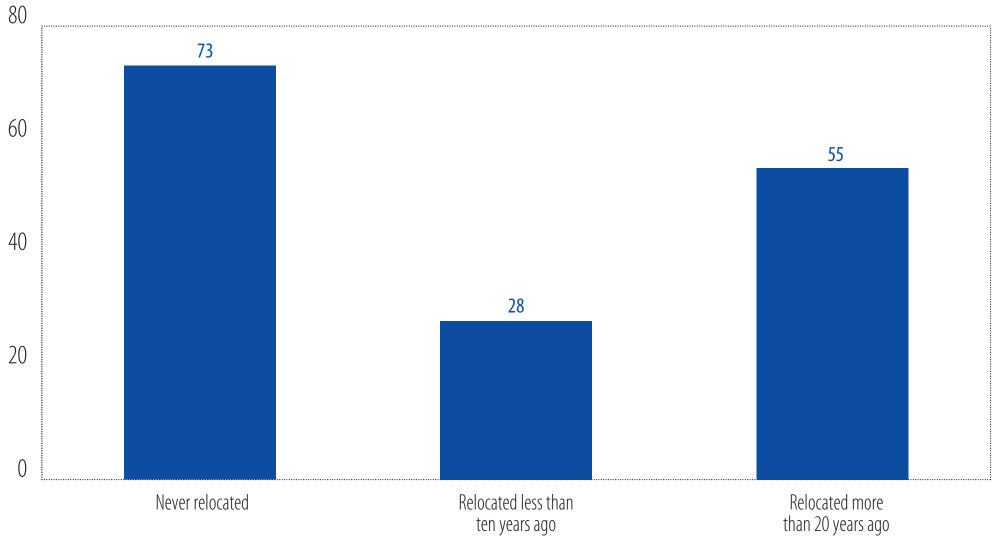
Potential gains in EU GDP (in %) **from increasing labour force participation rates to the level of the best performing EU country**



Source: *EIB staff calculations based on Eurostat, the annual macro-economic database (AMECO) of the European Commission's Directorate General for Economic and Financial Affairs and the Organisation for Economic Co-operation and Development.*

Figure 18

Homeownership rates (in %) **across different demographic groups, EU average 2021-2023**



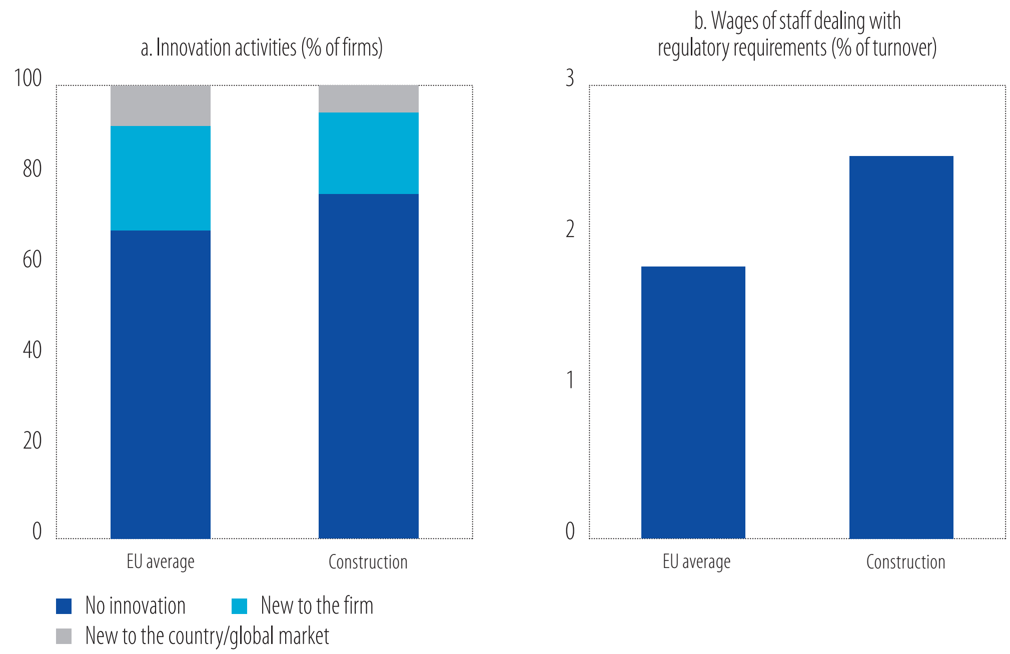
Source: *EIB staff calculations based on EU statistics on income and living conditions (EU-SILC).*

Housing affordability is an increasing concern: Particularly in fast-growing cities, rigidities in the supply of affordable housing increase labour misallocation and negatively affect growth and productivity. This has an especially negative effect on younger people and potential new migrants to cities (Figure 18). In Europe, construction has suffered from low productivity and insufficient innovation, adding to the cost and time of delivering housing projects. Other supply-side barriers are also a concern, with regulatory obstacles, such as difficult permitting processes, and skill constraints holding back the sector (Figure 19).

There is room to enhance the effectiveness of social investment spending. Raising the efficiency of public investment in social sectors across the European Union to the level of Europe's best performers could in theory save some 2.5% of GDP, without compromising on the outcomes achieved. This would free funds to expand investment in key social services.

Figure 19

Innovation and regulatory barriers in the construction sector



Source: *EIBIS 2024.*

Source: *EIBIS 2024.*

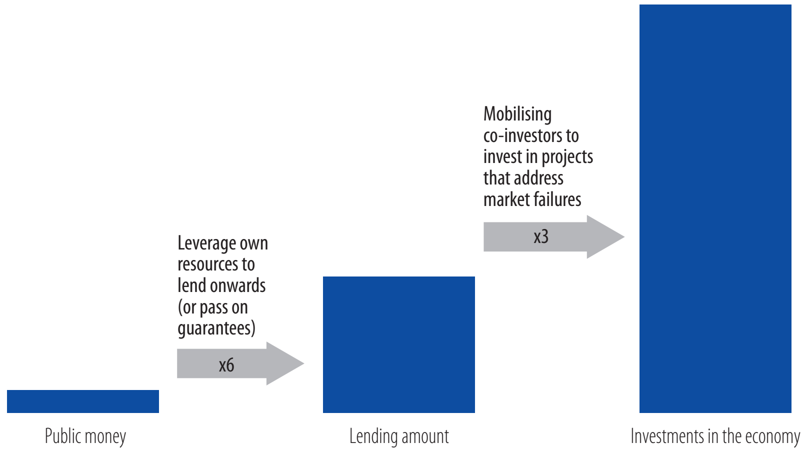
Maximising the impact of public support: Targeted instruments and EU coordination improve impact

Europe needs to maintain its focus on policies that encourage investment. As fiscal space is reduced, new investment needs emerge and the Recovery and Resilience Facility comes to an end, EU members will face more difficult trade-offs. Preserving public investment and enhancing European coordination is crucial, particularly by addressing market failures and catalysing private-sector investment in underserved areas. The impact of scarce public resources can be maximised with financial instruments and stronger EU coordination. When delivering investment in Europe, the leverage effect of financial instruments is a crucial enabler: an opportunity to achieve more with less (Figure 20).

Private sector incentives are more effective when they are targeted. Recent years have seen a substantial increase in policy support for firms in the form of subsidies or loans with favourable conditions. In 2024, 16.1% of firms in Europe received such support. Our analysis confirms that policy support has a positive impact on firms' investment and performance overall, and that the effect is stronger when the incentives are targeted (Figure 21). In fact, EU firms receiving support were 20 percentage points more likely to invest in energy efficiency, cleantech or innovation when the subsidies or loans they received targeted specific policy objectives.

Figure 20

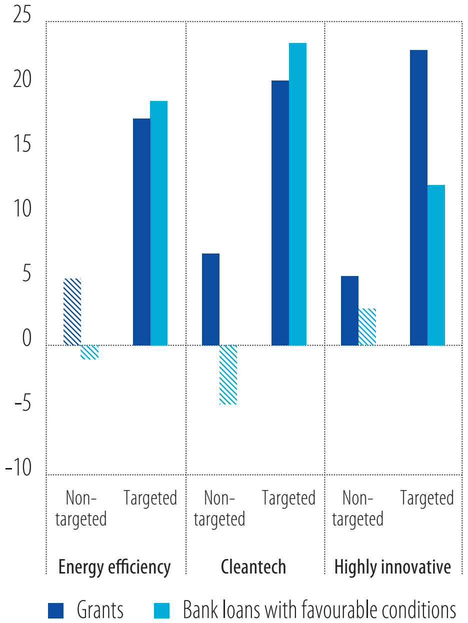
Using leverage to maximise resources (indicative lending multipliers for the EIB Group)



Source: *EIB staff calculations.*
Note *Indicative values only, depending on risk profile, product mix, market environment, additional EU support (especially guarantees).*

Figure 21

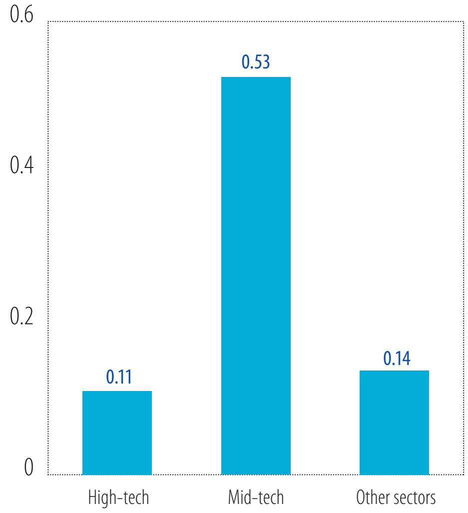
Impact of targeted vs. non-targeted financial support on the probability of investing in green transformation and innovation (in percentage points)



Source: *EIB staff calculations based on EIBIS 2024.*
Note: *Reference is no grants/no bank loans with favourable conditions. Results that are not statistically significant at the 90% confidence level are indicated with diagonal stripes.*

Figure 22

EU instruments reduce biases introduced by interventions at the national level (estimated productivity gain from coordinating policy support, in percentage points)



Source: *EIB staff calculations based on EIBIS 2024.*

Taking a European approach to industrial policy minimises distortions to the single market and enhances effectiveness. Our analysis shows that when policy support is allocated at the EU level, the market distortion effect is lower. This is particularly true in mid-tech sectors (Figure 22).

Ultimately, Europe's opportunity rests on its strengths, namely its capacity to integrate various economies while respecting European values and long-term objectives. Market integration and simplification are key to unleashing business opportunities, which will in turn drive innovation and investment.

PART 1

PUBLIC AND CORPORATE INVESTMENT IN A CHALLENGING ENVIRONMENT

EU real corporate investment is 1% above levels seen before the COVID-19 pandemic, **while in the United States it is 12% higher.**

Government investment has increased by **40%** since 2019.

Investment growth at equity-financed firms is 7 percentage points higher than other firms.

Improving the capital markets union:

Reducing the financial integration gap to half the level of its historical peak would increase cross border financial flows **by 3 percentage points of GDP, and lift EU real GDP by up to 1%**

Firms spent **1.8%** of their turnover **on employees that only deal with bureaucracy**

(**2.5%** for small businesses).

16% **of EU firms benefit from policy support.** This support is more effective if it is:

Targeted:

Firms are **20 percentage points more likely to invest in climate and innovation when support is targeted.**

EU based:

EU level support minimises market distortions, resulting in a 50% improved outcome in productivity for mid-tech sectors, 11% for high-tech sectors and 15% for other sectors.

The European Union is **not taking full advantage of its single market,** with

60%

of EU exporters experiencing trade friction.

Chapter 1

Accelerating transformative investment

European policies have supported investment since the pandemic, but levels are now stagnating. While the European economy emerged from the crises of the early 2020s without major scarring, growth has levelled off since mid-2023. Over the past year, the outlook has been shaped by a tentative normalisation of energy prices, the initial easing of monetary policy and persistent global uncertainty. Investment has been constrained by subdued demand and historically high financing costs, though public financing provided by the European Union, such as the Recovery and Resilience Facility (RRF), is helping to offset the effect. In 2024, public investment and intellectual property were the only kinds of investment that saw growth. At the same time, fiscal policy has shifted from strong support during the energy crisis to a slightly restrictive stance.

Some cyclical drivers of investment are likely to become more supportive of a recovery, while global developments and uncertainty are a key risk. Consumer demand should accelerate, and financial conditions should improve. Falling inflation is bolstering real income and, in turn, private consumption, even as household savings remain high. On the negative side, heightened uncertainty, the threat of new barriers to trade and reduced fiscal space at the national level are likely to weigh on investment activity.

Addressing structural challenges is critical for the European Union's long-term economic growth. Productivity needs to grow vigorously to improve living standards and meet the health and care requirements of an ageing population. To achieve this, Europe must better support research and development, remove barriers constraining the information, communication and technology (ICT) sector and accelerate the adoption of digital technologies – all while advancing the green transition. The labour supply must also be strengthened by increasing participation and enhancing skills. Facilitating the reallocation of capital and labour will be key, as the green transition requires a significant shift in resources to sustainable production. Encouragingly, the export patterns of EU countries indicate that Europe plays a leading role in exporting sustainable technologies, particularly for green energy.

To address these challenges, Europe needs major investment, but such high levels of investment are not unprecedented and the European Union benefits from substantial savings from households and firms. Similar investment expansions took place when the EU single market was created and the European Union was enlarged to bring in new members, and more recently when it adopted investment-focused policies like the RRF. By expanding markets, removing barriers, and facilitating substantial capital flows and access to finance, these events contributed to a large expansion in business opportunities, which also spurred a significant and sustained acceleration in investment. The key challenge for the European Union now lies in how to effectively support a new acceleration, channelling its hefty savings into the real investments needed to drive and capitalise on the green and digital transformation, while dealing with security issues. A better investment environment is a prerequisite to overcoming this challenge. Pursuing integration and simplification will spur business opportunities. Targeted public policies must be aligned to prioritise efficient public investment and facilitate private investment, while strengthening the financial system's capacity to fund innovation.

Introduction

This chapter examines the macroeconomic investment environment, key challenges to economic growth, and Europe's substantial investment needs – along with strategies for financing them. It is spread over three sections. Three boxes provide more detail on the housing market, the risk of trade disruptions and estimated investment needs.

The first section explores recent developments in the macro-financial environment influencing investment in Europe, and also includes a box on recent developments in housing investment. It highlights that, from a cyclical standpoint, the outlook is improving and investment is expected to gradually recover over the course of 2025. However, structural concerns remain, and pose future risks.

The second section discusses how longer-term factors influencing economic growth can be addressed to improve the European Union's potential, particularly as the green transition advances. It advocates for policies aiming to raise productivity, expand the labour supply and enhance the allocation of capital and labour across the economy.

The third section focuses on the investment required to boost EU economic growth and drive a structural transformation that will lead to greater sustainability. It shows that sufficient resources are available within Europe to finance these investments and outlines how the structure of the financial system should be adjusted to channel these resources to where they can be used most effectively.

From crisis to recovery: Investment benefits from cyclical tailwinds

This section provides an overview of investment and the macroeconomic factors driving its evolution. It first looks back at 2023 and early 2024, the most recent period for which data were available at the time of writing, before discussing the outlook for investment in 2025. It argues that the cyclical environment for investment is likely to improve.

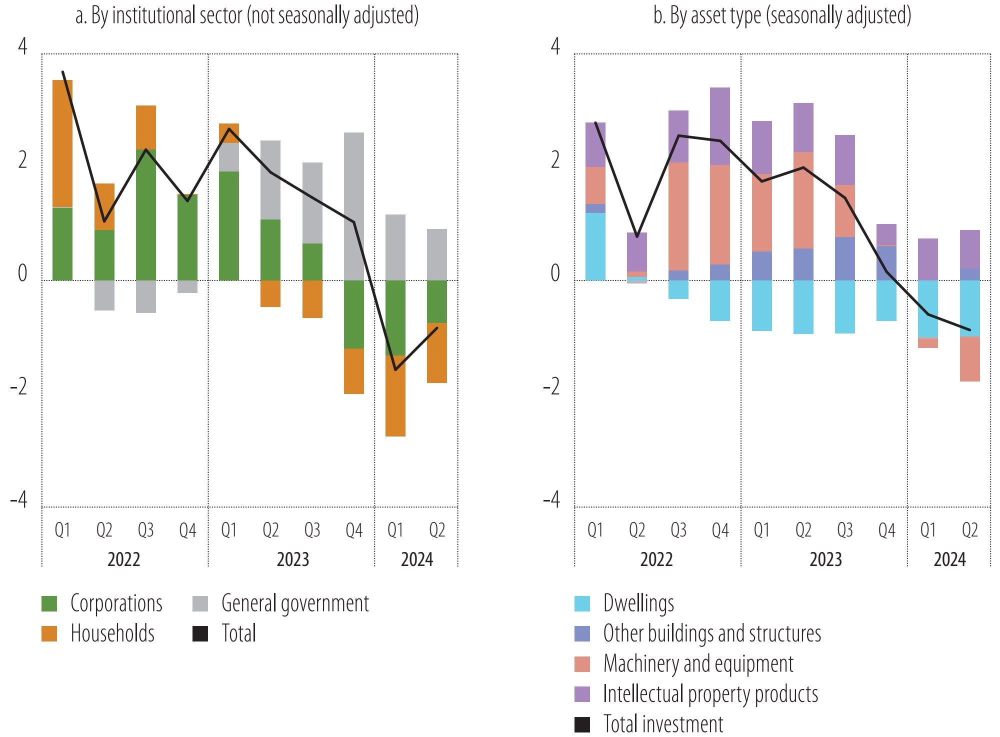
Investment is expected to gradually recover from the lows of late 2023 and 2024 as an easing of monetary policy feeds through to financing costs and demand, although geopolitical uncertainty will continue to drag on performance. So far, public investment has been driving overall investment growth, while private investment has contracted. Spending on machinery, equipment and dwellings has declined, whereas capital expenditure on intellectual property products has swelled. Looking ahead, supporting factors should strengthen the recovery in investment.

Public investment offset some of the weakness in private investment

A coordinated policy response has enabled the EU economy to emerge from the COVID-19 pandemic and energy price shock with no significant long-term scars. Domestic demand should pick up as real incomes increase, but for now it remains subdued as persistent uncertainty causes households to stash away savings. External demand has grown but EU firms report that they are becoming less competitive, in part because of stubbornly high energy prices. Trade tensions and geopolitical risks add further uncertainty to export prospects. Central banks have started to ease monetary policy in line with falling inflation, but borrowing costs are still high and continue to affect investment decisions. Fiscal policy is transitioning to a slightly more restrictive stance, but this is happening only gradually.

Figure 1

Contributions to fixed investment growth in the European Union (% change from the same quarter the prior year)



Source: *Eurostat.*
Note: *All EU countries except Ireland. Households include non-profit institutions serving households.*

Source: *Eurostat.*
Note: *All EU countries except Ireland. Changes in biological resources and the calculated residual, which contribute less than 0.02 percentage points to the change in investment, have been excluded.*

EU investment has shown remarkable resilience in recent years, but it weakened in 2024. From the onset of the energy crisis until late 2023, investment was bolstered by high corporate profits and the delayed response of corporate financing costs to rising interest rates. During this period, gross fixed capital formation not only recovered from the pandemic-induced slump, but also grew slightly faster than gross domestic product (GDP) in 2022 and 2023, while the investment-to-GDP ratio reached 22%, just above the long-term average. In 2024, overall investment in the European Union weakened, reflecting the broader economic soft landing. Gross fixed capital formation (excluding Ireland) contracted by 0.6% year-on-year in the first quarter, 1.2% in the second quarter and 2.5% in the third quarter.[1] In the first three quarters of 2024, overall EU investment was 1.4% below its level in the first three quarters of 2023.

The decline was largely driven by a drop in private-sector investment (Figure 1, left panel). Household investment fell by an average of 1.2%, while non-financial corporations recorded an almost 1% decline during the first half of 2024. There were notable bright spots amid these challenges, however. Investment in intellectual property – including research and development – continued to expand, contributing 0.7 percentage points to annual investment growth (Figure 1, right panel). In part, this reflects the practice of including spending on salaries for R&D personnel in research and development.

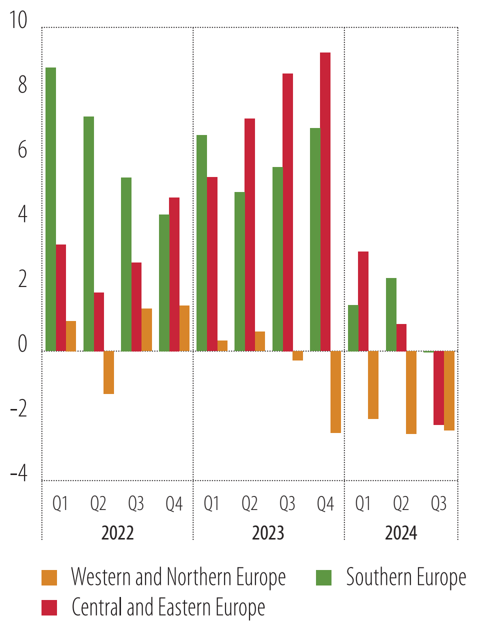
1 The changes including Ireland were -0.8%, -2.9% and -2.2% year-on-year, respectively. Ireland is excluded when discussing trends in investment and GDP contribution, as its figures tend to be highly volatile.

However, it may also be interpreted as a sign that firms continued to focus on innovation even when facing macroeconomic headwinds.

Meanwhile, public investment surged, providing a significant counterbalance. This stands in stark contrast to previous periods of weak economic growth, when public investment was often scaled back to create room for other public expenditure. Conversely, in 2023 the rise in government investment was accompanied by lower spending on non-investment subsidies and current transfers (see Chapter 2). The decreased spending was partly due to Europe's passing the peak of the energy crisis, which allowed governments to cut energy subsidies. Public investment was also lifted by coordinated EU-level policy initiatives, financing from the Recovery and Resilience Facility and the temporary suspension of EU fiscal rules. By the first half of 2024, government investment had risen by 10% compared to the same period in 2023.

Figure 2

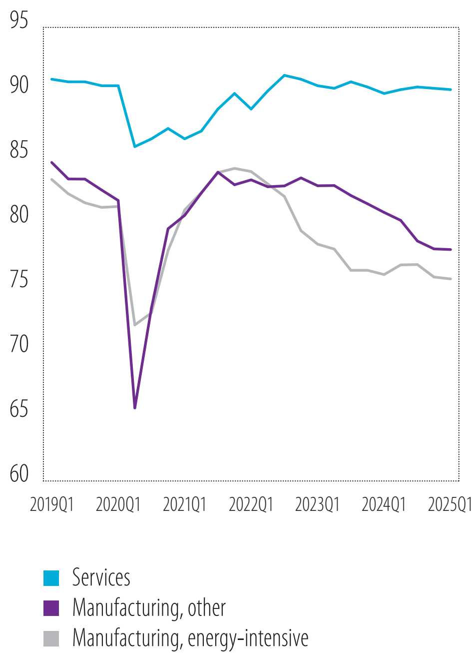
Investment in fixed assets (% change from the prior year)**, by country group**



Source: *EIB staff calculations based on Eurostat.*
Note: *Western and Northern Europe exclude Ireland. The latest figures available are for the third quarter of 2024.*

Figure 3

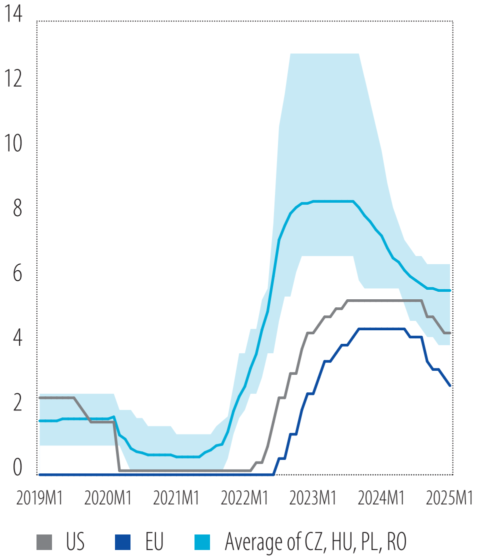
EU firms' capacity utilisation (in %)**, by sector**



Source: *EIB staff calculations based on Eurostat and the European Commission's business survey.*
Note: *NACE 17 (pulp and paper), 19 (coke, refined petroleum), 20 (chemicals), 23 (non-metallic minerals, such as cement), or 24 (basic metals) are defined as energy-intensive. Value-added shares are used to aggregate responses for each sector. Excludes NACE 10-15, 31 and 32 from non-energy intensive sectors because of data limitations. Nomenclature of Economic Activities (NACE) is the European statistical classification of economic activities. The latest figures available are for the first quarter of 2025.*

The bulk of the slowdown in aggregate investment occurred in the Western and Northern European Union. Gross fixed capital investment in Western and Northern European countries first stalled and then declined (Figure 2). In contrast, investment remained positive over the year for Central, Eastern and Southeastern European countries in 2024.

Figure 4
Central bank policy rates (in %)



Source: *EIB staff calcuations.*
Note: *The shaded area indicates the range of policy rates for four Central and Eastern European countries: Czechia, Hungary, Poland and Romania. The maximum rate is from Hungary during the 2022 tightening and corresponds to the base rate set by the country's central bank.*

Figure 5
Consumer price inflation and the level of energy prices (left axis: % change in consumer prices from the prior year; right axis: the energy component of consumer prices, January 2019=100)

Source: *EIB staff calculations based on Eurostat.*
Note: *HICP stands for the harmonised index of consumer prices.*

Surveys suggest that investment was weaker in manufacturing than in services. The utilisation of manufacturing capacity has declined much more than that of services (Figure 3).[2] Within manufacturing, the capacity utilisation of energy-intensive firms declined more steeply during the energy shock than that of non-energy-intensive firms. However, this difference has now disappeared, suggesting that the shock not only had a direct effect on energy-intensive investments, but also an indirect effect via higher financing costs and weaker overall private investment.

Three macroeconomic factors are behind the investment weakness. These factors include persistently high investment financing costs caused by tighter monetary policy, weak domestic and external demand due to the effect high energy prices had on real incomes, and high uncertainty stemming from geopolitical risks.

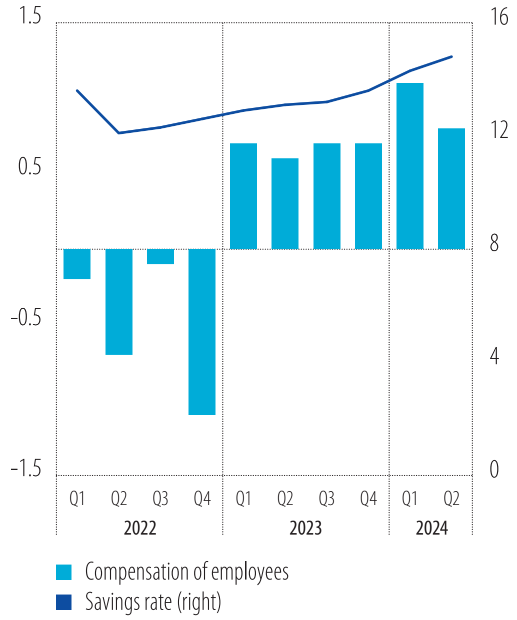
Monetary policy has started to ease, but the effects of previous tightening have weighed on investment. The European Central Bank (ECB) began lowering official interest rates in June 2024, gradually unwinding a rapid tightening cycle that had raised rates by 4.5 percentage points from July 2022 to September 2023. Other EU central banks, whose economies experienced even higher inflation than the euro area, eased policy earlier after having raised interest rates even faster (Figure 3).[3]

2 Sector-level data for EU investment is only available until 2022.
3 Annual consumer price inflation peaked in late 2022 at 10.6% in the euro area, 17.8% in Czechia, 26.2% in Hungary and 16.4% in Poland.

Domestic demand did not follow the growth in real incomes. The sharp increase in energy prices during 2022 transferred wealth from the European Union to energy-exporting countries and damaged household finances. For EU households, high inflation eroded the real value of their savings, most of which are held in bank deposits (see the last section of this chapter). In addition, the sluggish response of nominal wages to inflation weighed on households' real incomes despite public support. While inflation rose far above central bank targets (Figure 5), households initially supported their consumption by saving less of their incomes. When real incomes recovered, households raised their savings rate again (Figure 6). The sluggish economic recovery and political uncertainty have likely encouraged people to continue saving, which has caused private consumption to grow at a slower pace than real wages (1.1% during the first three quarters of 2024, compared with the same period in 2023).

Figure 6

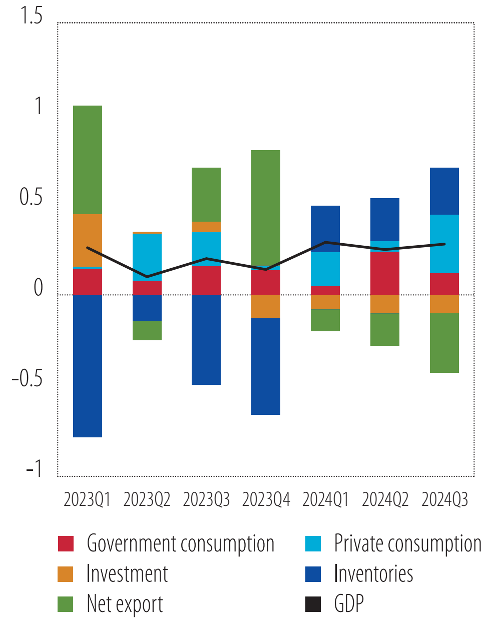
Real employee compensation (% change from the prior quarter) **and the savings rate** (% of disposable income)



Source: *EIB staff calculations based on Eurostat.*
Note: *Real employee compensation is adjusted according to the private consumption deflator.*

Figure 7

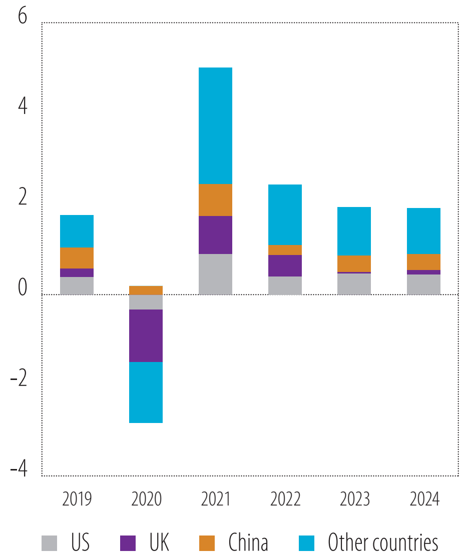
Contributions to EU GDP growth (% change from the prior quarter)



Source: *Eurostat.*
Note: *All EU countries except Ireland.*

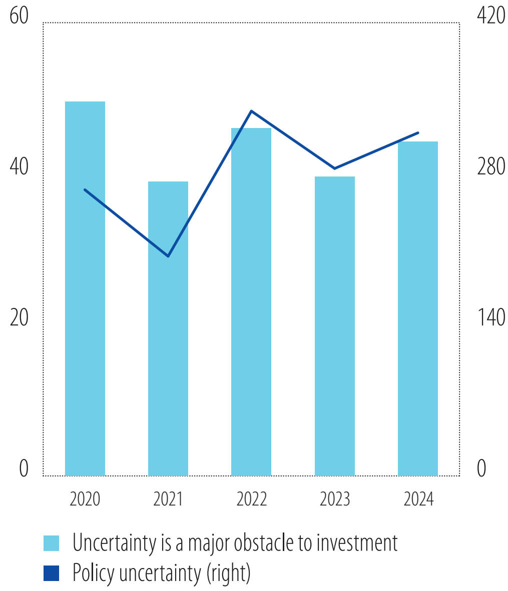
Strong net exports supported EU growth in 2024, despite the declining competitiveness of EU firms and weaker imports. The export share-weighted GDP of the European Union's trading partners, a measure of foreign demand, grew by approximately 2% during the year (Figure 8). Demand from China and the United States drove about one-third of this growth. EU firms were not able to capture this growth – EU exports (again, excluding Ireland) declined by 0.1% in the first three quarters of 2024, compared with the same period in 2023. Firms expressed concerns about their ability to compete (for example, in the European Commission Business Survey). Meanwhile, weak internal demand (particularly from investment) pushed imports below their level in the first three quarters of 2023 (-1.6%). In the end, EU GDP for the first three quarters of 2024 was supported mainly by government consumption, household consumption and net exports.

Figure 8
Export demand for EU goods and services (% change from the prior year)



Source: *EIB staff calculations based on Eurostat.*

Figure 9
Uncertainty as a major investment obstacle (left axis: % of firms; right axis: an index)



Source: *EIBIS 2020-2024 and Baker et al. (2024).*

Uncertainty also appears to be weighing on investment. Policy uncertainty, as measured by indices evaluating newspaper articles, rose steadily throughout 2023. By the end of 2024, it had reached levels comparable to mid-2022, when energy prices spiked following Russia's invasion of Ukraine (Figure 9). A growing share of firms reported uncertainty as a major obstacle to investment in 2024. Beyond the broader economic slowdown, concerns about the outlook for global trade and ambiguity surrounding governments' commitment to the green transition likely contributed to the rise in uncertainty.

Box A
The housing market shows resilience

The housing sector has resisted recent economic shocks. Building activity slowed briefly during the COVID-19 pandemic lockdowns in mid-2020 but stabilised in 2021 and expanded by more than 14% in 2022 and 2023 (Figure A.1, left panel). In the first half of 2024, activity eased by 7% year on year as financing conditions tightened. The demand for home improvements and secondary residences during the lockdowns led to a 40% surge in residential building permits issued from mid-2020 to early 2022 (Figure A.1, left panel). The building industry's ability to meet this demand was limited by disruptions to the supply of construction materials and construction worker shortages (Figure A.1, right panel). It took almost two years to clear this backlog. As a result, builders continued to grow from mid-2022 to mid-2023, when new orders dropped sharply.

The building of new residences accounted for slightly more than half of construction's output, and one-quarter of gross fixed investment, in 2020-2023 (Figure A.2, left panel). Despite major macroeconomic shocks in this period, residential construction produced a stable 5.5% to 6% of GDP. In 2021, it contributed as much as half a percentage point of GDP growth in the European Union (Figure A.2, right panel). The importance of the sector was also visible in 2023, when the homebuilding slowdown subtracted about one-fifth of a percentage point from GDP growth.

Figure A.1

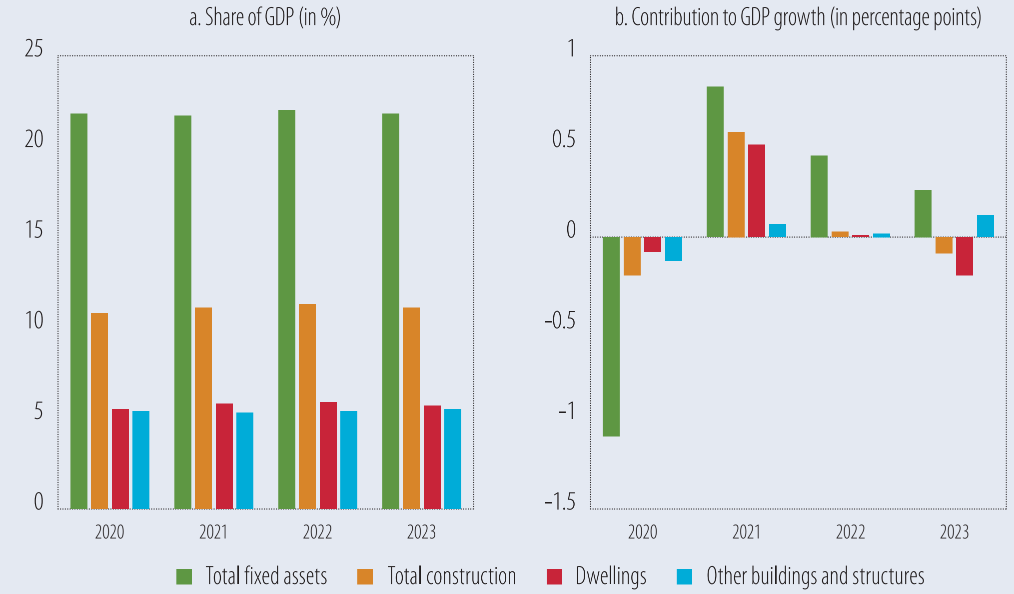
Residential construction output and employment (2021=100), **EU average, 2019-2024**

Source: *Eurostat.*

Note: **The construction index is for residential dwellings and building permits for new residential buildings. It is neither seasonally nor calendar adjusted. **Total construction is neither seasonally nor calendar adjusted.*

Figure A.2

Contribution of construction to EU economic growth, 2019-2024



Source: *Eurostat.*

Public policies contributed strongly to housing demand and residential investment. Mortgage interest rates in the euro area averaged just 1.75% in nominal terms (less than 0.25% in real terms) from 2015 until mid-2022, and 3.5% (-2.1% in real terms) once the ECB started tightening monetary policy. Falling interest rates generally do not push up residential investment on their own, but when they come with rising house prices, income growth and demographic factors (net immigration, smaller household size, etc.) the effect can be substantial (European Investment Bank (EIB), 2018). Regular fiscal support for housing, including social protection payments to households and public spending on housing and community amenities, has also increased since the pandemic after falling steadily following the global financial crisis, though it has yet to return to levels seen in the mid-1990s.

Prospects for an immediate pick up in investment are mixed

The cyclical outlook for investment is likely to gradually improve, but uncertainty remains a strong drag. Two out of the three factors that weakened private investment in 2023 and early 2024 are likely to be more positive. Monetary policy has eased and domestic demand is expected to grow despite governments' more restrictive fiscal stance, as rising real incomes will eventually result in increased household spending. However, uncertainty (including concerns related to trade policy) has a particularly strong effect on firms' investment and may continue to weigh on growth in investment spending. At the global level, the United States' "America first" policy with its questioning of international norms and established alliances is creating a high degree of uncertainty, which is particularly acute in areas like the green transition or critical technologies. Further global polarisation, new trade barriers and value chain disruptions have the potential to undermine investment prospects in critical industries. Research by Kolev and Randall (2024) finds that non-financial firms saying uncertainty is a major obstacle have investment rates that are about 3 percentage points lower than firms that do not see uncertainty as an obstacle.

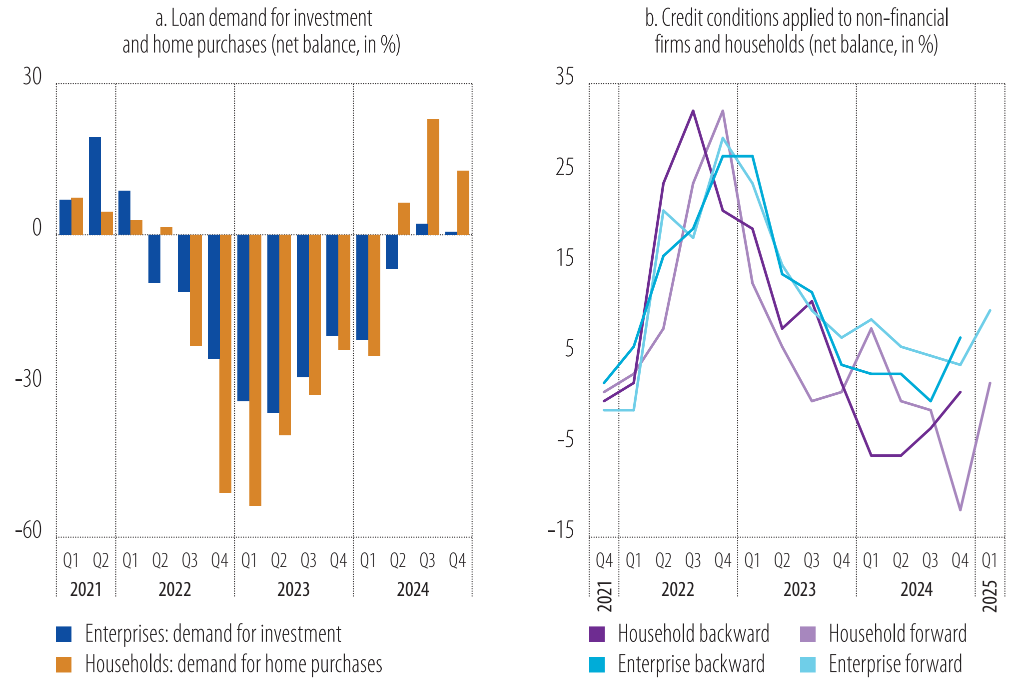
Lower interest rates and a gradual easing of credit conditions are expected to provide more support for private investment. Despite the easing of monetary policy, higher borrowing costs and lower availability of credit continue to constrain corporate debt. While financing costs for new corporate borrowing peaked in late 2023, the cost of outstanding loans reached their high only in mid-2024. At around 4%, these costs remain 2.5 percentage points higher than two years earlier, and they are declining only gradually. The delayed effects of higher borrowing costs are particularly pronounced for smaller, riskier firms and those operating in highly leveraged sectors (see Chapter 3). These factors continue to weigh on the investment decisions of more vulnerable segments of the private sector.

Monetary easing is likely to influence residential investment before it affects non-financial corporate investment. A slight majority of banks reported easing credit standards for household loans, both retrospectively and in their forward-looking assessments (Figure 10, left panel). This shift may bolster housing investment (Box A and Figure 10, right panel). In contrast, a larger share of banks still expect conditions for corporate loans to remain tight in the next quarter (Figure 10, left panel). Nonetheless, fewer banks are tightening credit conditions and, on balance, credit has started to ease in some euro area countries. Considering the typical lags in the impact of monetary policy on bank lending, investment by non-financial firms is expected to bottom out and begin recovering in early 2025.[4]

Conditions for private consumption are improving as households' real incomes continue to gradually recover from high energy prices and inflation. Unemployment is unlikely to rise substantially. While labour shortages may have eased, structurally they remain significant (Organisation for Economic Co-operation and Development (OECD), 2024). Declining interest rates for consumer credit, pushed down by easing monetary policy, should buoy consumption further. With the European Commission's business survey indicating that a lack of demand is currently the most important factor limiting production, more dynamic consumer demand will help corporate investment.

4 The Bank Lending Survey credit standard time series tends to lead non-financial corporate investment by two to three quarters.

Figure 10
The impact of credit conditions on demand



Source: *ECB Bank Lending Survey.*
Note: *Units are net percentages, defined as the difference between the percentages of banks responding "increased" relative to the previous quarter, and the percentage of banks responding "decreased."*

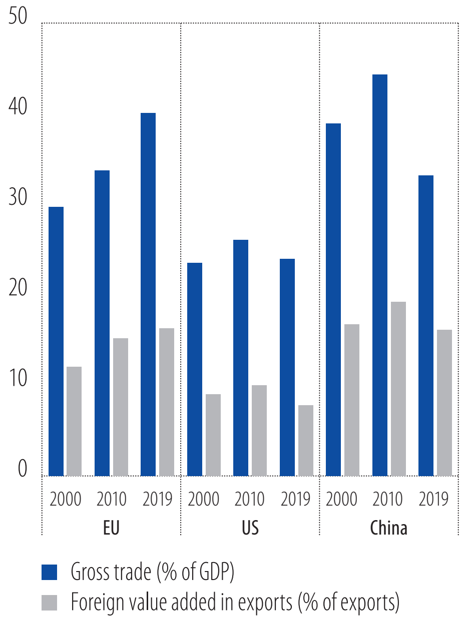
Source: *ECB Bank Lending Survey.*
Note: *Units are net percentages, defined as the difference between the percentages of banks responding "tightened" and the percentages of banks responding "eased". Backward refers to the change from the previous quarter. Forward refers to the change expected over the subsequent quarter.*

While financing costs and domestic demand are likely to be more supportive, the outlook for external demand is less clear. Export demand appears to be on the rise.[5] However, as highlighted above, manufacturing firms are increasingly uneasy about their ability to compete outside the European Union. Two factors seem to underlie firms' concerns. The first is the persistently higher energy costs paid by EU firms compared to their global competitors, which weighs particularly heavily on energy-intensive industries (see Chapter 4). The second is rising competition from China in traditional sectors (such as automotive) and emerging industries, as well as the impact of industrial policies outside the European Union. These concerns are compounded by geopolitical challenges.

As an open economy, the European Union is particularly vulnerable to geopolitical challenges. Fragmentation in global trade has a bigger effect on the European Union compared to the more closed US economy. Gross trade with countries outside the European Union (imports plus exports of goods with non-EU countries) accounted for nearly 30% of EU GDP in 2023, a level that has been relatively stable over the past decade. By comparison, China's gross trade with other countries has declined from over 40% in 2014 to 34%,[6] while the United States remains well below this level at around 18%. The United States and China are crucial trade partners for the European Union. The United States accounts for approximately 20% and China 10% of EU goods exported outside the union, while the United States makes up 12% and China 21% of goods imported.

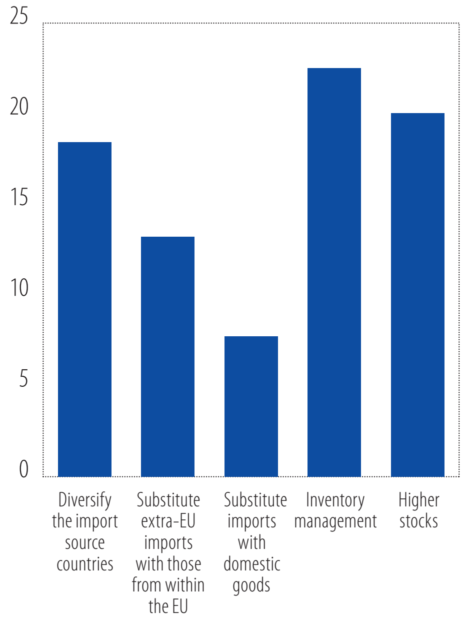
5 The International Monetary Fund's World Economic Outlook for October 2024 (International Monetary Fund (IMF), 2024b) suggests global trade will grow by 3.4% in 2025-2026, slightly exceeding world GDP growth.
6 These figures are computed using the IMF Direction of Trade Database and are the average for 2021-2023.

Figure 11
Gross trade and integration in global value chains



Source: *EIB staff calculations based on OECD data for trade in value added.*
Note: *Values for the European Union include services and exclude trade with other EU countries.*

Figure 12
Action taken in response to obstacles from trade (% of firms)



Source: *EIBIS 2024.*

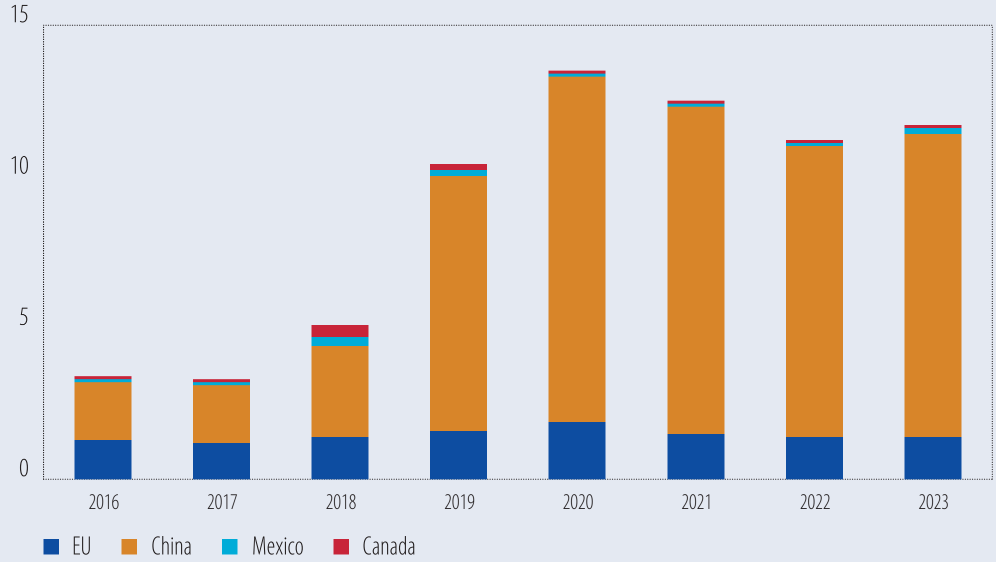
Box B
Estimating the effects of US tariffs on EU countries and beyond

The US trade balance and escalating protectionism

Trade between the European Union and United States has grown steadily over the past decade, albeit with significant differences between EU countries and sectors. The United States was the top destination for EU exports in 2023, accounting for 19.7% of the total. Ireland, Germany, Italy, the Netherlands, Belgium, the Nordic countries and Slovakia are among the most exposed, with exports to the United States accounting for at least 3% of their domestic GDP. EU exports to the United States are concentrated on medical appliances and pharmaceutical products, mechanical products and parts, machinery and vehicles, and manufactured goods.

Tariffs on goods imported to the United States have risen since the first Trump administration. Tariffs increased in 2018 and 2019 when the Trump administration raised the effective tariff for goods imported from China significantly, replaced the North American Free Trade Agreement (NAFTA) with the United States-Mexico-Canada Agreement (USMCA), and imposed additional tariffs on steel and aluminium imports. Steel and aluminium tariffs affected EU exports, although there was only a modest increase in the effective tariff rates (Figure B.1). By and large, the Biden administration did not change the tariff framework it inherited from Trump.

Figure B.1
US effective tariff rates on imports from selected countries (in %)



Source: *US International Trade Commission (USITC) and EIB staff calculations.*
Note: *Effective tariffs are computed as the ratio of import duties collected based on applicable rates to CIF (cost, insurance and freight) import values.*

Simulating the effects of higher tariffs

The impact of further tariff increases on the EU economy depends on their size, the countries and products concerned, and the degree of indirect effects arising from changes in trade patterns with non-EU countries. This box therefore considers a range of scenarios informed by statements made by the new US administration, and feeds them through a global macroeconomic model to capture direct and indirect effects. The box does not show the predicted impact of each of these scenarios on EU GDP, but rather presents the range of impact.

The calculations model scenarios where US tariffs on imports from the European Union rise to 10% or 20%, tariffs on Chinese goods increase to 60%, and tariffs on imports from Canada and Mexico climb to 25%. Each scenario is analysed via two approaches: "up-to" tariffs, where all tariffs are adjusted to reach the specified thresholds; and "top-up" tariffs, where the announced increases are added on top of existing tariff levels.

Table B.1
Effective base rate of tariffs across sectors (in %)

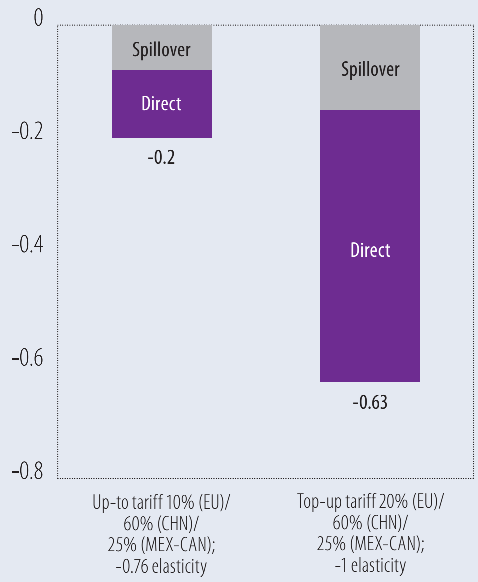
	Agricultural	Non-agricultural	Manufacturing	Energy
EU	4.2	0.4	1.3	0.1
China	18.2	9.4	10.2	0.5
Mexico	0.2	0.1	0.3	0.1
Canada	0.1	0	0.1	0.1

Source: *USITC and EIB staff calculations.*

A bottom-up approach is used to capture current tariff levels for the products concerned. The analysis uses effective tariff rates by country and sector (SITC level 1) calculated from United States

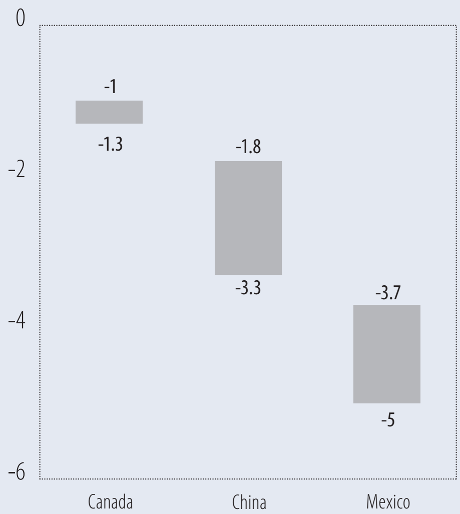
International Trade Commission (USITC) data, which combine CIF (cost, insurance and freight) import values with applicable duties based on the Harmonized Tariff Schedule. These rates are weighted by the share of each sector's exports to the United States, and aggregated into four categories (agriculture, non-agriculture, manufacturing and energy) to align with the sectoral breakdown in the S&P Global Market Intelligence - Global Link Model used for the simulations. As an example, baseline effective tariffs range from 4.2% for agricultural products from the European Union to 18.2% from China, with much lower starting levels for goods from Canada and Mexico (Table B.1).

Figure B.2
Response of EU output to US tariffs on imports from Europe, China, Mexico and Canada (in percentage points)**, by the end of 2026**



Source: *EIB staff calculations using the S&P Global Market Intelligence Global Link Model.*
Note: *The figure looks at the combined effect of US tariffs on imports from the European Union, China, Mexico and Canada. It depicts the range of response EU GDP considering the minimum and maximum impact models. They differ in their approach. "Up-to" tariffs are adjusted to reach the specified thresholds and "top-up" tariffs are added on top of existing tariffs. The EU tariff considered is 10% to 20% and the elasticity is -0.76 or -1.*

Figure B.3
Response of China, Mexico and Canada output to US tariffs (in percentage points)**, by the end of 2026**



Source: *EIB staff calculations using the S&P Global Market Intelligence Global Link Model.*
Note: *The figure shows the range of response of GDP outside of the European Union to tariffs of 60% on China and 25% on Mexico and Canada with elasticity of -0.76 and -1, giving the minimum and maximum impact.*

Depending on the scenario considered, the simultaneous increase in tariffs on the European Union, China, Mexico and Canada results in a cumulative decline in EU real GDP of 0.2 to 0.63 percentage points relative to the baseline by the end of 2026. The deviation range reflects different calibration assumptions: The less severe "up-to" scenario assumes a 10% tariff on EU imports, while the more severe "top-up" scenario assumes that tariffs increase by 20%. Tariffs on Chinese imports remained fixed at 60% and those on imports from Mexico and Canada at 25% in both scenarios. The trade elasticity is assumed to be -0.76 in the main scenarios, while an alternative assumption of -1 is used as a robustness check.[7] The majority (60% to 75%) of the EU GDP decline is attributed to the direct

7 On the choice of elasticities, see Boehm et al. (2023), Devarajan et al. (2023) and Jiang et al. (2022).

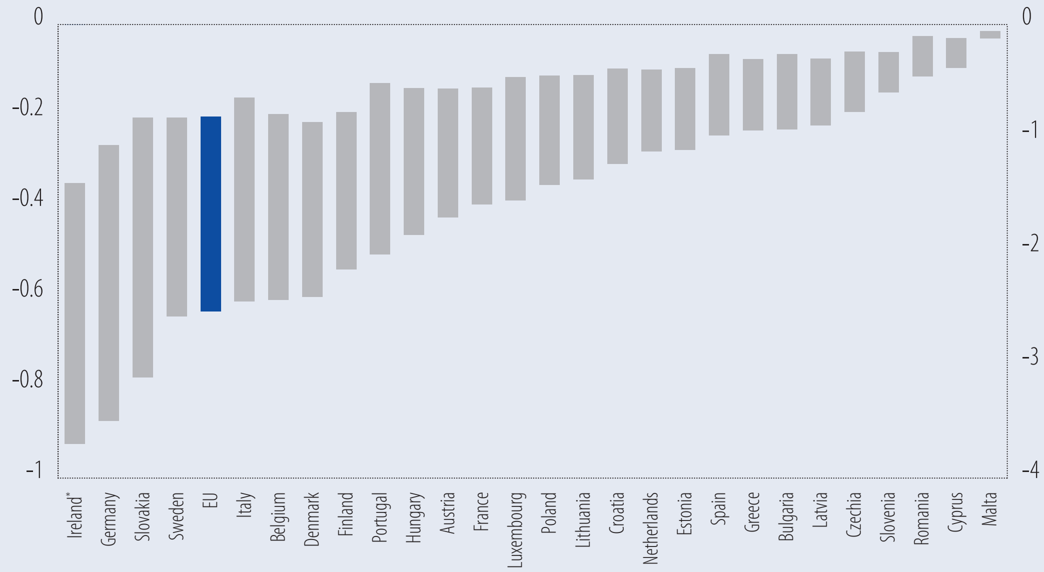
impact of tariffs on EU exports, while the spillover effect from the shock to non-EU trading partners accounts for the rest (Figure B.2).

The impact of US tariff increases on different EU members varies widely, reflecting how reliant they are on exports to the United States (Figure B.4). Ireland is the most affected, with its GDP projected to decline by 1.4 to 3.7 percentage points depending on the scenario. Larger economies such as Germany (GDP impact of -0.3 to -0.9 percentage points) and Italy (-0.2 to -0.6 percentage points) also experience adverse effects, highlighting the uneven distribution of risks from US tariff hikes.

The shock would also have a major impact on the economies of China, Canada and Mexico. Assuming a 60% tariff on imports from China and a 25% tariff on imports from Canada and Mexico, real GDP growth deviates from baseline projections by -1 to -1.3 percentage points for Canada, -1.8 to -3.3. percentage points for China, and -3.7 to -5 percentage points for Mexico, with Mexico experiencing the largest impact of the three (Figure B.3).

Figure B.4

Response of different EU countries' output to US tariffs (in percentage points)**, by the end of 2026**



Source: EIB staff calculations using the S&P Global Market Intelligence Global Link Model.
*Note: The figure shows the range of response of GDP for different EU members under the same scenarios of Figure 3A (see note). *The results for Ireland are on the right-hand axis.*

Conclusion

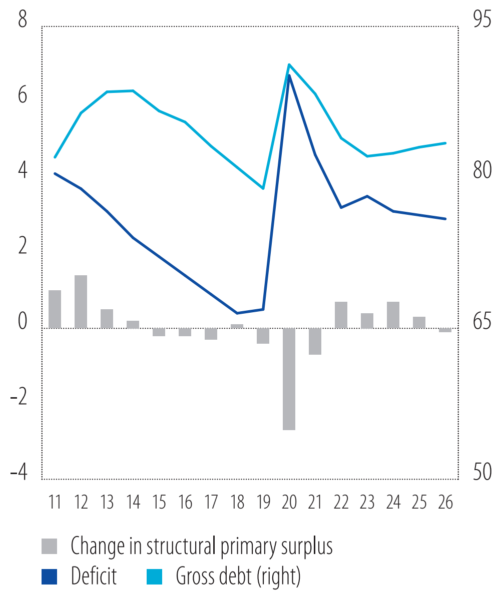
The simulations illustrate that higher US tariffs would negatively affect EU economies. While a reallocation of global demand could provide some opportunities for EU exporters in sectors like textiles and machinery, this potential upside is likely outweighed by broader risks. US protectionist measures could undermine the European Union's economic performance through spillovers from a slowing Chinese economy (one of the largest EU trading partners) or an influx of cheaper goods as China redirects exports away from the United States. These factors would exacerbate the direct negative effects of tariffs, highlighting the complex and uneven risks confronting EU economies.

The European Union's global value chains are also more integrated into the world economy. The European Union has deepened its integration into global trade over time, and a significant achievement of its strategy has been the integration of its eastern EU members into global value chains. In contrast, the United States has retrenched and integration levels are equivalent to those seen in 2000, while China has pulled back from previous highs as its rapid growth led to greater domestic consumption of its production and development reduced reliance on imported technologies (Figure 11). By 2019, the European Union's gross trade relative to GDP exceeded China's, with both regions showing comparable shares of foreign value added in gross exports. By 2019, the United States was the final destination for 20% of the value added in EU gross exports, and China the final destination for 10%. EU exports also depend to a significant degree on imports of intermediate goods from other countries.

In general, EU firms are not substituting imports with domestically produced goods and services. In 2019, foreign value added constituted 16% of the European Union's gross exports. Instead of substituting imported goods and services with domestically produced alternatives, firms have opted, or are planning, to increase their resilience of their value chains by increasing stocks, improving inventory management and diversifying the countries from which they are importing (Figure 12). Having to substitute foreign-produced goods with domestic replacements where possible would presumably raise production costs far more than steps being taken to increase resilience.

Figure 13

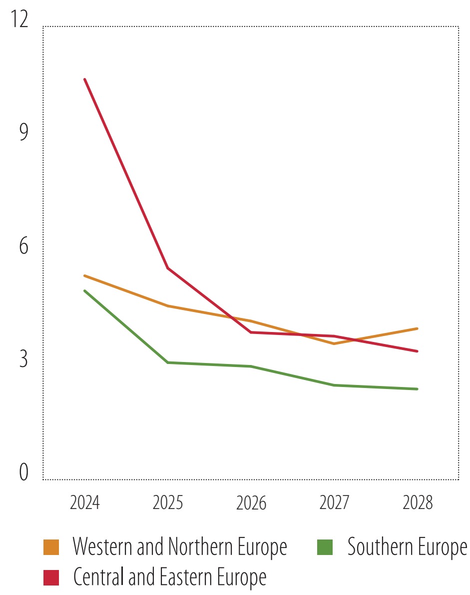
Gross debt, deficit and change in the structural primary balance (left axis: % change from the prior year; right axis: % GDP)



Source: *European Commission's 2024 autumn forecast and the annual macro-economic database (AMECO) of the Directorate General for Economic and Financial Affairs.*

Figure 14

Net primary expenditure
(% change from the prior year)



Source: *EU members' structural fiscal plans.*

Lastly, fiscal policy is transitioning into a new phase after providing substantial support for economic growth during recent crises. In the last few years, governments have employed fiscal measures to mitigate the economic and social impact of acute trade disruptions, leading to significant increases in public deficits and debt. As seen above, government (on the back of EU programmes) was the only sector that contributed positively to investment in 2024, and this will likely continue in 2025 and 2026. However, compliance with the new EU fiscal rules requires ambitious adjustments in several countries (see Chapter 2 for details), limiting their ability to support demand through fiscal policy.

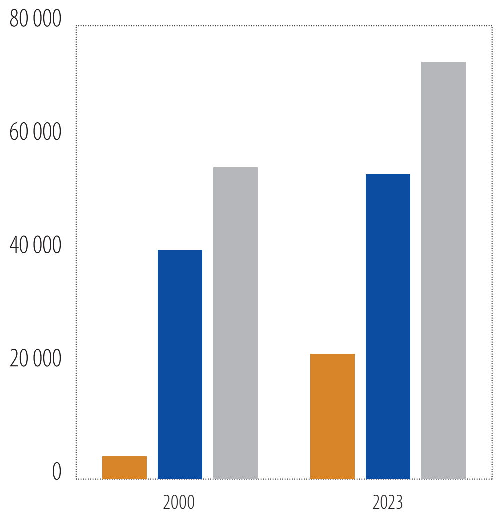
On average across the European Union, fiscal policy is set to constrain economic growth slightly, although less than in 2024. The impact is projected to be nearly neutral by 2026. According to the European Commission's Autumn 2024 Forecast, the overall budget deficit is anticipated to decline slightly from 3.1% of GDP in 2024 to 2.9% in 2026 (Figure 13). However, this will not be enough to halt the increase in gross public sector debt relative to GDP that has resulted from lower nominal GDP growth. Fiscal impulse indicators suggest that fiscal policy will be moderately restrictive. Changes in the structural primary balance are expected to be moderately positive, and growth in net primary spending is set to decline (Figure 14). However, the relatively benign evolution at the EU level masks very divergent situations in different countries.

Tackling structural impediments to raise long-term growth

GDP per capita adjusted for purchasing power has increased by about one-third over the past two decades. It has been driven by Europe's integration into global value chains, increased labour market participation and moderate productivity gains (Figure 15). Economic expansion has been particularly pronounced in the eastern regions of the European Union, whereas Southern Europe has recovered from the sovereign debt crisis only more recently. However, the EU and US economies lost some of their global weight as the Chinese economy expanded rapidly. In 2000, China accounted for less than 5% of the world economy, while Europe made up 21%. By 2023, China and the European Union accounted for equal shares of world GDP – just under 20% each (Figure 16).

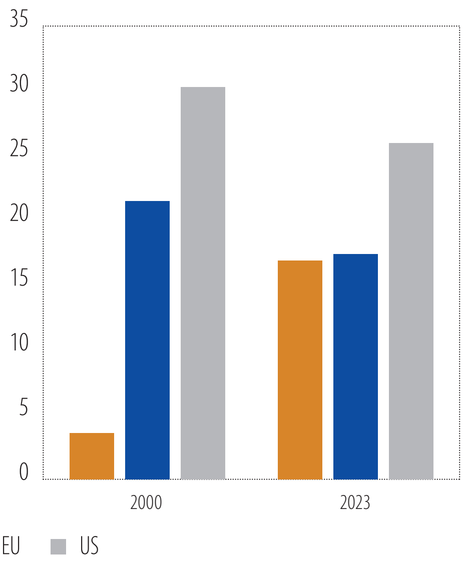
The growth of GDP per capita has gone hand in hand with substantial improvements in EU well-being. Economic growth and increased consumption have translated into better material living standards. Various of quality-of-life measures have moved forward at the same time, including health, environmental sustainability and employment. In recent decades, healthy life expectancy, social inclusion, enrolment in post-secondary education and job security have all increased (see Chapter 4).

Figure 15
Gross national income per capita
(2021 USD, PPP)



Source: *EIB staff calculations based on World Bank data.*
Note: *PPP stands for purchasing power parity.*

Figure 16
Share of world GDP (in %)



Source: *EIB staff calculations based on World Bank data.*
Note: *GDP is measured in US dollars to illustrate the global weight of each economy.*

Higher investments in areas like information and communication technologies and stronger job creation combined to raise GDP per capita more in the United States than in the European Union (Figure 17). The drivers of growth vary substantially from sector to sector. In manufacturing, productivity gains in ten EU economies for which this data is available were on a par with those in the United States, offsetting a decline in hours worked. Construction stands out as a sector with particularly poor productivity growth in these countries and in the United States. In the past few years, ICT service providers in the United States likely increased their already large investments, as these firms are spending heavily on the infrastructure required for artificial intelligence.

This section examines how GDP growth can be revitalised during the green transition by pushing up productivity, increasing employment and enabling the efficient reallocation of people and capital. It reviews the drivers of GDP growth over the past two decades and argues that the European Union is in a good position to capitalise on opportunities created by the green transition. The focus is on GDP growth rather than GDP per capita, given the need to generate resources for the health and care needs of an ageing population (Lagarde, 2024b).

Strong policy commitments and regulations are critical to the green transition. Stringent climate regulation drives transformation across all sectors, rewarding early movers and pressuring high-emission industries to adapt. In contrast, weaker regulations risk slowing the pace of change. The European Green Deal, with its carbon pricing, incentives and regulatory framework, supports green innovation and resource shifts to sustainable industries, driving potential productivity gains (European Central Bank (ECB), 2024).[8]

Reversing the productivity slowdown

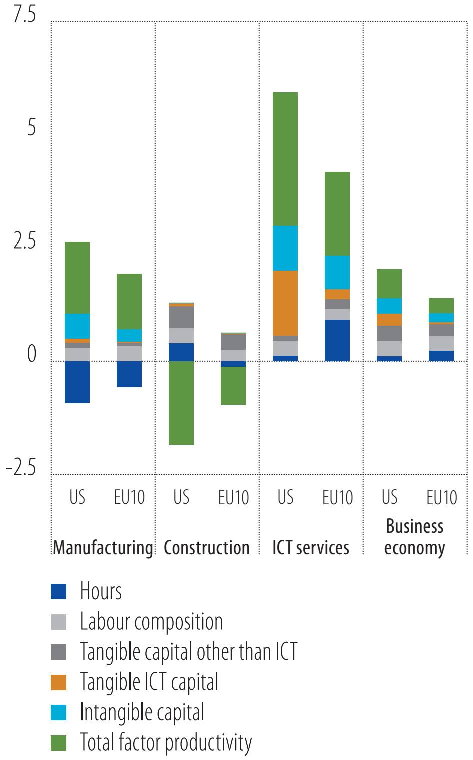
The European Union's productivity has slowed over the past two decades (Figure 18). The 2008-2009 financial crisis marked a turning point. Potential reasons for the slowdown include declining business dynamism and an increasing misallocation of resources following the crisis (IMF, 2024a). These factors are caused to some extent by tighter financial conditions, a shift towards services, particularly those with lower productivity growth, and imperfect measurement of the inputs and outputs of production (Lopez-Garcia and Szörfi, 2021).

Productivity is likely to slow further during the first stage of the green transition. Transitioning to green production processes can involve significant upfront costs and temporary disruptions, and tighter environmental regulations can hurt productivity growth in the short term. The redirection of investment and research efforts away from fossil fuel-based activities could lead to a slowdown in potential growth. For example, the transition away from fossil fuels is likely to temporarily slow productivity by around 0.25% each year in France, as less investment is available to expand production capacity or increase efficiency in other sectors (Pisani-Ferry and Mahfouz, 2023).

The European Union can accelerate productivity growth by investing more in intangible capital. Higher investments in intangible capital are one reason the US economy outperformed in the past two decades. EU spending on R&D has risen substantially in the 20 years, from 1.7% of GDP in 2000 to 2.1% in 2022. However, spending rose even faster in the United States, increasing from 2.6% to 3.6% of GDP (see Chapter 5 for details) over the same period. Patent applications were also somewhat higher in the United States.

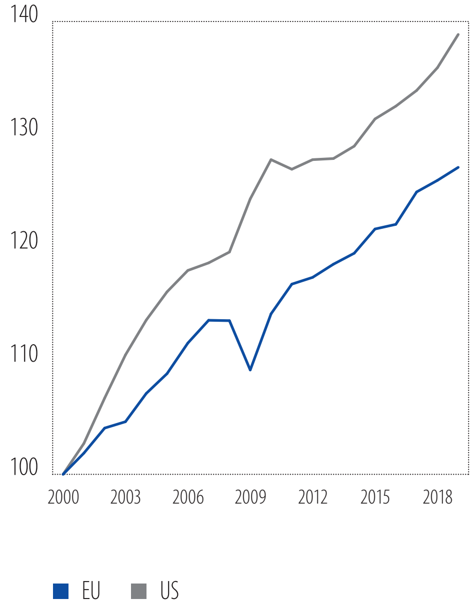
8 Pisani-Ferry and Tagliapietra (2024) propose a plan to ensure that sufficient resources are allocated to the green transition.

Figure 17
Annual growth in value added (in %), **by sector 2000-2019**



Source: *EU Klems.*
Note: *EU10 denotes the 10 EU economies for which data is available (AT, BE, CZ, DE, DK, ES, FI, FR, IT, NL). The decomposition for the total economy is very similar to that of the private business sector, with a somewhat larger contribution of hours worked and smaller contributions of investment in ICT and intangible capital.*

Figure 18
Labour productivity in the private business sector (an index, 2000=100)

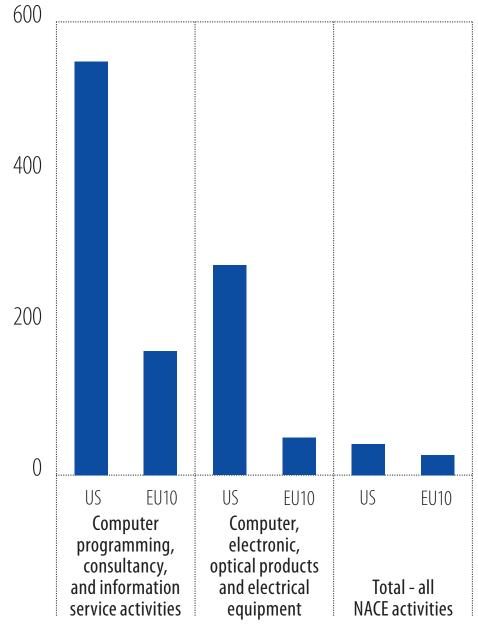


Source: *EIB based on EU Klems.*
Note: *Value added relative to hours worked. Value added in private business is just over two-thirds of the total economy. For the total economy, the productivity gap between the United States and the European Union has grown somewhat less (by a total of 5.5% instead of 8.5% from 2000).*

Similarly, the European Union could push up productivity by removing barriers to ICT growth and promoting the adoption of ICT technologies (Draghi, 2024). Growth in the ICT sector and ICT adoption drive productivity (see Vu et al. (2020) for a recent literature review). The rapid expansion of its ICT sector and the faster adoption of ICT across all industries explains some of the higher productivity growth in the United States. Interestingly, Europe initially had an advantage in the production of ICT services, with computer programming and consultancy accounting for 1.3% of the EU business economy in 2000, compared with only 1% in the United States. However, over the past two decades, the value added by ICT services in the United States has grown more than fivefold, while in the European Union it is only 1.5 times its former size. By 2018, ICT services made up 5.4% of the US business economy but just 3.8% of the European Union's (Figure 19). Growth in ICT manufacturing has been slower in the European Union, with much of the production shifting to China.

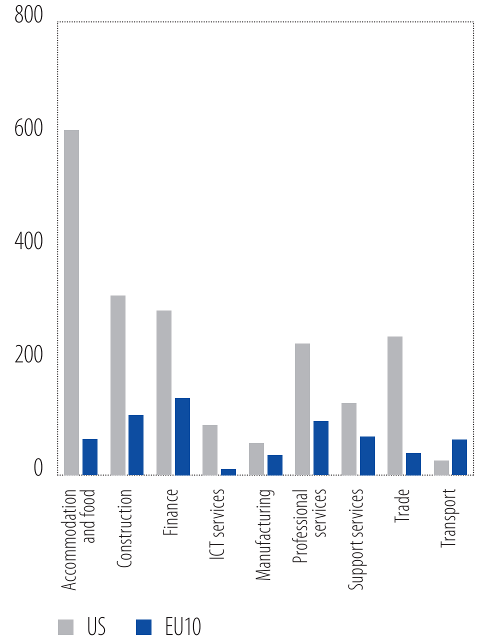
EU firms have been slower to adopt digital technologies than their US peers. EU firms have invested heavily in ICT, particularly in accommodation and food, construction, finance and trade. That said, the increase in ICT capital intensity was generally far higher in the United States and comparable to the European Union only in manufacturing (Figure 20). In finance and professional services, US firms not only increased their capital by much more than their EU peers, but also saw higher labour productivity growth (Draghi, 2024).

Figure 19
Cumulative real growth of the ICT sector
(in %), **2000-2019**



Source: EIB staff calculations based on EU Klems, an industry level growth and productivity research project.
Note: EU10 denotes the sum of ten EU economies for which data was available.

Figure 20
Cumulative growth in real ICT capital
(in %), **2000-2019**



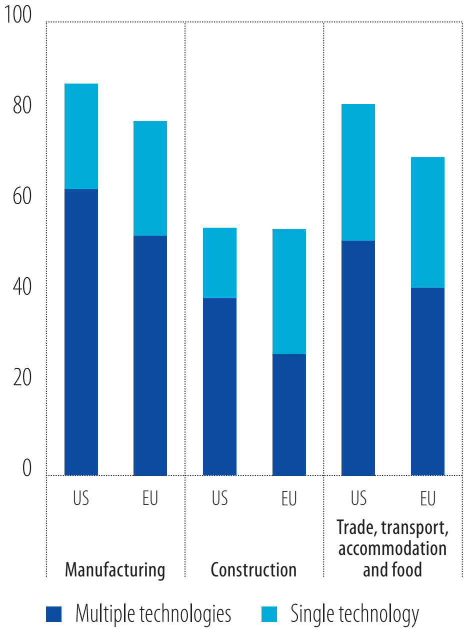
Source: EIB staff calculations based on EU Klems.
Note: Excludes accommodation and food for Denmark.

Lower digital adoption goes hand in hand with lower innovation and productivity. EU firms in construction, trade, transport, accommodation and food have also adopted fewer advanced digital technologies than those in manufacturing, and are less innovative than firms in the corresponding sectors in the United States (Figure 21 and Figure 22).[9] These are also sectors with below-average productivity. In 2023, 25% of EU employees worked in trade, transport and accommodation but produced only 17% of EU value added. Similarly, 7.5% of EU employees worked in construction, but produced only 5.1% of EU value added.

ICT advances also play a critical role in driving sustainable growth. Digital technologies enable better energy efficiency, resource optimisation and decarbonisation across all sectors. For example, the internet of things facilitates the use of smart grids and buildings, while artificial intelligence optimises energy use in manufacturing. Similarly, ICT systems underlie advances in renewable energy, from wind turbine design to predictive maintenance powered by machine learning. Without a robust ICT sector, the European Union risks falling behind in implementing the innovations necessary for its ambitious climate goals. Consequently, a competitive ICT ecosystem is not merely an enabler of digital growth, but rather an essential pillar of the green transition.

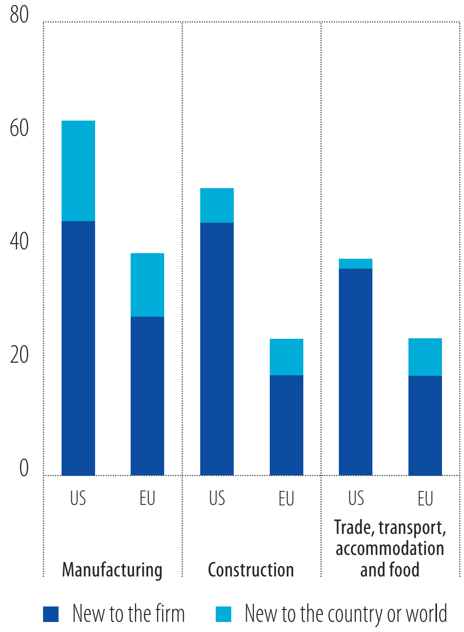
9 Another reason for the apparently low productivity in construction is that the sector is very narrowly defined and includes only on-site construction activities associated with physical assembly of buildings, which tend to be relatively low skilled and labour intensive. Off-site activities such as manufacturing of prefabricated components and modules, leasing of building equipment, provision of high value-added civil engineering, architectural and construction related services, etc., are classified elsewhere.

Figure 21
Use of advanced digital technologies (% of firms)



Source: EIBIS 2024.

Figure 22
Innovation activities (% of firms)



Source: EIBIS 2024.

The EU economy has thus far relied heavily on American ICT services and hardware from the United States and China, raising concerns about technological sovereignty and economic resilience. Major EU industries from automotive to finance depend on cloud services, software solutions and data analytics provided by leading US firms. At the same time, much of the ICT hardware that powers digital infrastructure (including semiconductors and telecommunications equipment) is imported from Chinese and US manufacturers. This dependence exposes the European Union to supply chain disruptions and geopolitical risks, undermining its capacity to independently drive key transitions.

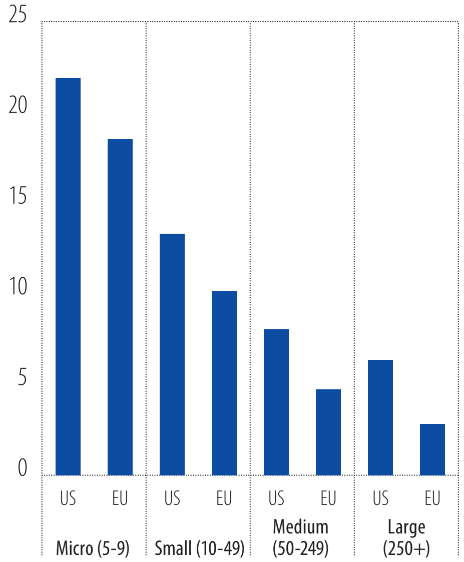
The information and communications technologies in the European Union could grow faster if they managed to overcome the first-mover advantage enjoyed by incumbents, a shortage of risk capital and skills, and insufficient investment in digital infrastructure. The production of ICT goods and services typically enjoys large economies of scale, giving incumbents an advantage. Startups need patient risk capital to grow sufficiently large to be able to compete, but this type of risk capital is in short supply in the European Union (see below). ICT services need strong ICT infrastructure, including in mobile and fixed-line broadband and cloud computing. According to the EIB Investment Survey (EIBIS), 18% of ICT firms in the European Union cite insufficient digital infrastructure as a major investment obstacle (compared to 13% on average for other sectors), while in the United States, only 13% of ICT firms (10% on average) report this issue. (The third section of this chapter estimates the investment needed to improve EU digital infrastructure.) As in other sectors, skills shortages are high in the ICT sector – over half of firms interviewed in the EIBIS describe skills shortages as a major obstacle to their investment, and about 3% of available jobs remain vacant.

Lowering regulatory barriers could boost productivity growth by fostering innovation and enabling companies to leverage economies of scale more effectively. The Digital Services Act, which entered into force in November 2022, has lowered some of the regulatory barriers for ICT services. That said, firms in all sectors currently dedicate a significant portion of their workforce to meeting mandatory or voluntary regulatory requirements. This burden is especially pronounced for smaller firms in the

European Union and the United States (Figure 23). Simplifying compliance processes could help reduce costs, allowing businesses to concentrate more on their core activities. Part of the compliance burden stems from differing regulatory standards in different export markets. In 2024, 60% of EU exporting firms reported that their primary product or service must meet distinct requirements for each EU market, with manufacturing and ICT firms particularly affected (Figure 24). This seems too high given that a unified rulebook should be in place. Different requirements place a particularly large burden on EU firms compared to their US counterparts. Whereas US firms can resort to a large domestic market, EU firms need to export to other countries, including those within the single market, to achieve economies of scale.

Figure 23

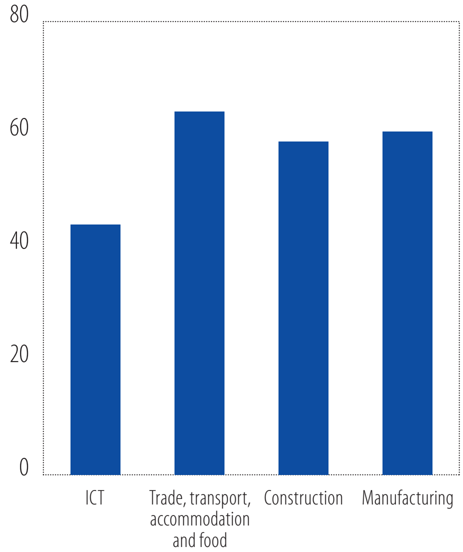
More than 10% of staff is dedicated to dealing with regulatory requirements (% of firms)**, by size**



Source: *EIBIS 2024.*

Figure 24

The main product has to comply with different regulatory requirements across the European Union (% of firms)**, by sector**



Source: *EIBIS 2024.*
Note: *The share concerns trade between EU members to capture barriers within the single market.*

The supply of labour continues to rise despite an ageing population

The labour supply has contributed little to GDP growth over the past decade. This is unlikely to change. Populations are ageing, such that fewer people are available to work over the next three to four decades. This picture is roughly the same in the European Union and the United States (Figure 25).

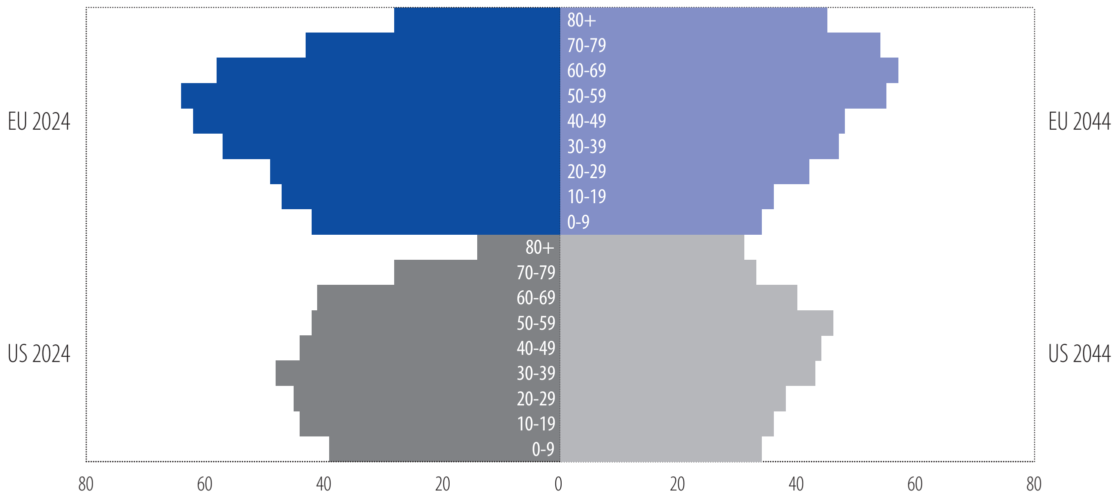
Even if fertility remains low, the labour supply does not need to fall by the same extent as the working-age population. Low birth rates can be balanced by raising average hours worked, the pension age or labour participation. Immigration can also replenish the skill pool. And even if employment declines, GDP can still rise if labour productivity increases. This can be achieved by improving skills or facilitating people's ability to move towards more productive employment.

Most of these factors have already been at work in the European Union over the past decade. The population of EU nationals aged 20-64 decreased by 15 million from 2010 to 2023. However, labour market participation increased, particularly among women (8 million additional employees aged 20-64) and

55- to 64-year-olds (close to 10 million, see Figure 26). Immigration from outside the European Union added just over 13 million (Figure 27, right panel). On balance, total EU employment of 20- to 64-year-olds therefore increased by 15.5 million, not only offsetting but actually overcompensating for the decline in EU population.

Figure 25

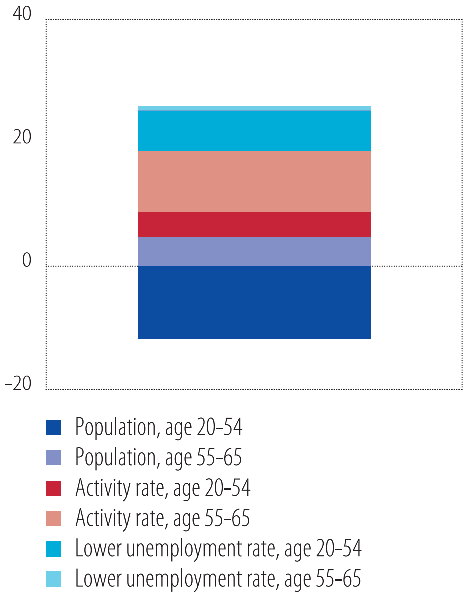
Population distribution across age groups (millions of people, UN population forecasts)



Source: *EIB staff calculations based on UN Population forecasts, 2024 edition.*
Note: *Values for 2044 are UN forecasts assuming zero immigration.*

Figure 26

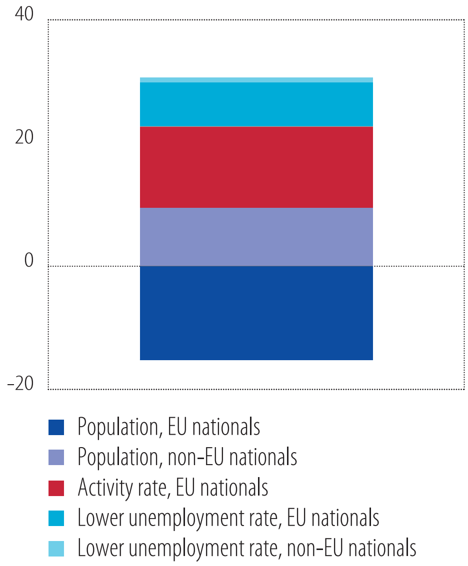
Contributions to the change in EU employment (millions of people, 2010-2023), **by age group**



Source: *EIB staff calculations based on Eurostat labour force survey data.*

Figure 27

Contributions to the change in EU employment (millions of people, 2010-2023), **by nationality**



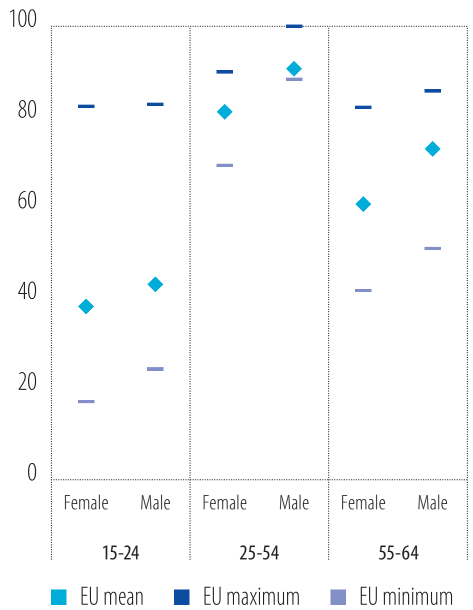
Source: *EIB staff calculations based on Eurostat labour force survey data.*
Note: *Activity and employment rates of non-EU nationals have been omitted because they hardly changed.*

Over time, the average educational background of workers also improved. Improvements in the composition of labour contributed 0.4 percentage points to EU GDP growth each year from 2010 to 2019 (Figure 17, above). There appears to be further scope for improving overall skills and making better use of immigrants' skills. Educational achievements as measured by standardised tests of 15-year-olds under the OECD's Programme for International Student Assessment (PISA) differ widely between and within EU countries, suggesting room for EU countries to learn from each other.

Looking ahead, there appears to be scope for offsetting the decline in the working-age population by raising participation rates further (see Chapter 4). Participation rates vary substantially within the European Union (Figure 28). For example, if countries whose participation rate lies below the EU average raised their participation rate to the EU average, the labour force would increase more than 3%. Moreover, employment levels could be further increased by accelerating the integration of immigrants into the labour market. As of 2021, it was taking about ten years for the employment rates of immigrants from outside the European Union who immigrated for family or humanitarian reasons to reach the same level as EU citizens (Figure 29).

Figure 28

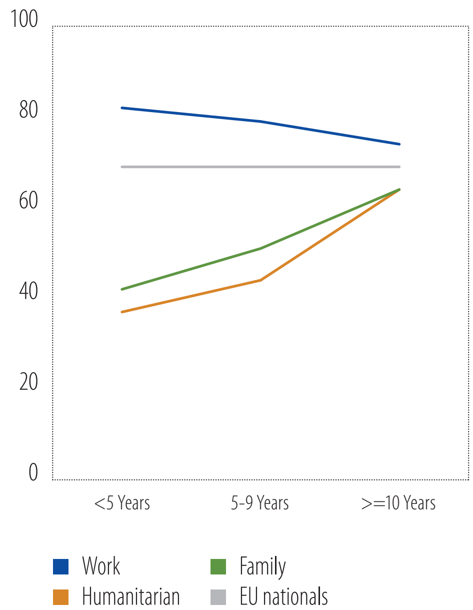
Participation rates (% of population), **by age and gender**



Source: EIB staff calculations based on Eurostat labour force survey data.

Figure 29

Employment rate of immigrants to the European union (in %)**, by reason for migration and duration of stay**



Source: EIB staff calculations based on Eurostat and OECD (2023), Indicators of Immigrant Integration. The employment rates for immigrants from outside the European Union are simple averages across women and men.

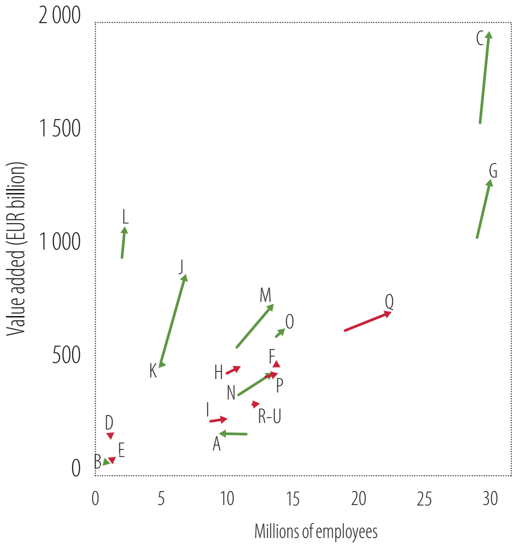
Improving labour and capital allocation

The green transition entails structural transformations of the economy, inducing substantial reallocations of capital and labour to greener activities, with a potential impact on productivity. Investments in the development and manufacturing of clean technologies and the economy-wide shift to sustainable production processes are at the heart of these transformations. They require major movements of capital and workers between sectors, between firms within the same sector and within individual firms. In the past, environmental policies have been combined with other policies (such as trade, education, employment and fiscal policies) to mitigate the effects of environmental policies on companies and workers (OECD, 2021).

Employment has grown at different speeds in different sectors over the past decade, showing that Europe can manage the big shifts needed for the green transition. From 2010 to 2022, most new jobs were created in health and social services, a sector with increased demand due to the ageing population (Figure 30). Employment also grew in high-productivity sectors like ICT services, manufacturing and trade.

Figure 30

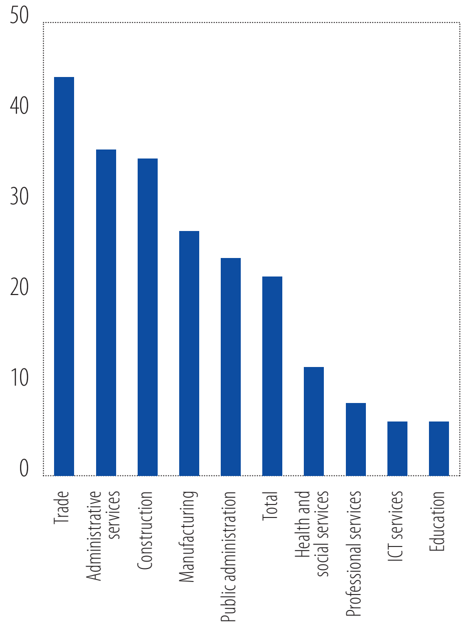
Reallocation of EU employment, by sector 2010-2020



Source: *EIB staff calculations based on Eurostat national accounts data.*
Note: *The arrows show the change in employment in each sector and the change in value added. The green arrows illustrate that these changes were accompanied by an increase in labour productivity, and the red arrows indicate a decline. The sectors are labeled by their NACE codes: A (agriculture), B (mining), C (manufacturing), D (energy), E (water and waste), F (construction), G (trade), H (transport), I (hospitality), J (ICT), K (finance), L (real estate), M (professional services), N (admin services), O (public sector), P (education), Q (health and social work), R-U (arts, other services).*

Figure 31

Perceived over-qualification for current job (% of employees)**, by sector**



Source: *Eurostat.*
Note: *Over-qualification rates are self-reported by employees.*

That said, there is still room to better match workers with jobs. Many EU employees report feeling overqualified for their roles, particularly in sectors like trade (44%), accommodation and food services (68%), and administrative and support services (46%) (Figure 29). Together, these sectors employ nearly one-quarter of the EU workforce but contribute relatively little to labour productivity growth. In contrast, the ICT sector, which drives substantial productivity growth, reports much lower levels of perceived overqualification. Reducing this mismatch could improve productivity and make work more fulfilling for employees.

Several barriers reduce job mobility. While aimed at protecting employees, labour market regulations also have side effects. For example, by increasing the risk and cost of hiring and firing workers, they limit the reallocation of workers to different sectors and firms. Moreover, the insufficient provision of care for dependents, the scarcity of rental accommodation and high transaction costs in residential real estate raise the cost of geographic mobility and the capacity to benefit from job opportunities in other regions. (The third section of this chapter reports estimates of investment needs in these areas.) Investment gaps are compounded by cultural and regulatory differences between

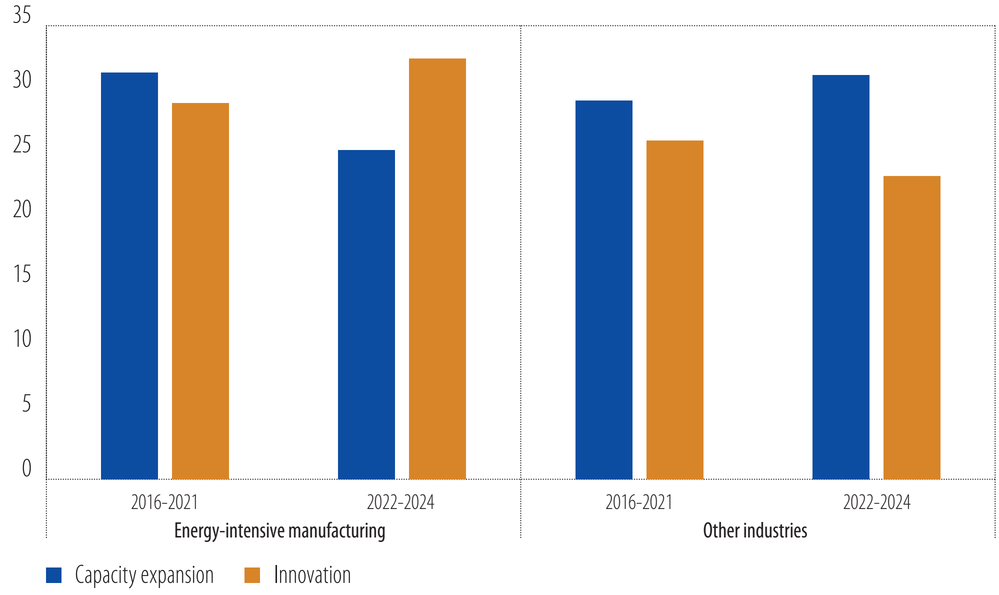
EU members. Different languages and national rules concerning taxation, social security and pensions inhibit cross-border labour mobility. These barriers limit the share of employees switching jobs in the European Union. Only 10% of EU workers changed jobs in 2019, half the share of the United States (Causa et al., 2021).

A flexible labour market – supported by retraining programmes, labour mobility incentives and social safety nets – is essential for workers to transition from declining to growing sectors. When economies face large structural changes such as the green and digital transitions, it is important for employees to be able to move to new jobs without substantial friction to prevent long-lasting unemployment. Digitalisation alters the skills needed and tasks performed by workers (OECD, 2019). However, the rise of green industries, including renewable energy production, electric vehicle manufacturing and energy-efficient construction, also creates new job opportunities. Without a flexible labour market and support for learning new skills, labour misallocation could result in prolonged unemployment and skill mismatches, undermining economic growth and social cohesion.

Like labour, capital must redeploy swiftly between sectors to facilitate the green transition. Assets such as coal plants, oil reserves and infrastructure designed for high-emission production processes are expected to lose their economic value as climate policies tighten and market preferences shift to sustainable alternatives. To offset the loss in value added, capital needs to flow to low-carbon infrastructure, renewable energy projects and innovative green technologies within existing firms or new entrants. Surveys are already suggesting that energy-intensive firms have deprioritised capacity expansion following the energy price shock and are instead prioritising innovation (Figure 32).

Figure 32

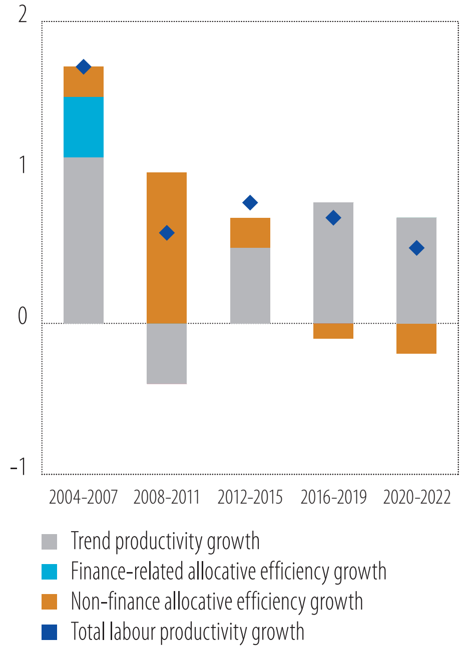
Investment priority over the next three years (% of firms)**, by energy intensity**



Source: *EIBIS 2024.*
Note: *Energy-intensive sectors include basic metals, non-metallic minerals, chemicals, refining and paper. Other industries are services and non-energy intensive manufacturing.*

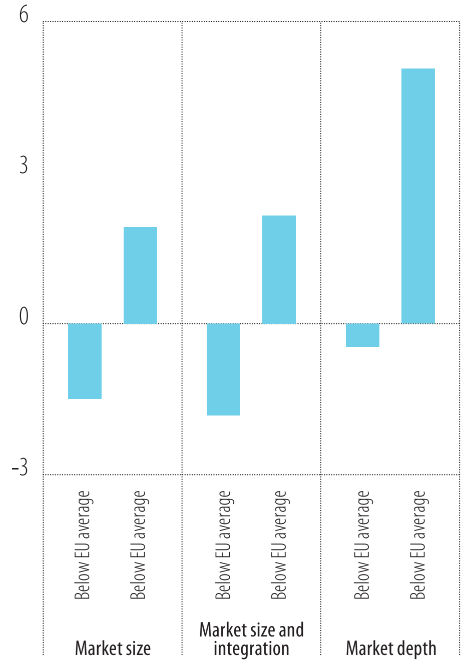
Capital reallocation works better when there is enough finance. From 2004 to 2007, aggregate labour productivity grew by an average of 1.7% per year in EU manufacturing (Figure 33). About one-third of this growth (0.6 percentage points) can be attributed to improvements in the allocation of capital, allowing more productive firms to grow faster than less productive ones. Maurin and Wolski (2024) use financial leverage as a proxy for the availability of external finance. Higher financial leverage, which suggests a greater availability of external finance, was the key factor supporting the reallocation of capital, and was responsible for an average of around 0.4 percentage points of productivity growth per year over the 2004-2007 period (Figure 33, finance-related allocative efficiency component). Labour productivity has grown more slowly since then and financial leverage has contributed next to nothing to its growth. Maurin and Wolski (2024) suggest that capital allocation was hampered by debt left over from the global financial crisis and credit constraints afterwards.

Figure 33
Drivers of labour productivity in EU manufacturing (% of annual growth)



Source: *Bureau Van Dijk's Orbis database.*
Note: *The chart represents the decomposition of the productivity growth trend and a measure of the efficiency of the allocation of capital, following Olley and Pakes (1996). The contribution of firm-level financial leverage to the allocative efficiency growth follows Maurin and Wolski (2024). The estimation is based on a sample of EU manufacturing firms in NACE 4-digit sectors with at least 30 firms throughout the period, in Belgium, Croatia, Czechia, Denmark, Finland, Hungary, Italy, Netherlands, Portugal, Slovenia, Spain and Sweden.*

Figure 34
Contribution of the availability of finance to total allocative efficiency (in %)



Source: *EIB staff calculations based on the Orbis database, Bloomberg, CapitalIQ, Eurostat, the IMF, the European Commission's Directorate-General for Financial Stability, Financial Services and Capital Markets Union (DG-FISMA) and data from the Association for Financial Markets in Europe (AFME).*
Note: *The share of allocative efficiency attributed to financial leverage follows Maurin and Wolski (2024) for different financial market indicators.[10] All the indicators are standardised with mean 0 and standard deviation of 1, with low (high) categories describing negative (positive) values.*

Finance contributes more to the reallocation of capital in countries with more developed financial markets. From 2016 to 2022, countries with more developed equity and debt markets (characterised by their size, integration and depth) saw a positive impact from external finance on the covariance between firm-level productivity and market size, significantly enhancing the efficiency of resource allocation (Figure 34). Developed equity markets provide better access to co-financing and risk sharing capital for firms, which can be further leveraged to direct resources to more productive uses. Conversely, in less developed markets, financial leverage has had a negative effect, with too many resources being tied up in less productive firms.[11]

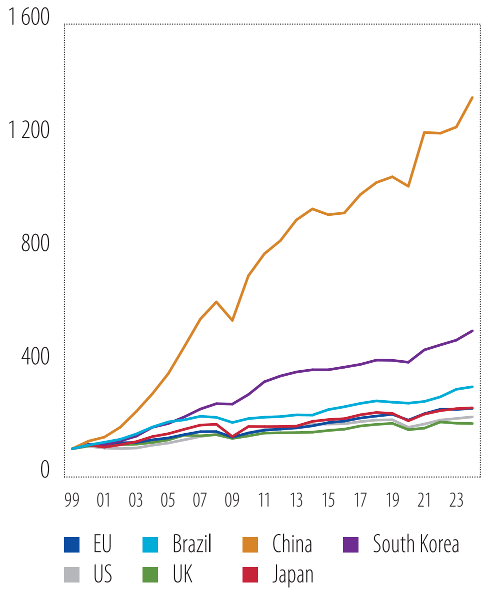
10 Market size and integration includes total market capitalisation (log scale) and composite indicator of integration with the rest of the world. Market depth includes (i) public market financing (market capitalisation relative to GDP) and capital raised through IPOs relative to GDP; (ii) pre-IPO risk capital (venture capital investment relative to GDP) and (iii) pool of investors including households' holding of listed equities, bonds and investment fund shares, institutional investors (pension funds and insurance firms) relative to GDP. Data are only available for 2016-2022.

11 See Gorodnichenko et al. (2020) for evidence on the importance of the business, institutional and policy environment for the dispersion of capital productivity.

Seizing growth opportunities from the green transition: Evidence from trade

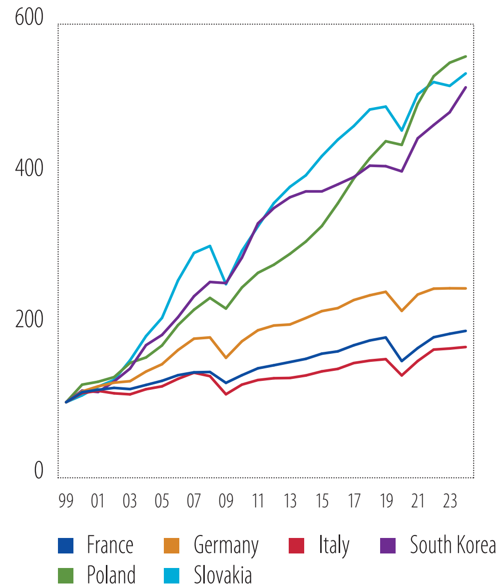
Changes in the structure of EU exports highlight the slow but steady reallocation of resources as the green transition progresses, with significant variation from country to country. Exports of green goods are rising rapidly, reflecting growing global demand for these products.[12] Since green goods are typically exported by high-income countries, their increasing share in the EU export basket is a promising indicator of potential long-term economic growth. Historically, countries that have successfully adjusted their export specialisations have experienced faster growth. However, the stability of export specialisations in much of the European Union suggests that structural adjustments are happening slowly. A more concerted effort is needed to enhance the reallocation of resources in the EU economy and its structural transformation so that Europe can fully capitalise on the opportunities offered by the green transition.

Figure 35
Export of goods and services
(volume, 1999=100)



Source: The IMF's World Economic Outlook database, October 2024.

Figure 36
Export of goods and services
(volume, 1999=100)



Source: The IMF's World Economic Outlook database, October 2024.

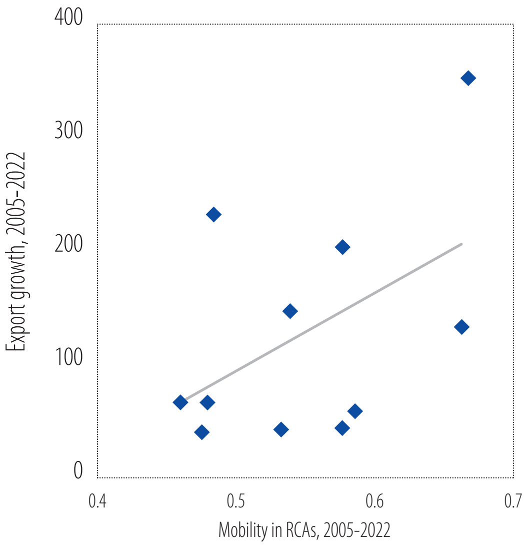
Following a string of crises, the EU trade balance seems to have returned to normal levels. Europe recorded a trade surplus of EUR 110 billion in the first eight months of 2024, a performance close to that of 2018 or 2019, prior to the COVID-19 crisis. As the trade balance shows the difference between exports and imports, a trade surplus may reflect a combination of strong exports and weak imports. When assessing the competitive strength of an economy, it is useful to focus exclusively on exports. EU export performance over the last 20 years has been satisfactory: above that of some major partners, but below that of others (Figure 35 and Figure 36). From 1999 to 2023, export volumes of goods and services increased by 257% in the European Union, slightly above Japan (241%) and well above the United States (206%) and United Kingdom (190%). The performance was well below that of China and South Korea, where exports rose by 1 236% for China and 483% for South Korea. Progress in the different EU members has been very uneven, with the old players in global trade reaching at best the EU average (Germany

12 Examples include "Photosensitive semiconductor devices" (HS 854140) used as components of solar panels and "Assembled flooring panels" (HS 441872) that enhance the energy efficiency of buildings.

and the Netherlands both sit at around 250% growth) or growing much more slowly (France 194%; Italy 173%), while Eastern European countries have matched or exceeded the South Korean figure.

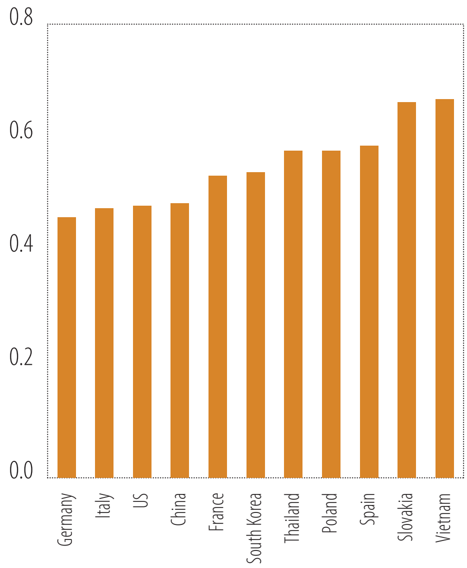
EU export specialisation has remained relatively stable since 2000. The specialisation of country *i* in sector *j* is computed as the ratio of the share of its exports in world exports for the specified sector, over the share of the total country *i* exports in world total exports. This value is known in the literature on international trade as revealed comparative advantages (RCA). A stable structure of the revealed comparative advantage (for all sectors) indicates a stable country specialisation. In some cases of quickly evolving demand, this stability can reflect hurdles to shifting production and exports to faster growing products. Figure 36 suggests a positive relationship between export growth and a change in specialisation patterns for a selected group of countries from 2005 to 2022, and Figure 37 shows the high degree of persistence in the revealed comparative advantage of the European Union's traditional exporters, suggesting that changes in the production structure over the same period were slow.

Figure 37
Change in specialisation (mobility) **and export growth** (2005-2022)



Source: EIB staff calculations based on Comtrade data.
Note: The mobility index is the Shorrocks index of mobility on transition matrices of revealed comparative advantages, calculated for a ten-year period, rolling.

Figure 38
Mobility index in trade specialisation for selected countries (EUR billion)



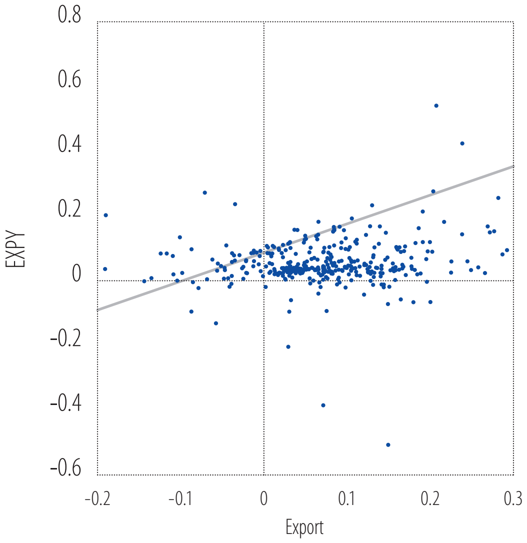
Source: EIB staff calculations based on Comtrade data.

Exporting more complex products produced by technologically advanced countries is key to supporting economic growth. An analysis of the trade impact on economic growth can be enriched by taking the income level of the countries with similar export specialisations into account. This rationale, explained by Hausmann et al. (2007), is based on the idea that countries exporting products typically exported by countries with higher per capita income are more likely to outperform their peers, eventually catching up to the higher income level. For example, if a country exports sheet piling of iron and steel – a product whose producers have higher average per capita income – its exports and possibly GDP are likely to grow more quickly. For this analysis, two indices are built from data on exports. The first (PRODY) is an index that accounts for product sophistication. It shows an average of per capita GDP, weighted by the revealed comparative advantage of each country in a specific product.[13] The second index (EXPY) combines the trade specialisation of each country with this product sophistication index.

13 The first product in the weighted average of per capita income of the exporters is sheet piling of iron and steel, which has many applications in sophisticated construction projects. The second product is tire cord fabric of high tenacity nylon yarn. The third product in the 2022 ranking is sulfonamides, which are synthetic bacteriostatic antibiotics.

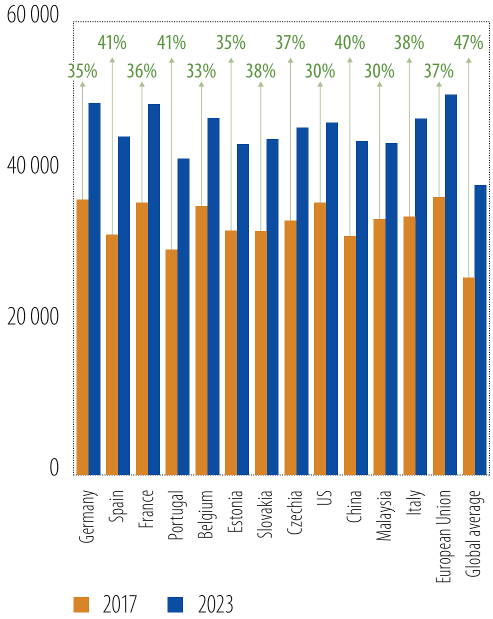
It shows an average of the PRODY index for the specified country, weighted by the export share of that product in the country's total exports.

Figure 39
Export growth and EXPY growth, 2017-2023



Source: *EIB staff calculations based on Comtrade data.*
Note: *The computations of the underlying indicators are based on Comtrade data at a very detailed level (involving more than 5 000 products).*

Figure 40
EXPY growth for selected countries



Source: *EIB staff calculations based on Comtrade data.*

Specialising in specific goods traded by higher per capita income countries leads to stronger export growth. Figure 39 shows EXPY growth and export growth from 2017 to 2023, again highlighting a clear positive correlation between the two concepts. Figure 40 shows the evolution of EXPY for selected countries (including the global average and EU members). The evolution is reassuring: The EXPY for the whole European Union (without considering intra-EU trade) increased by 37% over the period. While this is less than the global average (47%), it is close to the estimated rise for China (40%), and higher than the estimated rise for the United States (30%). If such a positive evolution of the EXPY index is taken to promise future growth, the composition of EU exports should guarantee a strong dynamic going forward.

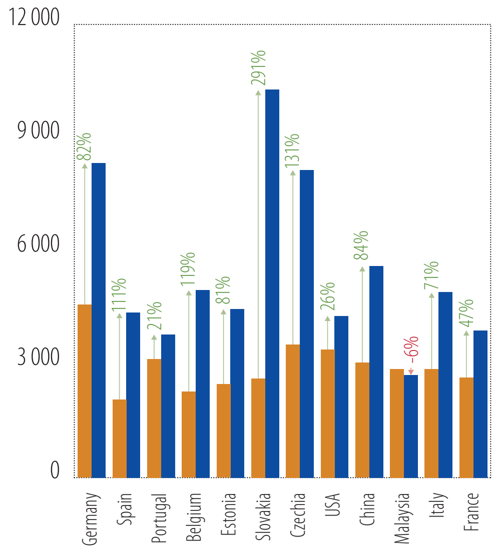
Focusing on climate change-related products could guarantee export growth, and ensure gains in market share. With these indices at hand, focusing on products related to the climate transition can be useful because they will become more intensely traded internationally.[14] Following the lead of the International Monetary Fund's Climate Change Indicators Dashboard,[15] the calculations below use two classifications of goods related to climate change, one dealing with low-carbon technologies and the other reflecting environmental goods. There are 224 different products in the two (partially overlapping) categories, all taken from the over 5 000 products included in the Harmonised System's six-digit categories used in the analysis above. The evolution of the EXPY indices for a selected group of countries producing these goods suggests that some EU members are doing particularly well (Figure 40).

14 Another potential driver of future international trade is artificial intelligence and its applications. However, identifying specific goods linked to related production remains challenging at this stage. The impact of artificial intelligence is currently more pronounced in the services sector than in the goods sector.

15 IMF Data: Trade in environmental goods and Trade in low-carbon technology products.

Figure 41

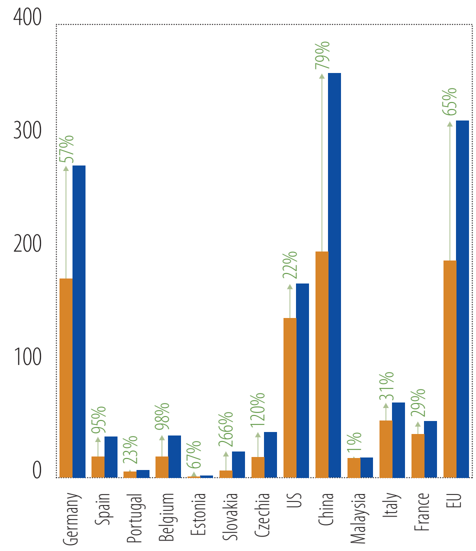
EXPY growth for low-carbon and environmental goods (an index)



Source: *EIB staff calculations based on Comtrade data, examining 224 products classified as low-carbon or environmental goods.*

Figure 42

Export growth for low-carbon and environmental goods (EUR billion)



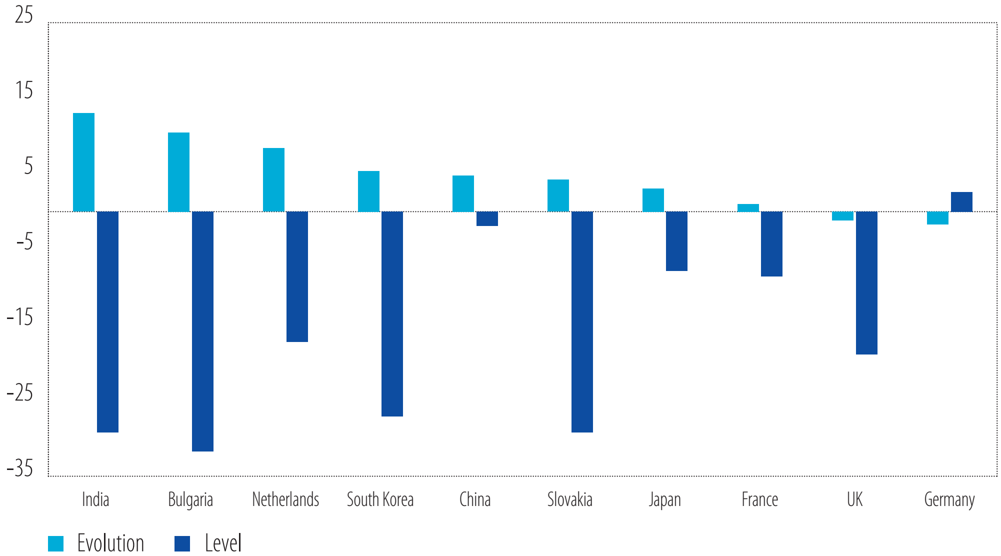
Source: *EIB staff calculations based on Comtrade data, examining 224 products classified as low-carbon or environmental goods.*

The EXPY index in climate change-related goods increased in all EU countries from 2017 to 2023. EXPY in Central and Eastern European countries grew faster than in other parts of the European Union, with Slovakia recording an increase of 291% (Figure 41). The very high growth seen in Slovakia is mainly driven by hybrid and electric vehicles, electric generators and accumulators, and paper and paperboard. Exports of green goods also grew in all countries considered, with China and Germany being the top exporters, and EU exports (excluding intra-EU trade) growing only slightly less than those in China. Slovakia once again leads the way with a remarkable 266% increase (Figure 42).

Simply summing the revealed comparative advantages of green goods can provide additional information on specialisation in these goods. When comparing the average of 2005-2016 figures to those from 2017-2022, two conclusions can be drawn – one related to the level of these exports and the other to the evolution. Germany is a frontrunner and is specialised in these goods. In 2022, it is one of the few countries for which the sum of the revealed comparative advantages in these goods is positive (Figure 43). However, this figure declines in 2017-2022 with respect to the average in 2005-2016. Other EU countries are doing particularly well in the ranking.

External trade has traditionally been a strength of the EU economy, and the green transition is an important opportunity. However, competition in the production of green products is ramping up, and the global market for climate change-related goods is likely to expand very quickly. Some EU countries are well positioned in this area and others are in the process of joining them, but a stronger, more coordinated policy push may be needed to reap the benefits of the transition.

Figure 43
Historical evolution of the revealed comparative advantages in green goods



Source: *EIB staff calculations based on Comtrade data.*

Financing investment needs

Investment needs within the European Union are substantial, but savings are equally significant. The key challenge lies in how to effectively channel aggregate savings into the necessary real investments while maintaining prudential standards and ensuring investor protection. To address this challenge, public policy must focus on investment and improving the investment environment for firms while also strengthening the financial system's ability to absorb and allocate these funds. This section starts by providing an overview of investment needs for the private and public sectors, before turning to the financial resources that are available to meet these needs.

Europe's investment needs are substantial, but the required increase is not unprecedented

Leaders increasingly agree that for Europe to meet key challenges, investment needs to rise significantly. As set out by European Commission President Ursula von der Leyen (2024), countries need to invest massively in cleantech to mitigate climate change, to invest in digital technologies and other innovation areas, and to raise the productivity and competitiveness of European industry. Scaled-up investment is required to tackle gaps in security, agriculture and climate adaptation, skills, and social infrastructure such as affordable housing. In his recent report, Mario Draghi provides further backing for this view, suggesting that investment as a share of GDP might need to return to levels last seen in Europe in the 1970s (Draghi, 2024). Other publications have also sought to collate estimates of investment needs (Andersson et al., 2024; Demertzis et al., 2024; European Commission, 2023b).

Estimating the total size of the additional investment needed is difficult, but it is useful to give a sense of scale, sector by sector. The Draghi report cites investment needs totalling EUR 750 billion to EUR 800 billion. The report makes clear that these estimates are highly uncertain and incomplete. The section below seeks to provide a brief overview of investment trends, needs and gaps by sector, reporting quantitative estimations where available. It cautions against simplistically summing the investment needs and gaps suggested by different sources to derive an overall total.

A mix of public and private investment is required to address investment needs, and public policy should strive to create the conditions that will attract private investment. As Draghi's report points out, the emphasis should be on the role of public policy and public investment in effecting the specific structural shifts needed to enhance European competitiveness, sustainability and well-being. Importantly, this includes unlocking private investment, as investment needs are far beyond what the public sector can deliver directly.

The consensus on the need for a sharp increase in investment is driven by the identification of sector-specific investment gaps related to different EU policy objectives. Objectives such as the transition to carbon neutrality, digital transition goals and better defence capabilities clearly require specific new and increased investments in infrastructure and technologies. A range of analyses have therefore been conducted in recent years to estimate sector-specific investment needs and gaps. The estimate overview in Box C provides a sense of the scale of the investment increases required, as well as an indication of how needs are distributed (although overlaps cannot be ruled out). Some recent EIB estimates may help to fill information gaps.

It is prudent to clearly define the terms "investment need" and "investment gap." In the literature, the term investment gap is sometimes used to refer to the annual or cumulative investment needed to reach a certain goal or benchmark, irrespective of whether that investment is already taking place. In Box C, such estimates are referred to as investment needs. The terms investment gap and additional investment needed are taken to refer to the difference between the levels of investment achieved and the investment that is required. High investment needs may reflect the backlog in innovative and transformative investment necessary to change the productive structure of the EU economy. While this may not necessarily lead to structural shift in investment levels, investment in certain areas might have to accelerate in the short term (Buti et al., 2024).

The existence of an investment need does not necessarily imply a need for public finance. Instead, investment needs must be addressed by a combination of private and public funding. The public-private split required is likely to depend heavily on the sector concerned, and the extent to which public funding is necessary to de-risk and catalyse private involvement.

Moreover, caution should be applied in using these bottom-up estimates to quantify an overall investment gap. Many of these estimates are highly uncertain, and their bottom-up nature means they do not necessarily account for possible substitution effects between sectors (such as between public transport and private vehicles), or between old and new technologies. There are also information gaps regarding some methodologies used. At the same time, the estimates are not comprehensive and investment needs for some policy goals (particularly for social investment) are hard to quantify. There is also often uncertainty about current progress in closing gaps where the baseline estimates come from less recent data.

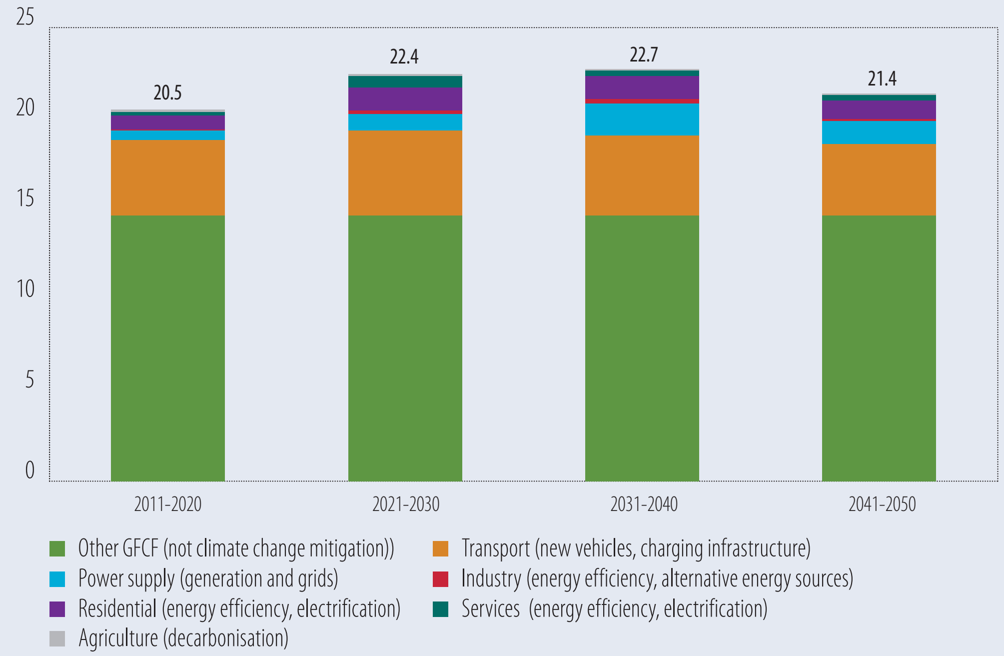
Box C

Estimated investment needs

Climate change mitigation: The European Commission estimates (2021c, 2024a) that additional annual investment of EUR 506 billion (in 2023 prices) – beyond levels seen from 2011 to 2020 – will be needed this decade to meet the Fit-for-55 objectives, and an additional EUR 673 billion will be needed from 2031 to 2050 to reach climate neutrality. These estimates cover investments in clean energy supply; in the residential, industrial and services sectors (in energy efficiency, electrification and alternative fuels); and in new vehicles and charging infrastructure. These are large numbers, but they should be considered together with GDP growth. As a share of GDP, they involve an increase in total investment from 20.5% of GDP from 2011 to 2020 to 22.4% this decade and 22.7% next decade, where other categories of investment are held constant (Figure C.1).

Figure C.1

Effect of projected increases in climate mitigation investment on GDP (in %)



Source: *European Commission, staff working documents SWD(2024) 63 final and SWD(2021) 621 final. EIB staff calculations.*

Note: *All data are based on European Commission PRIMES modelling. Investment needs and GDP estimates for 2011-2020, 2031-2040 and 2041-2050 are based on European Commission (2024a), with projections for 2030-2050 targeting climate neutrality by 2050 (Scenario 3). Estimates for 2021-2030 are based on European Commission (2021c), Fit-for-55 policy scenario, with average annual GDP for that decade interpolated from the figures available in European Commission (2024a), and close to actual EU GDP in 2023. Transport investment includes all investment in motor vehicles, not just in the technology that makes them greener, and so implicitly accounts for the substitution of internal combustion engines. Other gross fixed capital formation (GFCF) (not climate change mitigation, or not covered by European Commission estimates) is assumed to remain constant as a share of GDP.*

Transport infrastructure: A report for the European Commission (Schade et al., 2021; European Commission, 2021b) estimated that the annual investment needed to implement the core Trans-European Transport Network (TEN-T) in the current decade would be EUR 63 billion (in 2023 euros), with the same amount needed to implement the core and comprehensive network goals from 2031 to 2050. Less detail is available on urban transport infrastructure, but one report (European Commission, 2020a) suggests additional annual investment of EUR 35 billion is needed this decade, beyond 2015 levels of investment.

Strategic autonomy in cleantech: The Green Deal Industrial Plan calls for a significant boost to the manufacturing of wind turbines, photovoltaic panels, heat pumps, batteries, electrolysers and carbon capture and storage to reduce Europe's dependency on imports during the green transition (European Commission, 2023a). The Commission (2023b) estimates that annual investment of EUR 11.5 billion will be needed from 2023 to 2030 to reach Net-Zero Industry Act benchmarks. There are no estimates for current investment levels, but EUR 6 billion would be needed just to maintain Europe's share of the global market for these technologies.

Digital networks: Europe has set a Digital Decade goal of ensuring that all European households have access to a gigabit network and all populated areas are covered by 5G or equivalent wireless networks by 2030 (European Commission, 2024b). Considerable progress has been made, with 89% of EU households served by connections of at least 100 megabits per second (Eurostat). The most recent estimate (Ockenfels et al., 2023) suggests that a joint broadband and mobile deployment meeting both of the Digital Decade connectivity targets will require around EUR 15 billion in investment per year, with a further EUR 3.3 billion needed for full coverage of main transport routes.

Data centres, cybersecurity and other associated investments: A recent detailed industry report (European Commission, 2021a) estimated investment needs in cloud and edge (data centres and the associated technology and service provision) to be EUR 6.64 billion per year until 2025. This includes investments in cybersecurity of EUR 500 million. There is no indication of current investment levels, but the report suggests that the public sector would need to provide EUR 3.4 billion per year of the total. These estimates are lower than the additional EUR 17 billion per year for cloud, cybersecurity and common European data spaces for 2021 and 2022 stated in European Commission (2020a).

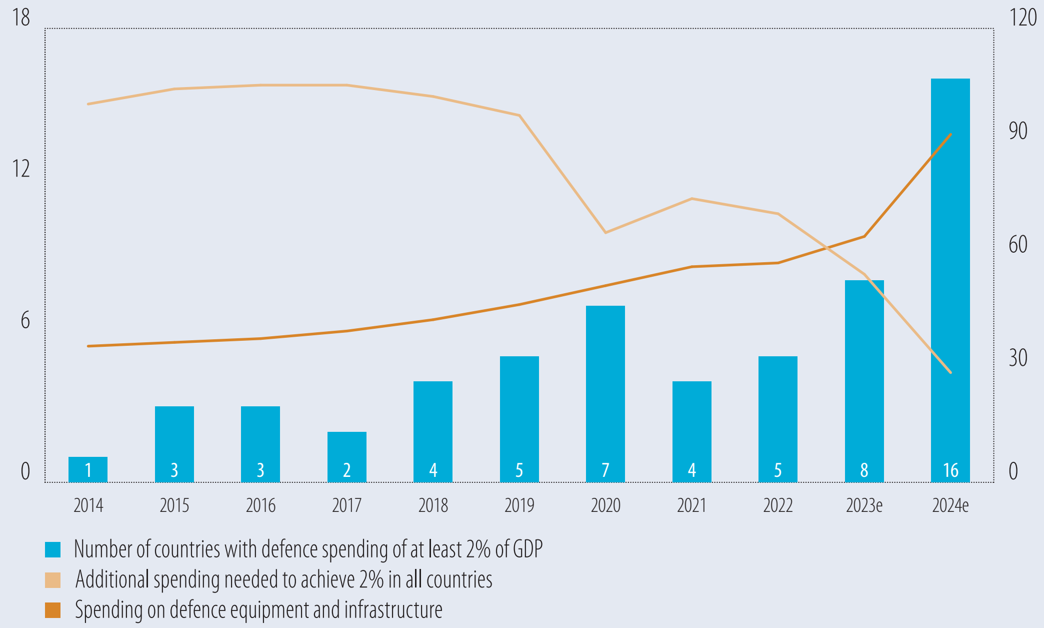
Other areas of digital transformation: Europe's Digital Decade policy also calls for increased investment in various other digital technologies. In an exercise covering 2009 to 2021, Torrecillas Jodar et al. (2023) estimate that asset growth in EU firms related to semiconductors, big data and artificial intelligence amounted to EUR 46.4 billion per year, compared to EUR 71.9 billion in the United States, a gap of EUR 25.5 billion per year. The European Commission (2020a) suggests that additional investment of EUR 57 billion per year would be needed in 2021 and 2022 in digital technologies, including semiconductors, artificial intelligence, blockchain, quantum computing, digital green technologies and next-generation internet, with a further EUR 9 billion needed per year for developing digital skills.

R&D: EU members agreed to spending 3% of GDP on R&D in 2000 and reconfirmed this target in 2020 (European Commission, 2020b). According to the latest data (for 2022), R&D spending accounts for just over 2% of GDP, implying a gap of 0.8% of GDP, or EUR 129 billion (in 2023 euros).

Education and health infrastructure: There is a shortage of information on investment needs for social infrastructure (such as health and education facilities), which is critical for raising participation rates in the labour market, labour productivity, human well-being and longer-term social sustainability (see Chapter 4). In 2018, the High-Level Task Force on Investing in Social Infrastructure in Europe (Fransen et al., 2018) suggested that additional spending of 25% over existing levels was a reasonable minimum estimate of the gap, with more money needed for long-term care. The European Commission (2020a) increased the estimate for healthcare in 2020 in view of the impact of the COVID-19 pandemic.

Housing: Europe has for some time recognised the need to push up spending for social and other affordable housing (Fransen et al., 2018). As discussed in Chapter 4, a lack of affordable housing, particularly in cities, hinders labour mobility, exacerbating skill shortages experienced by firms and undermining productivity growth. Based on national data sources on building permits and household formation rates, an estimated 2.25 million additional housing units will be needed across the European Union in 2025. This is 50% greater than the number of housing starts as indicated by permit data, suggesting a gap of 925 000 units (Chapter 4, Box B).

Figure C.2
Defence spending among the 23 EU NATO members (left axis: number of countries; right axis: EUR billion)



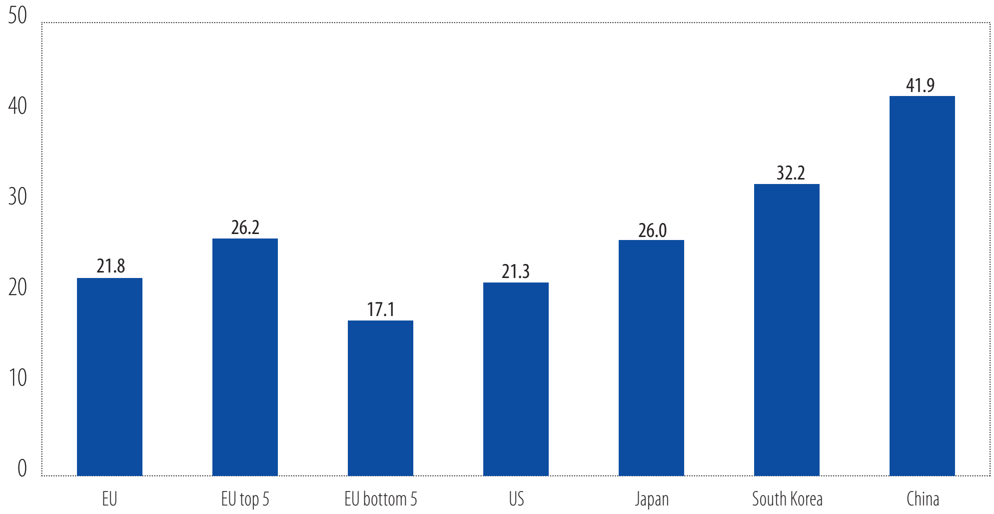
Source: *North Atlantic Treaty Organisation (NATO) (2024).*
Note: *Data for 2023 and 2024 are estimates. Spending amounts are in constant 2023 euros. Data for the four EU members that are not NATO members are not included (and are not available for 2023-2024).*

Defence: Russia's invasion of Ukraine in 2022 drew attention to weaknesses in Europe's defence capabilities and renewed Europe's resolve to increase spending on defence. Significant progress has been made since then. According to North Atlantic Treaty Organization (NATO) estimates, all but seven of the 23 EU members that are also NATO members were expected to reach the 2% of GDP target for defence spending in 2024 (North Atlantic Treaty Organization (NATO), 2024). The additional spending needed to achieve that target in those seven countries has fallen to around EUR 29 billion (Figure C.2). Capital expenditure (on defence equipment and infrastructure) has risen to 35% of total spending. Despite this progress, there are strong calls for further sustained increases in European defence spending to address new security challenges and close gaps left by past underinvestment.

To address these investment needs, Europe will have to shift to significantly higher – but not implausible – rates of investment as a share of GDP. The gaps quantified above amount to at least 3% of 2023 GDP, when taking GDP growth into account.[16] Such an increase in the investment share of European GDP has not been seen in Europe since the 1970s, but it is not unprecedented. Structurally higher investment rates also exist today in peer economies such as Japan and some European countries (Figure 44).

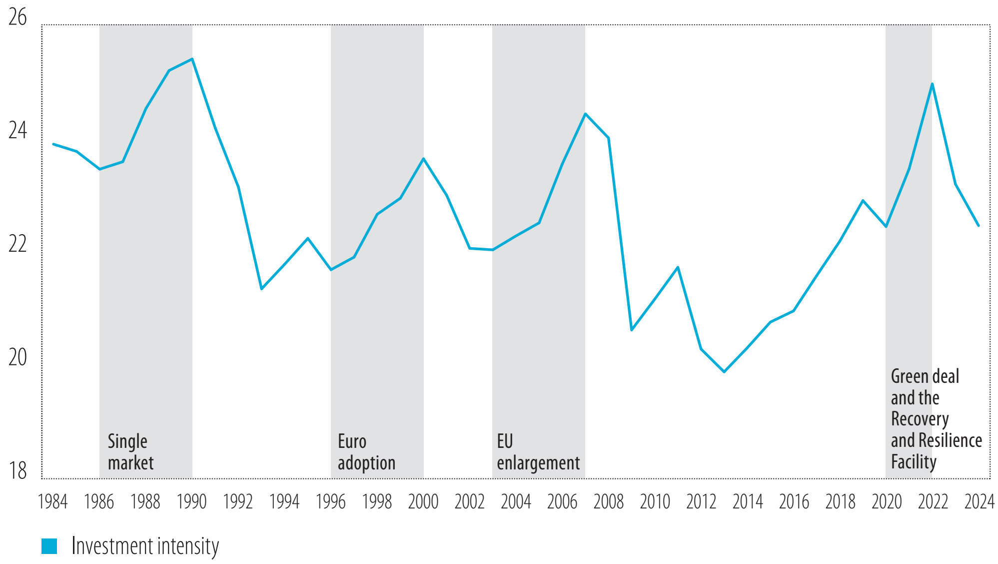
16 Specifically, the European Commission's modelling of climate mitigation investment needs (which also models GDP) suggests a decade-on-decade increase in investment as a share of GDP of 2 percentage points. This is lower than EUR 500 billion as a share of current GDP. In general, additional investment may also itself raise GDP (the investment multiplier cannot be assumed to be zero), but this effect has not been considered here.

Figure 44
Gross fixed capital formation as a share of GDP (in %, 2023 or latest available data)**, for EU and comparison countries**



Source: Eurostat, the World Bank.

Figure 45
Investment intensity, five-year swings and GDP growth in the European Union



Source: IMF World Economic Outlook database, October 2024.

Within the European Union, there have been three episodes over the last 40 years during which investment's share of GDP increased substantially. One was from 1986 to 1990 (with intensity growing from 23.5 % to 25.4%), the second in 2002 to 2007 (from 22.1% to 23.5%) and the third in the years after 2014, and in particular from 2018 to 2022 (from 22.2% to 25%). None persisted: In 2024, investment had returned to about 22.5% of GDP, lower than in 1980.

All three of these phases were the result of significant structural shifts (Figure 45). The first episode (1986-1990) was primarily driven by EU market integration as it coincided with the creation of the EU single market. The Single Market Act entered into force in July 1987, setting a precise deadline of the end of 1992 for completing the EU single market. This period was characterised by significant growth in investment intensity in large EU countries in the north, west and south of the European Union, particularly France (from 21.8% to 24.4%), Belgium (from 19.2% to 25.2%), Spain (from 20.8% to 25.7%) and Portugal (from 25.7% to 30.4%), with Spain and Portugal also benefiting from entering the European Union in 1986. The second episode (2002-2007) was fuelled by the Central, Eastern and Southeastern European accession countries, including Bulgaria, Slovenia, Croatia and the Baltic States, alongside the structural shift associated with the euro introduction, which lead to continued acceleration of investment activities in Belgium, France and Spain, in particular. The third episode, spanning the COVID-19 period (2018-2022), is more challenging to interpret due to the GDP drop during this time, but it stands out as the most geographically homogeneous of the three. It might be linked to the phase of coordinated policy response from EU members.

Construction was an important element in two of the more recent investment peaks. During the second episode, the investment boom was largely driven by construction (residential and business-related), while in the third episode, it was exclusively attributed to construction.[17] For institutional sectors, the second episode was led by non-financial corporations, followed by households. In contrast, the third episode was primarily driven by households (mainly through residential investment) and the general government. Unsurprisingly, not all investment during these episodes appears to have been allocated efficiently. For private investments, market risk generally provides good incentives for investing in productive projects. For public investment, it is crucial that projects are selected transparently and competitively, that the execution of projects is monitored, and that the extent to which investments meet their objectives is evaluated afterwards.

Financial systems must channel ample savings to the necessary investments

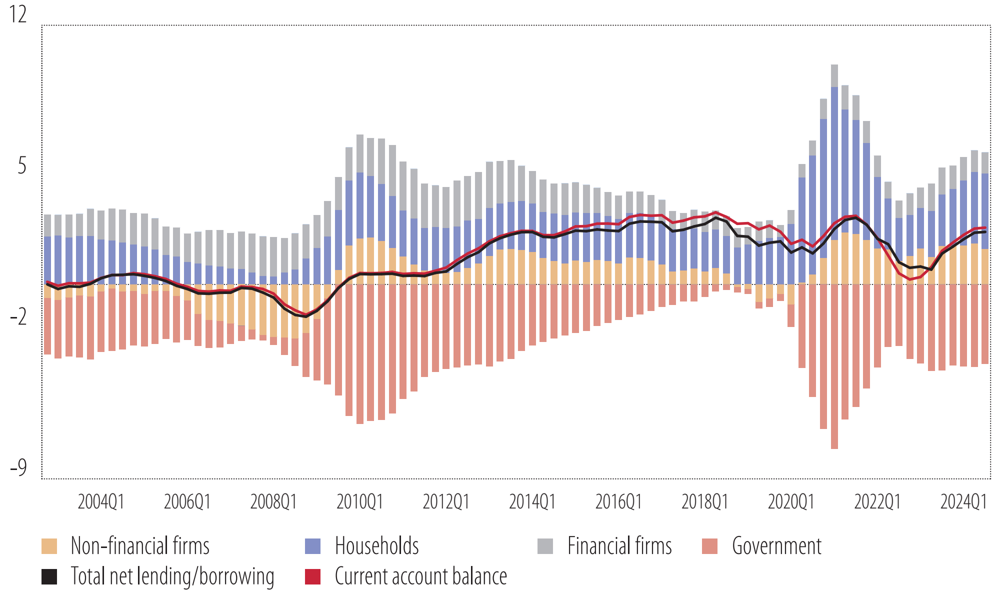
The European Union has ample savings to finance substantial domestic investment needs.[18] Over the last decade, net domestic savings have risen, driven by households and firms. These financial resources flow abroad, particularly to the United States, as they are diverted away from financing domestic investments. Households, the main source of EU financing, prefer safe assets like real estate and deposits, while businesses have shifted from net borrowers to net lenders, reflecting weak investment relative to savings. Institutional factors, including the European Union's reliance on a bank-dominated financial system and underdeveloped pension funds, hinder an efficient allocation of savings. The challenge lies in effectively channelling these savings into domestic productive investments while maintaining high oversight.

17 There is no breakdown of investment by assets for the first episode.

18 This point concerns making better use of savings (a flow concept), rather than financial wealth (the corresponding stock concept). Savings are influenced by cyclical and structural factors, meaning that weaker investment lowers aggregate demand and therefore raises savings, especially during periods of weak economic activity. The resulting stock of private wealth can be geared towards the financing of EU real investment instead of financing real investments abroad. But the conditions must be right for this shift to happen. More integrated EU financial markets, a more developed market for risk capital, lower transaction costs, higher financial literacy and less political and regulatory uncertainty are all necessary.

Figure 46

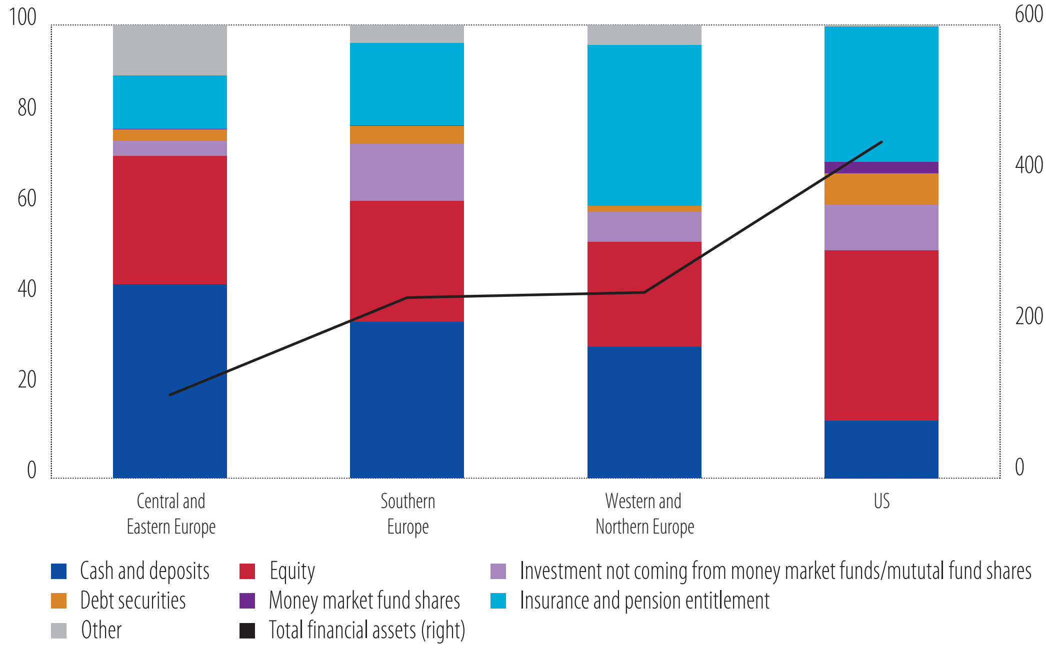
EU net lending and borrowing based on current and capital accounts (% GDP)**, four quarter moving average**



Source: *EIB staff calculations based on Eurostat.*
Note: *The latest figures available are for the third quarter of 2024.*

Figure 47

The composition of household financial assets (left axis: % of total financial assets; right axis: % GDP)**, average 2018-2023**

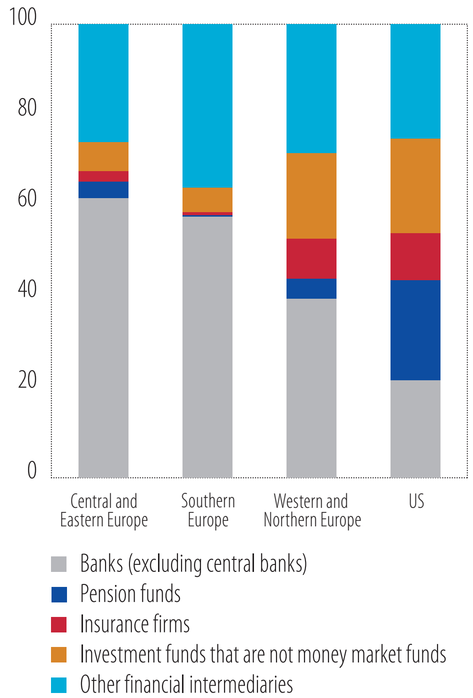


Source: *EIB staff calculations based on Eurostat, and data from US Federal Reserve Economic Data (FRED).*

Since 2010, domestic savings have exceeded investment, and the European Union has remained a net lender to the rest of the world (see Figure 46). Households contributed an average of 2.4% of GDP in net lending from the end of the global financial crisis until the beginning of 2024, peaking at over 7% during the COVID-19 pandemic. Corporate net lending averaged 1.3% of GDP over the same period, and it has increased since mid-2022 due to weak investment. Government borrowing fell during the fiscal consolidation that followed the financial crisis, from a peak of over 6.5% of GDP in the early 2010s to a nearly neutral stance (0.3%) by the second half of 2019. While it increased again in the wake of the COVID-19 crisis, it has hovered around 3% of GDP since the middle of 2022. After balancing the net borrowing positions of the three main sectors, the European Union is a net lender to the rest of the world, and its export savings have accounted for an average of 2% to 3% of GDP since 2008. EU portfolio investments in the United States reached nearly 3% of GDP during the COVID-19 pandemic and recent data show a resurgence in outflows.

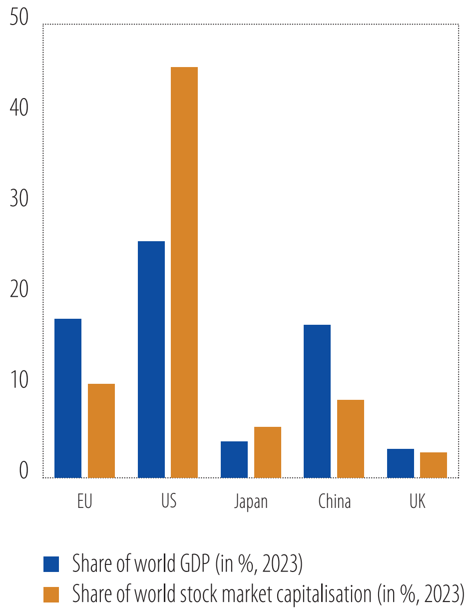
EU households invest heavily in safe assets, such as real estate and bank deposits, with cash holdings exceeding €11 trillion in 2023. In contrast, US households allocate a greater share to equities and financial instruments (Figure 47).[19] Financial literacy gaps partly explain this divergence, with higher literacy associated with greater equity ownership. Only 18% of EU citizens have a high level of financial literacy, and disparities between EU members are notable. Boosting financial literacy could channel household savings into higher-risk investments.

Figure 48
Institutional breakdown of the financial sector (% of total assets, excluding central banks), **2018-2023**



Source: EIB staff calculations based on Eurostat and FRED.

Figure 49
EU market capitalisation does not reflect the size of its economy



Source: EIB staff calculations based on Bloomberg and the IMF.

19 The primary reason for this is that the top 10% of US households hold approximately 80% of total household net worth, and this is held predominantly in financial assets. In contrast, even the top 10% of EU households maintain a high level of non-financial assets.

EU companies remain a net lender to the rest of the economy, and they primarily access these ample savings through bank lending. This is reflected in financial sector structures, with banks dominating EU financial markets, especially in Southern and Central and Eastern Europe, where they hold over 60% of total assets of the overall financial system. In contrast, banks hold around 40% of assets in Western and Northern Europe and 21% in the United States (Figure 51). Additionally, pension funds hold the second-largest quantity of assets in the United States, but these funds are a minor player in most of the European Union. This limits financing options for high-growth, riskier companies, as these funds are better suited to riskier and long-term investments. However, they remain underdeveloped in the European Union, tamping down the vibrancy of capital markets.

The size of the EU capital market is not commensurate with the size of its economy, and this discrepancy weighs on corporate financing. In 2023, the EU economy accounted for 17% of global GDP but only 10% of global market capitalisation (Figure 52). The European Union lacks sizeable equity and corporate bond markets, and the liquidity of European equity markets falls short of the US market, especially for small-cap investments. This shortfall extends to bonds and private markets. The EU securitisation market also lags behind the United States, limiting Europe's capacity to redistribute risk and finance the green and digital transitions (see Chapter 3). While bank balance sheets in the European Union are twice as large as those in the United States, securitisation issuance is only one-fifth of the US level, underscoring untapped potential in this area (Association for Financial Markets in Europe (AFME), 2024).[20] Together with fragmentation, underdeveloped markets and a lack of liquidity result in higher capital costs for European companies. In some cases, this environment leads them to raise funds in the United States.

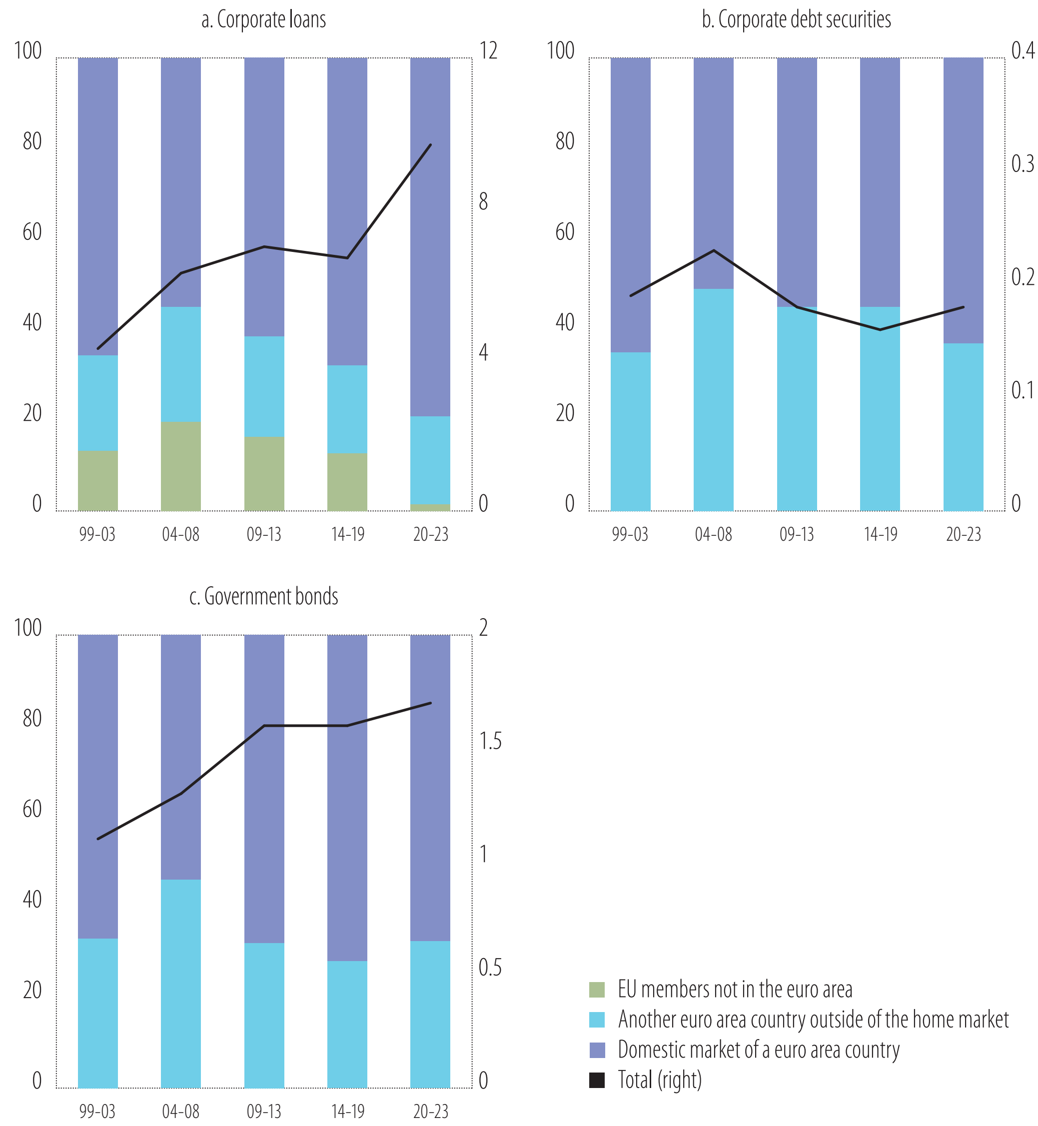
EU banks are relatively focused on their own home country, which can create a bias. A bird's-eye view of bank asset allocation shows banks' strong prevalence for domestic assets, especially since the global financial crisis (Figure 50). From 2020 to 2023, domestic corporate loans accounted for over 75% of bank portfolios, while domestic corporate and government bonds stabilised at 60-70% of holdings. Cross-border exposure within the European banking union remains low, with only 14% of assets originating from other EU countries. Despite widespread foreign ownership of companies in Central and Eastern Europe, even the subsidiaries of international firms increasingly rely on domestic funding.

A stronger role for institutional investors would support investments across borders and firms with high growth potential. Institutional investors (especially pension funds) play a limited role in the European Union despite their stronger cross-border asset diversification and higher likelihood of investing in growth assets. US pension funds' assets constitute 22% of the financial sector's total, vs. only 1% to 5% in EU regions (Figure 48). EU pension funds exhibit stronger cross-border diversification than insurance companies (especially in direct equity investment), with more than 80% of equity investment going to markets outside of their home country (see Figure 51).

Institutional investors are more likely to invest in growth assets. As shown in Figure 52, pension funds and insurance companies hold the majority of their assets in market-based instruments such as debt securities, equities and collective investment undertakings (such as mutual fund shares and money market fund shares). Interestingly, EU pension funds invest more in collective undertakings (42% of their assets), followed by government bonds (20%) and direct equity investments (17%). In contrast, US pension funds invest heavily in direct equity (33%), followed by money market and mutual fund shares (26%), and very little in government securities (4%). Additionally, US institutional investors hold relatively small amounts of their assets in cash and deposits: 0.4-1.4%, compared with 4-5% in the European Union.

20 It should be noted that the data provided by the Association for Financial Markets in Europe (AFME) include the United Kingdom, while US data include agency issuance.

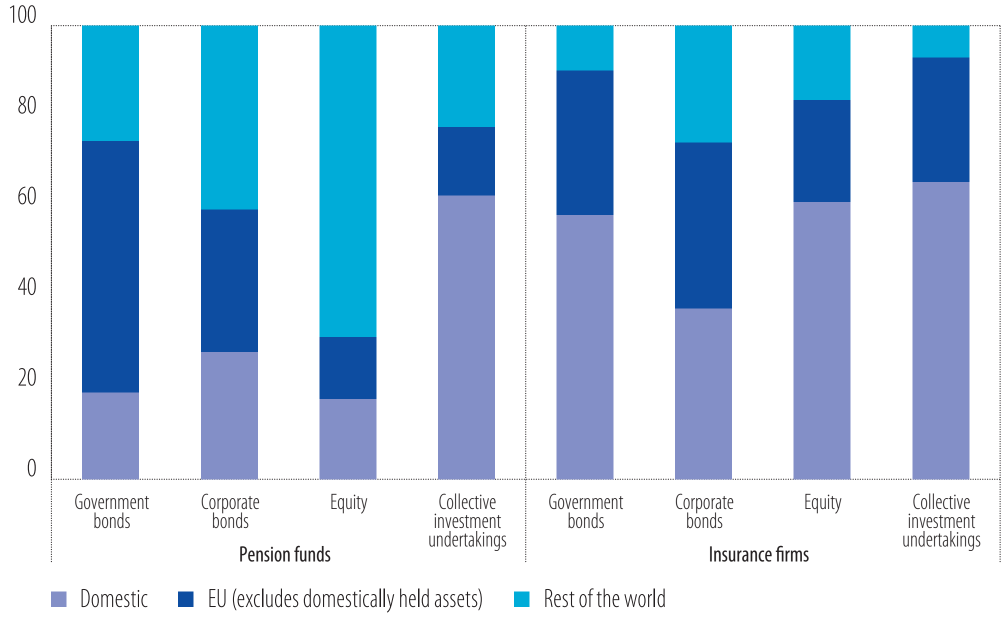
Figure 50
Bank asset exposure (left axis: % of total assets; right axis: EUR trillion)**, by location**



Source: EIB staff calculations based on data from the ECB.

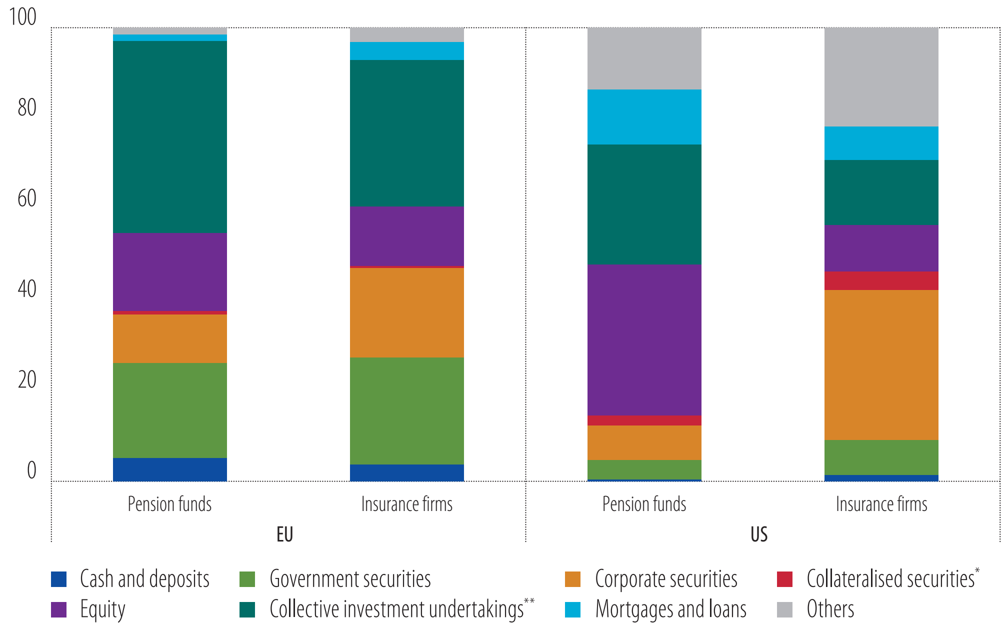
Pension funds are also a possible source of venture capital and private equity funding. However, their overall small size constrains their ability to drive EU cross-border investments and venture capital or private equity investments, which are vital for innovation, competitiveness and the efficient use of EU savings. Interestingly, EU pension funds tend to invest more in the equity of firms beyond the European Union than within.

Figure 51
Pension funds invest more abroad (% of total assets)**, fourth-quarter average, 2017-2023**



Source: *EIB staff calculations based on the European Insurance and Occupational Pensions Authority (EIOPA).*
Note: *Collective investment undertakings include equity funds, debt funds, money market funds, private equity, alternative funds, etc.*

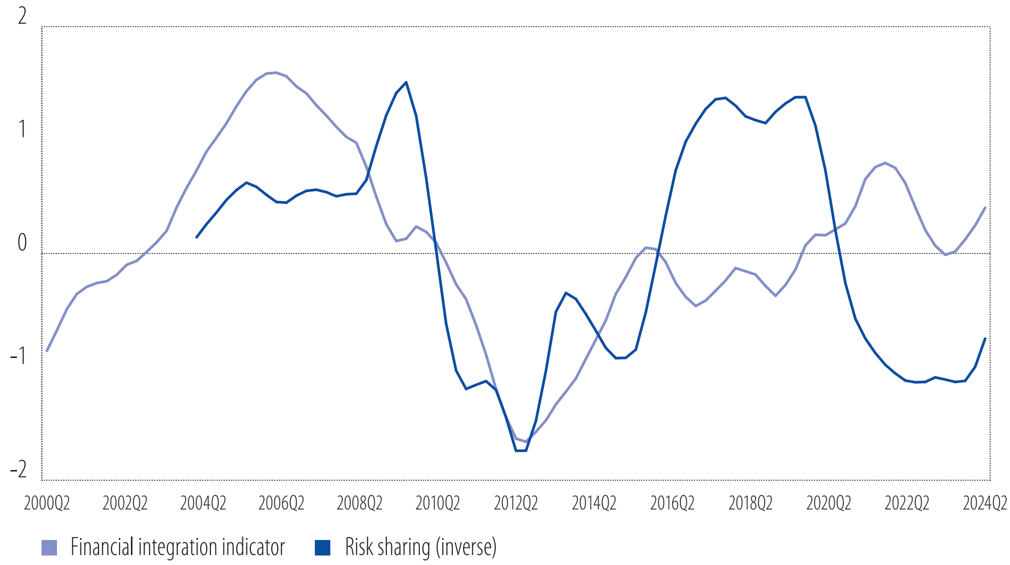
Figure 52
Institutional investors are more likely to invest in growth assets (% of total assets)**, fourth-quarter average, 2017-2023**



Source: *EIB staff calculations based on EIOPA and FRED.*
Note: *Claims of pension funds on sponsors are excluded to align with EU data. * EIOPA classifies asset-backed securities as collateralised securities. For the United States, FRED reports only agency and government-sponsored enterprise securities, which we classify accordingly. ** EIOPA's collective investment undertakings include equity, debt, money market, private equity and alternative funds. For US data, we classify money market fund shares and mutual fund shares under this category.*

European financial integration has not yet recovered from the financial crisis. Cross-border financial flows retrenched following the global financial crisis and the sovereign debt crisis. While these flows began to recover in mid-2012, financial market integration remains substantially below its historical peak since the euro adoption (see Figure 53). However, part of the rise in integration during the introduction of the euro was not necessarily due to a fundamental shift, and therefore did not last long (Maurin et al., 2024). Over the last two years, the evolution of financial integration has been disappointing, with significant declines in the composite financial integration indicator, an indicator that combines data on various market segments. The decline was triggered by drops in both price-based and quantity-based sub-indicators.[21] Figure 53 also plots the evolution of the risk sharing indicator, an indicator of the capacity to smooth specific shocks to income in one country with the financial returns received from investments made abroad. Higher financial integration is associated with stronger risk sharing, and the figure does show a positive correlation between both indicators over the long term. While the risk sharing indicator has remained below its long-term average since the end of 2020, the financial integration indicator has hovered around its long-term average values since the second quarter of 2023.

Figure 53
Indicators of financial integration and risk sharing (indicators are de-meaned and standardised)



Source: *EIB staff calculations calculation based on ECB (2024).*
Note: *The risk sharing indicator is derived from a smoothed estimate of the correlation between private consumption growth and GDP growth across countries. It is inverted on the figure to display a positive correlation with financial integration indicators. The horizontal dotted line represents the long-term average. The latest figures available are for the second quarter of 2024.*

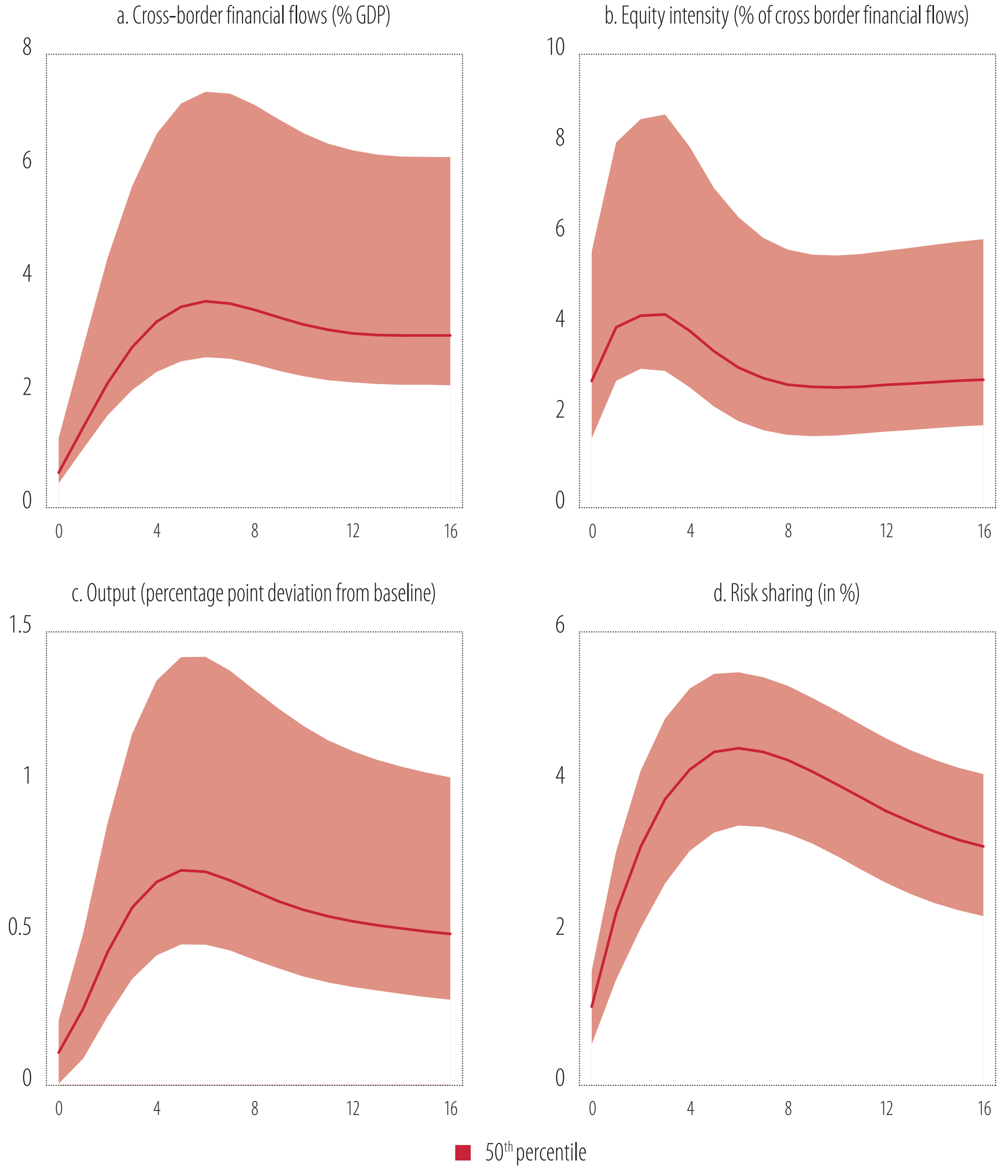
Stronger cross-border financial integration would benefit the European Union. Figure 54 plots the estimated response of selected macroeconomic variables to an increase in financial integration grounded on structural factors and a reduction in financial firms' domestic bias brought about by an improvement in the institutional framework (for example, the creation of pan-European supervisory policies raising transparency and confidence in cross-border investments). The rise in the financial integration indicator is calibrated to correspond to one-half of the gap between the current degree of financial integration and its historical peak. The results show that this stronger financial integration raises cross-border financial flows by around 3 percentage points of GDP in the long run. As it is based on long-lasting factors, it also raises the equity intensity of cross-border financial flows by 3 percentage points. While a widening gap in the interest rates between EU members can increase bond purchases

21 The price-based sub-indicator of financial integration tracks the return dispersion of cross-country assets, while the quantity-based sub-indicator compiles data on cross-border holdings of various asset classes, including bonds and equities. For more details, see Hoffmann et al. (2019).

in the short term, proper financial integration supports more patient investments entailing higher risk, such as equity investment. Capital flows will unlock investments as they expand and are better allocated within the European Union. The rise in financial integration is therefore accompanied by GDP that is structurally higher (0.3% to 1%, with a median impact of 0.6%).

Figure 54

Estimated response to increased integration (a one standard deviation rise in the financial integration index)

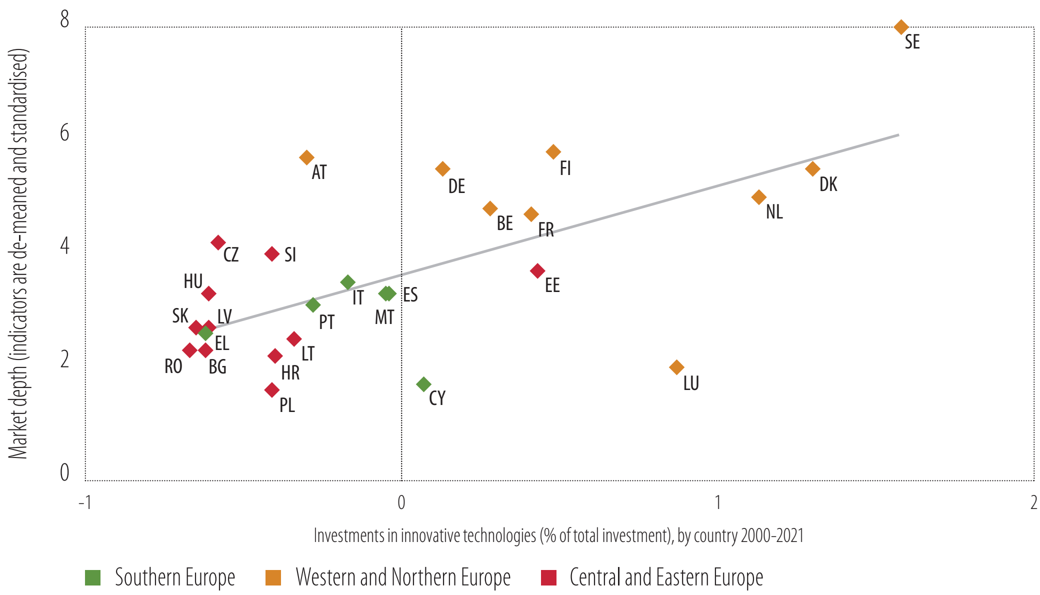


Source: *EIB staff calculations.*
Note: *See Maurin et al. (2024). The solid red line is the posterior median response whereas the red shaded area corresponds to the area between the 20th and 80th percentile. The future horizon is reported as quarters on the x-axis.*

Equity finance is also crucial, and countries with deeper and more sophisticated capital markets tend to invest more in innovative technology. Market depth is measured here using a synthetic indicator that includes capital market financing, initial public offering size, pre-initial public offering risk capital (venture capital or private equity investment), and the pool of investors (retail and institutional). Figure 55 shows a positive correlation between investment in innovative technologies and financial market development. The Nordic countries, the Netherlands and Belgium excel in both areas. Larger market sizes also benefit Germany, France, Italy and Spain. Eastern European countries (except Estonia, Slovenia and Czechia) lag behind in financial market development and technology investments. This link is not surprising, as market-based financing is crucial for investing in the high-risk, intangible and innovative assets that traditional bank financing may not adequately support.

Figure 55

Investment in innovative technologies and financial market depth



Source: *EIB staff calculations based on Eurostat, Bloomberg, CapitalIQ, IMF, DG-FISMA and AFME data.*

Note: *Market depth includes (i) public market financing (market capitalisation relative to GDP) and capital raised through IPO relative to GDP; (ii) pre-IPO risk capital (venture capital investment relative to GDP) and (iii) pool of investors including households' holding of listed equities, bonds and investment fund shares and institutional investors (pension funds and insurance corporates) relative to GDP. Averages for 2016-2023. Investment in innovative technologies and gross value added are measured in chain-link volumes at 2015 prices. This investment includes gross fixed capital formation in R&D, software and databases, other intellectual property products and telecommunications equipment.*

Three key issues (the "three E's") impede progress on Europe's saving and investment union (Largarde, 2024a). European savings are concentrated in low-yield deposits (not entering), remain confined within national markets (not expanding) and fail to reach innovative companies because of an underdeveloped venture capital ecosystem (not exiting). It is paramount to develop accessible, transparent and affordable investment products to address the not entering issue, harmonise the regulatory environment to resolve the not expanding issue, and enhance institutional investments in venture capital, as well as leverage funds provided by public development banks like the EIB, to tackle the not exiting issue.

Conclusion and policy implications

EU policymakers face the dual task of addressing current economic challenges while unlocking opportunities for future growth. The recovery from the energy shock and shifts in monetary and fiscal policies have improved real incomes. However, domestic demand remains fragile, while external demand is constrained by trade conflicts. Investment – a key driver of long-term growth – has weakened. This reflects the lingering impact of tighter financial conditions and persistent structural challenges in reallocating resources efficiently.

To secure sustainable growth, the European Union must tackle three interlinked tasks: revitalising productivity, addressing demographic challenges and facilitating the reallocation of capital and labour.

Revitalising productivity: To improve productivity, the European Union needs coordinated action and better targeted R&D funding to ensure that the most promising projects receive support across all EU members. Equally important is public investment in state-of-the-art research infrastructure to foster innovation and competitiveness. Reducing fragmentation in the EU single market and the EU capital market is essential to facilitate the funding of innovation, and to allow companies to exploit economies of scale.

Offsetting demographic pressures on labour supply: Raising labour market participation across genders, age groups and nationalities, and encouraging immigration to sustain and diversify the skill pool can offset the impact of declining birth rates.

Facilitating reallocation for the green and digital transitions, while also dealing with security concerns: The contraction of carbon-intensive industries risks causing a rise in unemployment and skill mismatches, especially in vulnerable regions. A flexible labour market supported by retraining programmes and better physical and social infrastructure – including affordable housing, public transport and dependent care facilities – will help workers transition to emerging green and digital sectors. Similarly, capital reallocation must be encouraged by reducing barriers to scaling up businesses and by advancing the integration of the EU capital market.

The EU capital market needs to become more integrated to ensure that ample savings can finance much-needed investments. The large investment needed in tangible, intangible and social capital must be found to move forward with the green and digital transitions, guaranteeing EU sovereignty and maintaining competitiveness.

History shows that the European economy is able to generate high investment rates when structural changes to the economy unlock new business opportunities. Today, the green and digital transitions are pushing forward such structural changes. The challenge lies in enabling firms to exploit the resulting business opportunities. One aspect is to effectively channel Europe's substantial savings into productive investments inside the European Union while protecting investors and maintaining adequate oversight. Public policy should focus on creating a favourable investment environment by harmonising regulations across the single market, lowering barriers to cross-border investments and enhancing the financial sector's capacity to allocate savings efficiently. Policy measures that incentivise investment not only raise the supply of products and services but, by encouraging companies to invest, also generate demand, which in turn supports economic growth.

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Chapter 2

How to maximise the impact of government investment

The public sector has played an important role in the economy since the pandemic. Governments' coordinated response to the pandemic and a later spike in energy prices reinforced the economy and maintained a focus on economic transformation and investment. Since the beginning of 2020, current and capital expenditure by governments has accounted for nearly one-third of gross domestic product (GDP) growth, substantially exceeding the long-term average.

In the European Union, government investment grew at a record pace in 2023 and continued to rise in the first half of 2024. Having expanded considerably since 2019, government investment in the European Union increased faster in 2023 than it had since at least 1996. Government investment climbed to 3.5% of GDP – nearly a full percentage point above the lowest reading in 2017. This growth has been underpinned by coordinated policies at the EU level, a reprioritising of investment, finance provided by the Recovery and Resilience Facility (RRF) and the temporary suspension of EU fiscal rules. The rapid growth continued in 2024, when government investment increased 10% in the first half of the year compared to the same period in 2023.

Infrastructure investment, both public and private, also grew, underpinned by the energy sector. Infrastructure investment as a share of GDP has continued an upward trend that began in 2018. Squeezed by the energy crisis, the European Union emphasised investment in improving the energy sector's resilience and in accelerating the green transition.

On the national level, recovery and resilience plans are giving renewed impetus to government investment. Disbursements from the RRF have picked up as EU members begin to implement investment projects. This has spurred government investment.

The reinstatement of EU fiscal rules will require difficult trade-offs – especially when the Recovery and Resilience Facility winds down in 2026. Several countries will need to overhaul their finances to comply with reworked EU fiscal governance rules. Some countries have relied heavily on RRF funds to sustain strong government investment, and they will need to make difficult decisions when the RRF expires in 2026. European structural and cohesion funds might alleviate these trade-offs in some regions, but countries must make effective use of these funds. Only about 6% of cohesion funds dedicated in the 2021-2027 budget period had been spent at the end of 2024, and about 30% have been allocated to selected projects.

Government capital spending has catalysed overall investment since the pandemic. The recent acceleration of government investment and the extensive use of investment grants have given a boost to overall investment in the European Union. RRF money and European structural and cohesion funds have also lifted private investment.

The EU single market and tight economic integration mean that the effects of government investment in one country spills over to the rest of the European Union. These spillover effects lead to higher output and private investment not only in the country of origin but also in the rest of the European Union. EU efforts to coordinate investment at the individual country level have enhanced these effects. This coordination will become even more important as some countries will face increased fiscal pressures when complying with the revised fiscal rules. EU coordination can also benefit from the substantial experience that has been gained in using EU financial instruments to leverage public resources in ways that best catalyse public investment.

EU governments invest significant resources to improve people's overall well-being and skills, which is a key driver of competitiveness. These resources need to be used effectively and efficiently. Spending by EU governments on health and education, as well as on affordable and social housing, is some of the highest among members of the Organisation for Economic Co-operation and Development (OECD). The impact this investment has on human capital varies from one country to the next, and cannot always be linked to spending. More closely monitoring how spending affects outcomes would improve its effectiveness at helping different social groups and improving competitiveness.

Introduction

The recent Letta (Letta, 2024) and Draghi reports (Draghi, 2024) on the state of the EU economy have stressed the need for increased investment. Ursula von der Leyen, the president of the European Commission, is focusing her mandate on investment, particularly investment that addresses structural challenges to EU economic stability and growth. This investment needs to happen despite the reinstatement of EU fiscal rules, which have been revised under the overhauled governance framework. Structural challenges include shifting demographics like an ageing population, which strains public pension systems and healthcare services; economic disparities between EU members, which leads to uneven development; and social cohesion. The European Union also needs to invest heavily in the digital and green transitions, which require substantial investment in technology and sustainable infrastructure. Another high priority is European defence, particularly in the current geopolitical context. Strong government investment is crucial to addressing these challenges.

This chapter is presented in three sections and four boxes. The first section reviews recent developments in government investment and infrastructure finance, and progress in implementing national recovery and resilience plans. It includes Box A discussing the macroeconomic effects of government investment in the European Union. The second section looks at the challenges to government investment in the near and medium term. It includes two boxes: Box B looks at experience that the European Union already has in leveraging public-sector resources to deliver on investment, while Box C explores the interaction between institutional quality and public spending on research and development (R&D) that supports private investment. The third section takes stock of government investment and policies in areas related to human capital, namely education, health and housing. It includes Box D on the effect of government spending on human capital.

The analysis in this chapter stresses the importance of EU structural funds and the RRF in sustaining government investment even as the European Union begins to apply overhauled fiscal rules. It also makes the point that improving government efficiency will help make countries' finances more sustainable.

Government investment remains strong

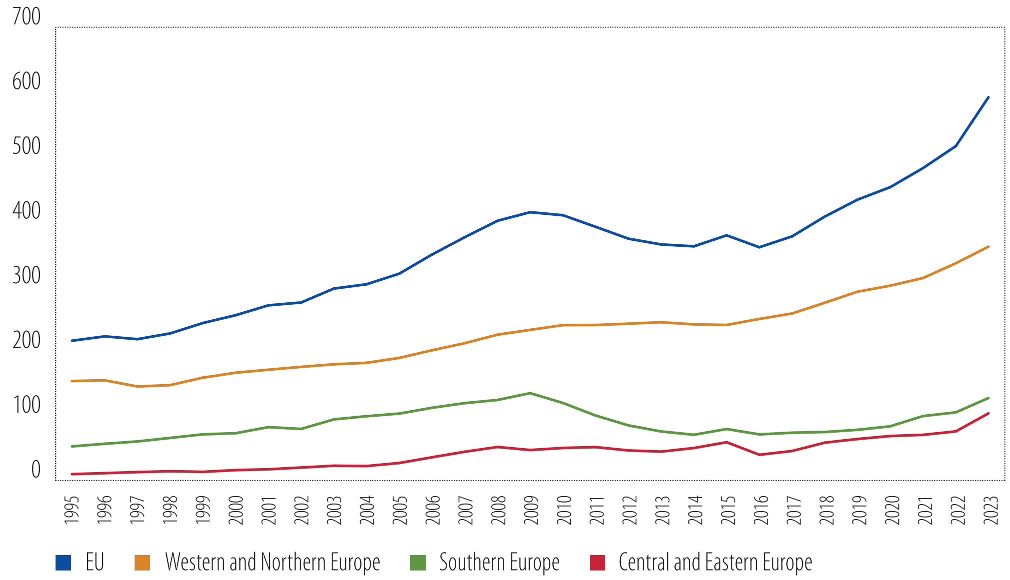
This section provides an overview of recent developments in government investment in the European Union. It shows that EU government investment has remained resilient since the COVID-19 crisis – backed by substantial RRF financing, the phase-out of expensive efforts to address the energy crisis in 2022-2023 and the suspension of EU fiscal rules. Government investment also remained high as countries spent on new infrastructure to deal with the energy crisis and reduced supplies from Russia, and to advance the transition to clean energy. These aggregate trends are corroborated with investment data from local governments gathered during the latest wave of the EIB Municipalities Survey 2024.

Government investment grew at record speed in 2023 and continued to expand robustly in 2024

In the European Union, gross fixed capital formation by the government grew at a record rate of 15% in 2023 (Figure 1).[1] The increase was especially high in Southern European countries (21%) and in Central and Eastern Europe (37%). High inflation has contributed somewhat to these growth rates. The GDP deflator, which takes inflation into account, rose by 6.1% and the investment deflator increased by 4.4% in 2023. However, even after correcting for the relatively high inflation, government investment increased 10% in 2023, the biggest rise since at least 1996.[2]

Figure 1

Gross fixed capital formation of EU governments (EUR billion)



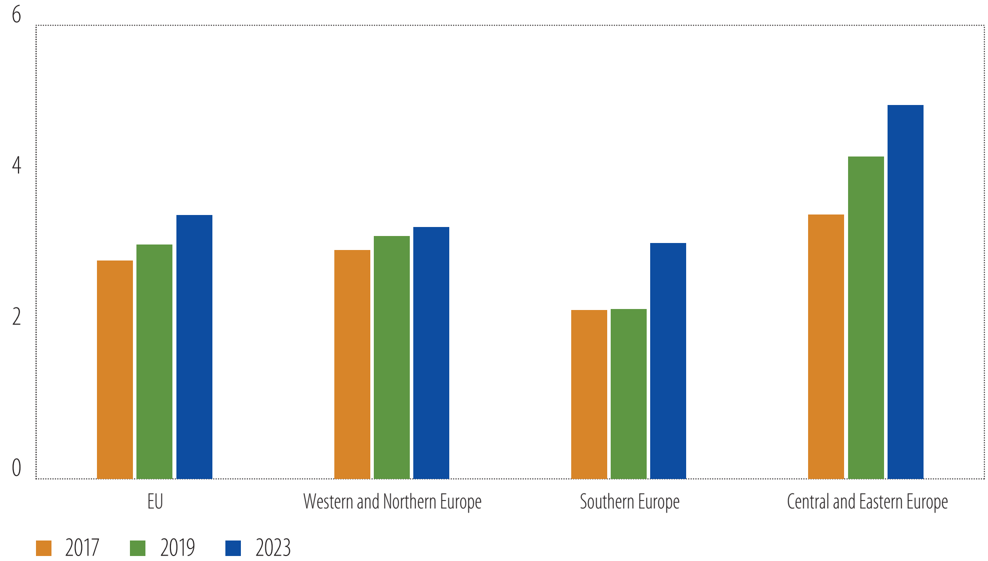
Source: *Eurostat and EIB staff calculations.*
Note: *Western and Northern Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, the Netherlands and Sweden. Southern Europe includes Cyprus, Greece, Italy, Spain, Malta and Portugal. Central and Eastern Europe includes Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.*

After remaining depressed for years after the European debt crisis, government investment in the European Union has accelerated steadily since 2017, consistently outpacing GDP growth each year (Figure 2). This rise pushed up government investment rates (investment as a share of GDP), bumping them up closer to the highs of the late 1990s and the brief years of fiscal stimulus that followed the global financial crisis. Southern Europe particularly suffered from low government investment during and after the European sovereign debt crisis, and has also benefited from the pickup since 2017. As a result, EU government investment rose to 3.5%. of GDP, almost one full percentage point higher than the low of 2017.

1 In this chapter, gross fixed capital formation (GFCF) by the government is sometimes also referred to simply as government investment.

2 Government investment was transformed into real terms using the price deflator.

Figure 2
Investment rates of EU governments (% GDP)



Source: *Eurostat and EIB staff calculations.*
Note: *See notes under Figure 1 for the composition of the country groups.*

Increased investment by regional and local governments was largely responsible for the rise in 2023. Local and regional governments accounted for about two-thirds of the increase in government investment across the European Union. That contribution was even stronger in Western and Northern Europe (80%). It was less pronounced (about 40%) in Central and Eastern Europe, where government finances tend to be more centralised.

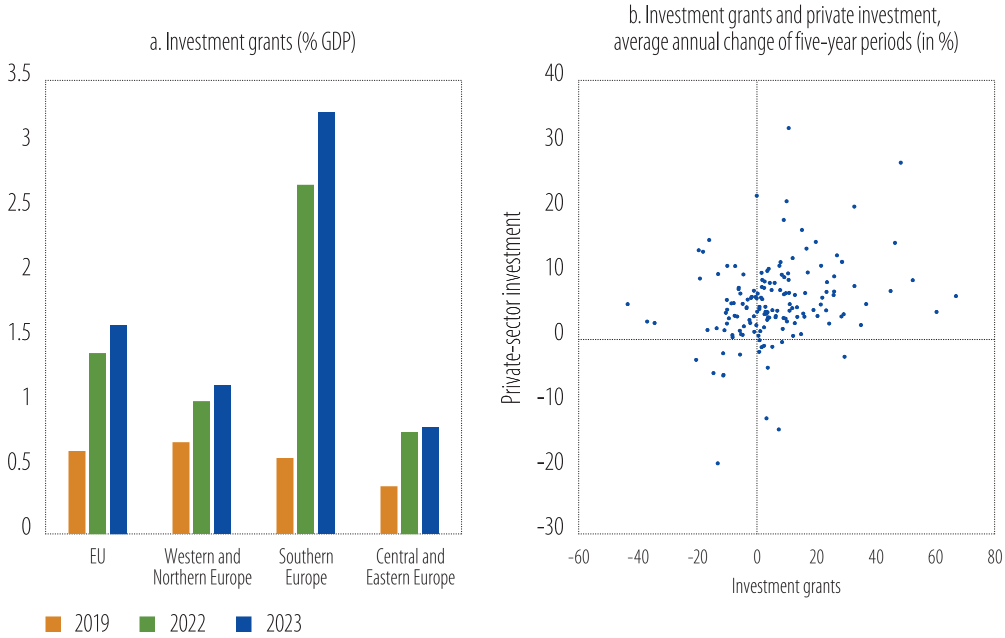
In addition to government investments, EU countries also increased spending on investment grants.[3] Government investment grants picked up substantially in 2020, accounting for 1.6% of EU GDP, a gain of 1 percentage point from 2019 to 2023 (Figure 3a). The contribution of Southern European countries was especially high. Government investment grants in Southern Europe increased by 2.5 percentage points of GDP, virtually matching the share of government investment. Much of this spending came from EU countries' efforts to sustain their economies during the COVID-19 and energy crises. Governments incentivised private investment with funds that supported capital expenditure. This is confirmed by the robust relationship seen between investment grants and growth in private investment (Figure 3b).[4] The funds available for investment grants also expanded substantially with the deployment of the RRF.

The combination of public investment and investment subsidies has strengthened private investment. While the relationship between public and private investment is complex, there are substantial synergies between the two. Analysis in Chapter 3 confirms the positive effects of public grants on business capital expenditure. Academic research has also found that public investment substantially reinforces private investment in many countries (Afonso et al., 2024; Pereira, 2000). Furthermore, increases in government investment that are coordinated at the EU level are shown to have significant spillover effects on output and private investment in individual domestic economies, as well as in other EU members (Box A). When looking at the impact public investment has on private investment, spillover effects from coordinated government investment account for 12% of the total multiplier effect.

3 Investment grants consist of capital transfers in cash or in kind by the government to residents or non-residents to finance all or part of the cost of their acquiring fixed assets.

4 In a panel regression, the annual growth of private investment is robustly positively related to the annual growth of investment grants, controlling for past and present GDP growth, time fixed effects and country fixed effects. The data cover the EU members from 1995 to 2023.

Figure 3
Government investment grants and private-sector investment



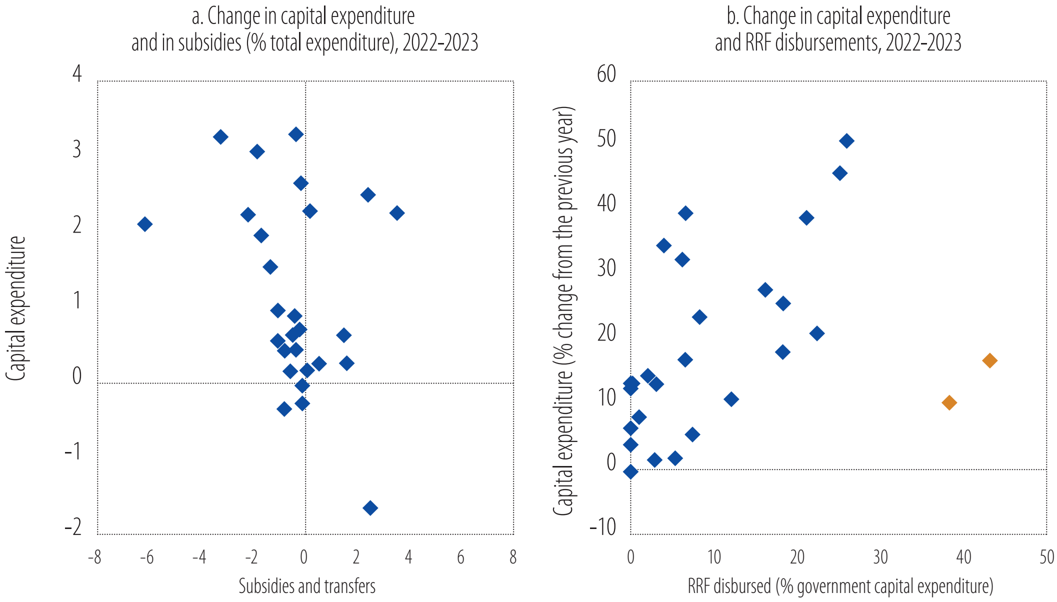
Source: *Eurostat and EIB staff calculations.*
Note: *See notes under Figure 1 for the composition of the country groups. Payable investment grants for the government in percent of GDP (panel a) and the annual rate of change averaged over periods of five years (panel b). Private-sector investment is the difference between total investment and government investment and is measured in five-year averages of the annual rate of change. Observations in panel b represent a country-five-year-average rate of growth for the European Union from 1995 to 2023.*

Budget constraints intensify the trade-offs between current spending and investment. The increase in government investment in 2023 was associated with reductions in government expenditure on non-investment subsidies and transfers (Figure 4a). In 2022, governments in the European Union faced a trade-off between sustaining the pace of government investment and mitigating the harsh consequences of the energy crisis on households and businesses. Consequently, real government investment slowed in 2022 (European Investment Bank (EIB), 2024). Policies to address the energy crisis were phased out gradually in 2023, giving governments leeway to invest again.

Disbursements of recovery and resilience funds are providing an additional boost to government capital expenditure in the European Union. In 2022 and 2023, disbursements amounted to EUR 166 billion – about 10% of the sum of government gross fixed capital formation (GFCF) and investment grants in those two years. While only a fraction of total RRF disbursements pays for government capital expenditure, RRF funds have noticeably alleviated fiscal trade-offs (Figure 4b).[5] At the same time, the pace of absorption of EU cohesion and structural funds has slowed substantially, as countries have prioritised putting RRF funds to work. By the end of 2024, only about 6% of EU cohesion and structural funds had been spent.

5 See also the last part of this section on the progress of RRF disbursement, as well as the first part on the share of RRF financing that goes to government investment.

Figure 4
Capital expenditure, subsidies and recovery and resilience disbursements



Source: *Eurostat and the European Commission.*
Note: *The two outliers in panel b are Greece and Portugal (yellow diamonds), where RRF disbursements for investment projects are concentrated in the later years of the RRF.*

Box A
How government investment affects the overall EU economy

Public investment can drive economic growth by providing public goods and by stimulating the broader economy. It can spur private investment and economic growth by spilling over through the business links and value chains that connect the investing region or sector to other areas.

The scope of such spillovers may differ by sector and geography. This exercise studies the extent of two such spillovers: spillovers from public investment to private investment and spillovers between EU members.

It uses a large dynamic spatial general equilibrium model called RHOMOLO developed by the Joint Research Centre of the European Commission. Each NUTS 2[6] region in a country is shocked with fresh public investment equal to 0.1% of GDP, spread equally over a five-year investment period.[7]

Public investment buoys private investment

Public investment will directly affect private investment during implementation by activating supply chains (for example, building new roads stimulates investment in construction). As the investment activity comes to a close, this effect ends. However, public investment continues to stimulate private investment through enabling factors like better transport or more competitive production. These effects can support value chains, spur local production or even foster imports.

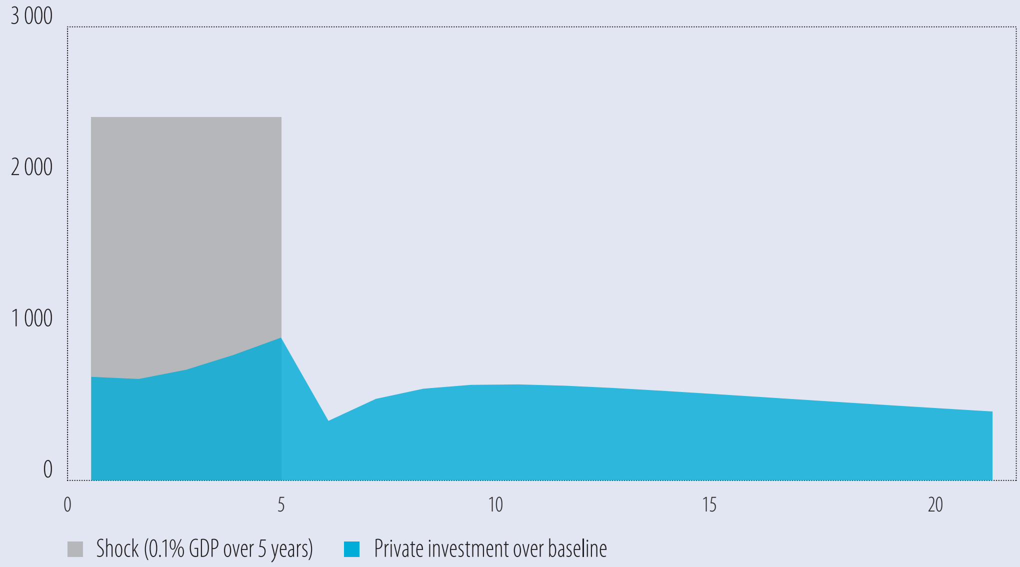
6 NUTS refers to the Nomenclature of Territorial Units for Statistics, or La nomenclature des unités territoriales statistiques in French. It is used to reference the administrative divisions of countries for statistical purposes.

7 The shock is split, with 25% of the impact going to transport. Of that 25%, one-quarter is assigned to each of the NACE Rev. 2 sectors of RHOMOLO: B to E (electricity supply), C (manufacturing), F (construction) and G to I (transportation and storage). The remaining 75% goes to non-transport public infrastructure.

The effect will largely be limited to a specific region because it will depend on the local economy as well as developments in other countries. The model estimates that an increase in public investment of 0.1% of GDP would increase private investment by 0.037% in the short run (one to two years), and by 0.018% in the long run (20 years). This means that **one euro of additional public investment would generate close to one euro of additional private investment over 20 years**. Both types of investment will push GDP higher through new public goods, higher private investment and higher productivity.

Figure A.1

The effect of a 0.1% shock on public investment (EUR million, change a year after intervention)



Source: *Results, using RHOMOLO-EIB, a joint exercise between the EIB and the Joint Research Centre of the European Commission. RHOMOLO stands for Regional Holistic Model.*

The total impact of a shock to public investment leads to GDP above the baseline scenario by 0.034% in the short run. GDP is still higher 20 years after the start of the investment, at which point the effect drops to 0.023. This includes the GDP impact generated by increased private investment. Similar exercises show that the multiplier can be higher under more balanced investment programmes that also support private investment, as these programmes can result in public resources being better leveraged to crowd in private finance.

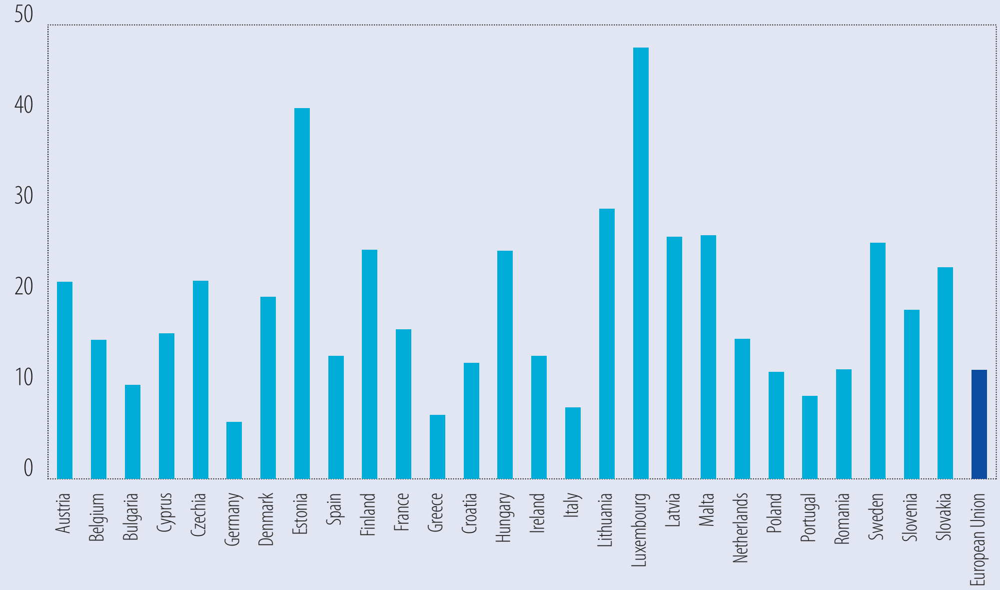
Investment programme spillovers from one country to another

Typically, more integrated economic trade and value chains result in stronger investment effects being diffused throughout an economy and across regions. As some effects of unilateral investment programmes spill over to other regions, the reverse can also be observed, as investment in other regions spills over to a specific country. Coordinated investment programmes could therefore be beneficial, to the extent that investment in other regions benefits the domestic economy in question.

Smaller and more integrated countries would be more exposed to such spillovers, as they internalise the spillover effects less. Instead, those effects would be diffused more generally through the value chains of other EU members. When an economy expands and begins to adjust structurally (for example, through changes to its competitive position, transport and trade), spillover effects account for a sizeable share of the overall impact.

Figure A.2

The long-term effect on GDP of spillovers created when countries invest at the same time (in %)



Source: *Results, using RHOMOLO-EIB, a joint exercise between the EIB and the Joint Research Centre of the European Commission.*

At the EU level, spillovers explain some 12% of the total impact of government investment on GDP. In other words, 12% of the change in GDP due to government investment emanates from government investment in other EU countries.

In the two types of effects modelled, the results show that economic links will result in spillover effects that are not confined to direct investment, and that investment programmes should take this into account.

- Public investment will spill over to private investment. A balanced investment programme that includes the private sector may have a bigger impact on economic growth.
- Spillovers between countries are significant. The more an economy is integrated into the broader EU economy and the more specialised it is, the greater the spillover effect. Coordinated investment programmes help the broader EU economy to internalise spillover effects.

Strong infrastructure investment is underpinned by the energy transformation

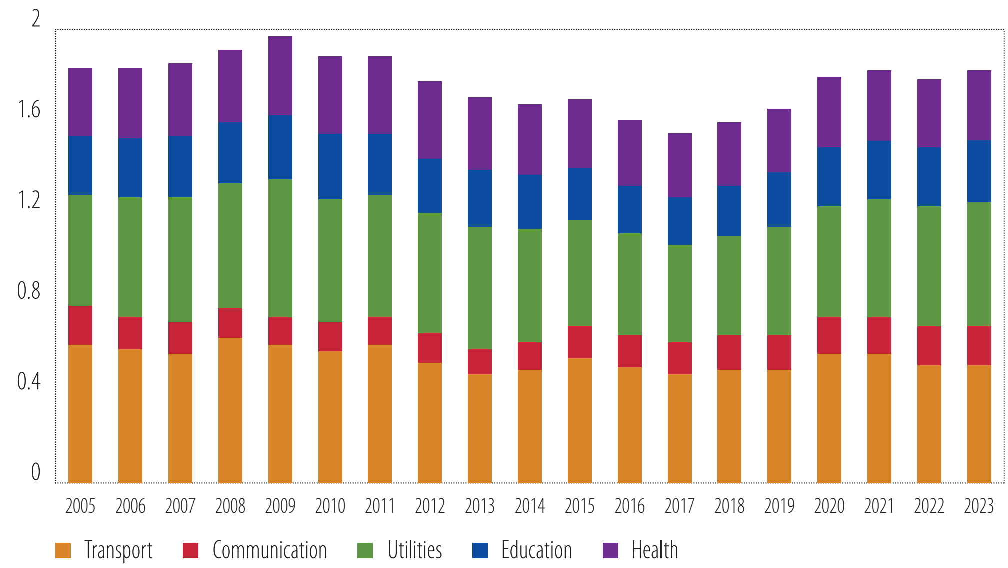
Infrastructure investment is a critical part of overall investment, and encompasses the development of buildings and structures essential for societal progress. As a cornerstone of the twin digital and green transition, infrastructure plays a pivotal role in driving sustainable transformations. A large part of national infrastructure is public – financed by the government or responsible public entities – but private investment also plays an increasingly relevant role. In this section, we delve into infrastructure investments, highlighting key statistics and the dynamic interplay between public and private contributions.[8]

8 Data on infrastructure investment are not readily available, as infrastructure is not classified separately in national account statistics. More details on the methodology underlying the consistent EU-wide infrastructure finance database used in this section can be found in Wagenvoort et al. (2010) and Revoltella et al. (2016).

Infrastructure investments in the European Union remain remarkably resilient. In 2023, infrastructure finance continued its upward trajectory, reaching close to 1.8% of GDP across the European Union (Figure 5). While infrastructure investments in Western and Northern Europe have grown (although at a slower pace since the end of the pandemic), infrastructure investments in Central and Eastern Europe have only recently returned to pre-crisis levels. Despite expanding steadily in Southern Europe throughout 2023, infrastructure investment in this region remained significantly below its pre-crisis benchmarks.

While the distribution of investment across sectors has remained relatively stable over time, infrastructure investments in utilities have grown steadily. Infrastructure investments can be categorised into five main sectors: utilities, transport, communication, health and education. Two notable trends have emerged (Figure 5). First, in 2023 communication's share continued to increase steadily, following a decade-long upward trend. Second, utilities are expanding steadily, and saw rapid growth in 2023 fuelled by investments in energy security. Interestingly, a sizeable portion of the energy generation capacity created by projects started in 2023 and not financed under public-private partnerships (PPP) is now derived from investments in solar and wind infrastructure – equal to 19.9 GW (81% of the capacity created in 2023) or EUR 22.7 billion (36% of total non-PPP project financing). This trend underscores the ongoing transition towards renewable energy sources, highlighting the growing commitment to sustainable and environmentally friendly solutions.

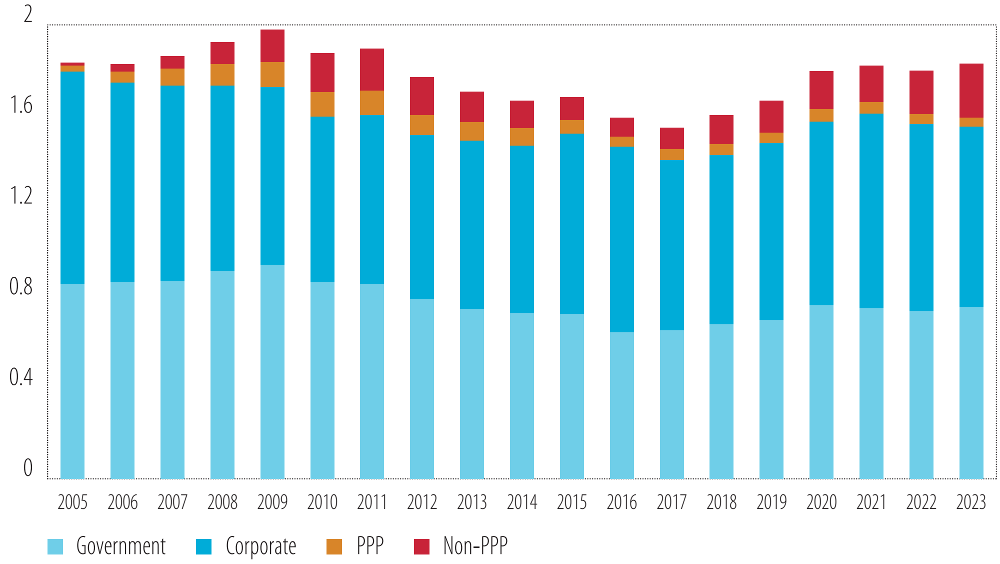
Figure 5
Infrastructure finance in the European Union (% GDP)**, by sector**



Source: Eurostat, IJGlobal, European PPP Expertise Centre (EPEC), EIB staff calculations.

Government financing has increasingly driven growth in infrastructure investment since the pandemic. In 2023, public financing increased its contribution to 0.75% of GDP in the European Union (Figure 6), while the role of the private sector remained sizable and stable. In Western and Northern Europe non-PPP special purpose vehicles are gaining importance. Conversely, in Central and Eastern Europe, the recent rise in infrastructure financing is predominantly supported by government investment. Meanwhile, project financing through public-private partnerships has remained relatively subdued, consistent with trends observed in previous years.

Figure 6
Infrastructure finance in the European Union (% GDP)**, by type**



Source: *Eurostat, IJGlobal, EPEC, EIB staff calculations. PPP stands for public-private partnerships.*

Assessing public investment by local authorities using the EIB Municipalities Survey

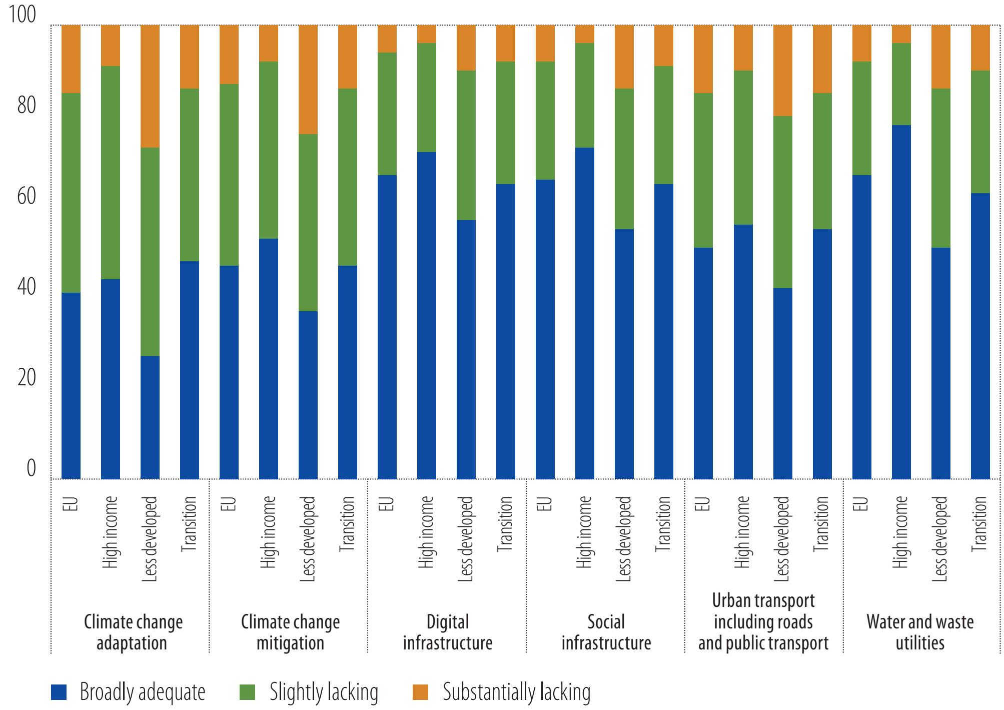
Local authorities play a pivotal role in the successful implementation of government infrastructure investment programmes. Over the past two decades, local and regional governments accounted for more than half of public investment in the European Union. With their local knowledge and administrative capabilities, these governments can facilitate infrastructure projects that are closely tailored to the specific requirements of the area. This includes essential infrastructure like public transport networks, electricity grids, wastewater systems and the modernisation of public buildings like schools, hospitals and social housing. Building on their understanding of local needs and priorities, local authorities ensure that infrastructure investments yield maximum social and economic benefits. Below, we talk about how local governments view infrastructure investment, drawing on the latest wave of the EIB Municipalities Survey.

More than half of municipalities view the level of investment in technical infrastructure as broadly adequate, except for climate change-related infrastructure. More than 50% of EU municipalities consider the level of infrastructure investment in the past three years to be broadly adequate in four of the six infrastructure areas (assets) covered by the EIB Municipalities Survey. Investment is most frequently said to be adequate for digital infrastructure and for water and waste utilities (in both areas, 67% of municipalities are satisfied with their investment). However, this figure drops to 41% of municipalities for investment in climate change adaptation, and only 47% for climate change mitigation. While satisfaction with the level of climate change-related investment has increased over time, it still lags behind the other categories. Satisfaction with social infrastructure has not changed, while it has deteriorated slightly for urban transport.

Local government perceptions of investment vary substantially among cohesion regions and across asset types (Figure 7). Overall, less-developed regions regard investment levels less positively, across assets. The gap is especially broad for climate change adaptation (from 17 points for transition regions to 21 points for high-income regions) and water and waste utilities (from 12 points for transition regions to 27 points for high-income regions).

Figure 7

Infrastructure investment over the past three years (% of municipalities)



Source: *EIB Municipalities Survey 2024. All municipalities, excluding don't know and no response. The number of responses varies across areas.*

Note: *High income refers to regions with GDP per capita greater than 100% of the EU average. Transition regions have GDP per capita of 75% to 100% of the EU average. Less developed regions have GDP per capita of less than 75% of the EU average.*

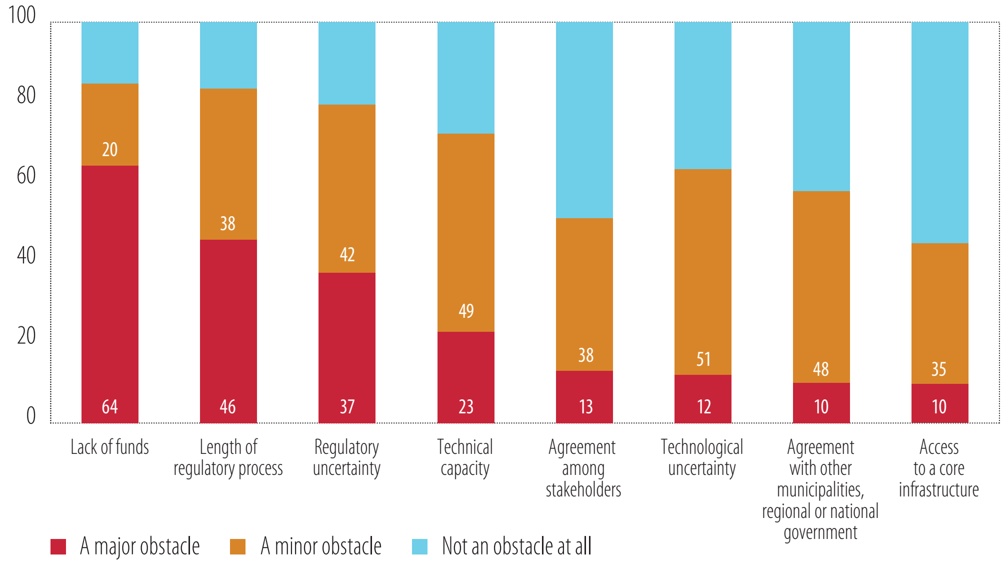
Question: *In the last three years, between the start of 2021 and the end of 2023, would you say that within your municipality/city the level of investment in infrastructure projects was broadly adequate, slightly lacking or substantially lacking in each of the following areas?*

Financial constraints are a major obstacle for 64% of EU municipalities, while regulatory burdens and technical capacity are challenges common to all regions. Insufficient funding and regulatory hurdles, like the length of the approval process and the resulting uncertainty, continue to be the primary barriers to municipal infrastructure investment (Figure 8). These obstacles are more problematic in less developed and transition regions. For almost three-quarters of municipalities in less developed regions, a lack of funds or financing is a major obstacle to investment. About half of municipalities in Southern Europe say regulatory hurdles are a major barrier. Finally, municipalities also have significant difficulty hiring skilled workers to implement infrastructure investment programmes, an issue exacerbated by the shortage of experts with environmental and engineering skills.

Municipalities' plans show continued investment in climate change. Municipalities plan to increase their infrastructure investment, compared to the past three years, in social infrastructure, climate change mitigation and climate change adaptation. Almost nine out of ten municipalities will increase investment at least in one of these areas, and four out of five will increase it in all three of them.

Structurally, planned infrastructure investment has shifted towards modernisation. When analysing the structure of planned infrastructure investment, municipalities' intention to spend on maintenance and repairs has not changed significantly since 2020. However, the share of new investments has declined as efforts to modernise existing infrastructure have increased (from two-fifths to almost one-half in 2024).

Figure 8
Main obstacles to municipal infrastructure investment (% of respondents)



Source: *EIB Municipalities Survey 2024.*
Note: *All municipalities, excluding don't know and no response. The number of responses varies across activities.*
Question: *To what extent is each of the following an obstacle to the implementation of your infrastructure investment activities? Is it a major obstacle, a minor obstacle or not an obstacle at all?*

Sustaining government investment in the medium term

The pickup in government investment over the past few years has been and will remain essential to transforming the EU economy – and it should accelerate further if the European Union is to meet the structural challenges it faces, such as ageing, social cohesion and the digital and green transition. However, sustaining this increase in the medium term could prove difficult as governments face increasing pressure on their finances, particularly with the end of RRF financing and borrowing costs that have risen since 2022. This section reviews the effects of these factors on government investment in the medium term. It provides an overview of the current state of RRF disbursements and highlights the role of EU funds in supporting public investment. Drawing on these findings, it discusses risks to the outlook for public investment.

The implementation of recovery and resilience projects is gradually speeding up, with countries prioritising that spending over cohesion and structural funds

With more than two full years left until the end of the implementation period, the Recovery and Resilience Facility has reached about the halfway point in its lifetime. The RRF has been instrumental to the increase in government investment in the European Union over the past two years (EIB, 2024), making it an opportune time to assess its implementation and impact so far.[9] The analysis here first

9 The European Central Bank has published its own assessment of the implementation of the RRF, focusing on the programme's expected impact (Bankowski et al., 2024). Parts of this study are of relevance to the analysis here. First, it has been confirmed that, despite some implementation risks, RRF disbursement is gaining traction. Second, according to the ECB assessment, around 70% of total RRF expenditure consists of government investment and capital transfer with high fiscal multipliers. In addition, the RRF contributed a cumulative 0.7% to GFCF in 2021-2023, but that figure should rise to 1.6% in 2024-2026. Third, RRF reforms have improved the quality of EU members' institutions, further enhancing growth.

looks at total disbursements. With the exception of unconditional payments made at the beginning of the RRF, money is disbursed as investment plans meet each agreed milestone. At the end of September 2024, disbursement stood at 41% of total requested allocations: EUR 267 billion had been disbursed, out of a total of EUR 650.2 billion (Table 1). Two large countries, France and Italy, stand out for their high absorption rates. France has already received 76.7% of its allocated funds (EUR 40.3 billion), while Italy has received 58.4% (EUR 194.4 billion). Based on this snapshot, the real pace of implementation should increase across the European Union in the next two years, albeit only moderately.

Table 1

Recovery and resilience disbursements (EUR billion)**, by year**

					Total allocations		(disbursed)
	2021	2022	2023	2024 *	Grants	Loans	
Austria			1.2		3.961		30.1%
Belgium				1.5	5.034	0.264	29.2%
Bulgaria		1.4			5.689		24.1%
Croatia		1.4	0.7	2.4	5.787	4.254	44.7%
Cyprus	0.026	0.085	0	0.152	1.02	0.2	21.5%
Czechia			2.0	0.7	8.409	0.818	29.2%
Denmark			0.54	0.42	1.626		59.3%
Estonia			0.38	0.12	0.953		53.0%
Finland				0.50	1.949		25.6%
France		7.4	16.0	7.5	40.27		76.7%
Germany	2.3		4.0		30.325		20.6%
Greece	1.7	3.6	7.2	4.8	18.22	17.728	47.9%
Hungary			0.78	0.14	6.512	3.918	8.8%
Ireland				0.32	1.154		28.1%
Italy	15.9	42.0	35.0	20.5	71.78	122.602	58.4%
Latvia		0.2		0.60	1.969		40.7%
Lithuania			1.0	0.38	2.298	1.552	35.2%
Luxembourg	0.012		0.02		0.083		39.0%
Malta			0.11	0.06	0.328		50.7%
Netherlands				1.3	5.441		24.5%
Poland			5.1	6.3	25.277	34.541	19.0%
Portugal	0.4	1.2	6.3	0.7	16.325	5.891	38.2%
Romania		4.5	2.8	2.1	13.566	14.942	33.0%
Slovakia		0.4	2.3		6.408		41.7%
Slovenia			0.8		1.613	1.072	31.3%
Spain	10.0	12.0	6.0	20.3	79.854	83.16	29.6%
Sweden					3.446		0.0%
	30.2	74.1	92.1	70.9	359.3	290.9	41.1%

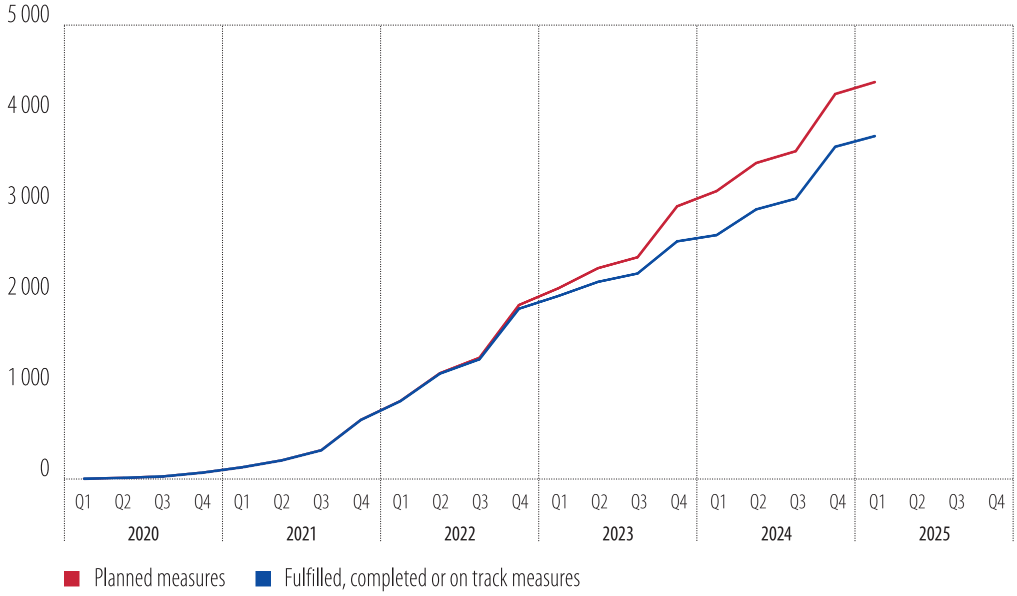
Source: *RRF scoreboard.*
Note: *2024 figures are until the end of September. At the time of writing, Sweden had not yet received any payments.*

The implementation of most recovery and resilience programmes are on track. By the end of 2024, countries had reported on 4 372 investment measures.[10] Comparing the planned achievements up to the first quarter of 2024 with actual implementation, 44.7% are marked as fully completed and assessed, 40% as completed but not yet assessed, and 15.3% as not completed. Looking ahead to the first quarter of 2025, the sum of those milestones and targets marked as fully completed and assessed (32.5%), completed but not assessed (31%), or on track (22.8%) is slightly higher than the sum of the three categories in first quarter of 2024 (85%). Of measures with target dates up until first quarter of 2025, 11.1% are labelled as not completed while 2.5% are delayed. Thus, the gap between the number of planned and realised milestones and targets, which was growing until last year (EIB, 2024), peaked at 15% in the first quarter of 2024 (Figure 9) and then stabilised.[11]

Figure 9

Gap between plans and realisations in recovery and resilience implementation

(count of measures)



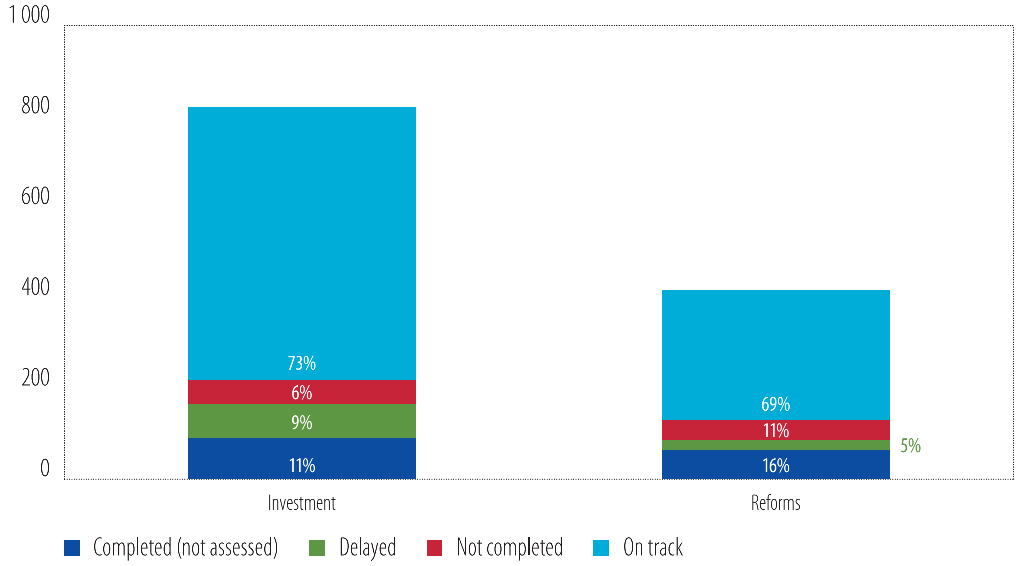
Source: EIB staff calculations based on EU members' data on RRF implementation.

The first two years of the Recovery and Resilience Facility was marked by countries' instituting reforms required to receive the funds, which meant that actual investments began in earnest in 2024 (Figure 10). As investment-related projects take longer to implement, in the first years of the RRF countries focused more on reforms than on actual investments. By the end of 2023, 1 591 measures were classified as reforms, and 1 413 measures were classified as investment operations. In 2024, the number of planned investment measures was almost twice that of reforms (821 vs. 416). Investment measures are more frequently delayed (9.3% vs. 4.8% of reforms), while reforms are more often classified as not completed (11.1% vs. 6.5% of investment measures).

10 Due to the performance-based governance design of the RRF, each EU member must show they have fulfilled certain requirements (milestones and targets) for each approved project before receiving subsequent payments. Payments are disbursed after EU members have made a documented request. In addition, EU members must provide semi-annual implementation reports. In the sixth reporting round in April 2024, countries reported on 4 372 measures.

11 In a forward-looking assessment, it is expected to decline to 13.5% in the first quarter of 2025.

Figure 10
Status of investments and reforms in 2024 (count of measures)



Source: EIB staff calculations based on EU members' data on RRF implementation.

Recovery and resilience measures related to intangible investment, R&D and NextGenerationEU policies are implemented more swiftly than others. Similar to the findings in European Investment Bank (2024), a text-based search of descriptions of different measures was used to investigate the areas under- or overrepresented among measures that are not completed and/or delayed – keeping in mind that delayed measures only appear in the forward-looking assessment, while measures not completed only appear in the backward-looking assessment. Intangible investments, and in particular, measures with the keywords research or innovation are underrepresented in both categories (Table 2). The same is true for measures that include the keyword green transition. Measures related to these areas do not seem to suffer from major impediments to implementation. These results are similar to, and possibly more pronounced than, the results from last year.

Table 2
Areas where recovery and resilience implementation has been relatively quick, 2020-2024

	Research	Innovation	NextGenerationEU | Policy	Green transition
Total	5.4	5.4	5.7	1.6
Delayed	2.1	2.1	4.2	1.0
Not completed	3.7	4.5	5.6	0.2

Source: EIB staff calculations based on EU members' data on RRF implementation.
Note: The calculation is based on a text search using the keywords indicated in the columns. NextGenerationEU is the European Union's EUR 648 billion stimulus package to refocus the economy on sustainable growth.

Investment measures related to construction, like infrastructure or climate-related assets, tend to lag behind (Table 3). Construction projects are overrepresented among the delayed or not completed measures, which is consistent with European Investment Bank (2024) findings. A very broad keyword like infrastructure or build is included in the description of one-fifth of the measures. The share of delayed measures in this subset is 8.4 percentage points higher than the average, and the share of not completed measures is 2.6 percentage points higher. Using only infrastructure as a keyword captures around half of these measures, and this keyword is greatly overrepresented among the delayed or not completed measures. The same holds for keywords related to climate change and infrastructure, like solar or wind or hydrogen.[12] The subset of measures containing any of the keywords digital transformation, digital, energy, twin or transition is overrepresented among the delayed measures, but not among the measures not completed.

To some extent, the slow progress of construction projects can be explained by local governments' inability to effectively administer these projects. One explanation for the overrepresentation of certain kinds of reforms and investments in the delayed or not completed categories is that responsible authorities face unexpected hurdles or limits on their capacity to implement these measures. It might also show that authorities need to increase their capacity to plan implementation properly. Deployment of the RRF may well be an opportunity for some local governments to build expertise and increase their effectiveness.

Table 3

Areas with bottlenecks in recovery and resilience implementation, 2020-2024

	Infrastructure	Infrastructure | Build	Municipal | Authority	Solar | Wind | Hydrogen	Digital transformation	Digital | Energy | Twin | Transition
Total	11.8	19.7	10.7	4.5	3.1	31.0
Delayed	15.6	28.1	11.5	8.3	4.2	36.5
Not completed	15.9	22.3	13.0	6.2	2.3	29.5

Source: EIB staff calculations based on EU members' data on RRF implementation.
Note: The calculation is based on text search with the keywords indicated in each column.

The Recovery and Resilience Facility is an unprecedented, large-scale experiment that may have a lasting impact on the economy and how economic policy is implemented. With two years remaining for implementation and 60% of the resources yet to be distributed, much still needs to be done for the RRF. However, evidence that the gap between plans and action has stabilised is reassuring. Projects involving construction, like infrastructure, and those involving local authorities take longer to implement. As Box C illustrates, overcoming these challenges could improve the quality of government institutions.

RRF implementation has improved, underscoring the need to continuously evaluate and assess its progress. A common Europe-wide focus on reforms and investment has allowed public and private spending to accelerate in certain important areas of EU policy. Because the RRF is designed to be used in individual countries, it does not focus on financing cross-border projects. However, it has resulted in improving the ability of many countries to absorb and effectively utilise public funds and financing, as shown by the decrease in delayed measures reported. The system is also evolving over time. At the same time, interest is growing in financial instruments that can extend the life of the RRF.

12 Note that the overrepresentation is smaller when the description includes keywords like municipal or authority.

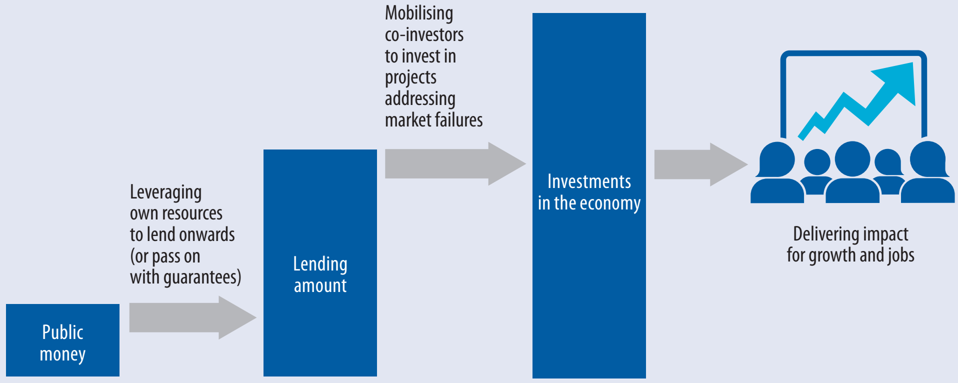
Box B

Leveraging public resources to support investment

At a time of enormous investment needs and limited resources, it is important to take stock of the experience that the European Union already has in leveraging public-sector resources to crowd in investment through public financial instruments or institutions. Magnifying the effect of limited public capital in this way works in three stages: leveraging public resources to enable lending, crowding in other investors to finance operations and, ultimately, delivering amplified impact in the economy.

Figure B.1

Using leverage to maximise resources



Source: *European Investment Bank.*
Note: *Indicative values only, depending on risk profile, product mix, market environment, additional EU support (especially guarantees), etc.*

1. **Leveraging public funds for lending:** Public resources can be used to provide guarantees, or channel equity into a purpose-created investment vehicle. This allows a financial institution to provide more loans, guarantees and equity products in turn. How much underlying capital can be directly leveraged depends on the risk profile of the operations and the financing provided. Riskier operations consume more capital and typically reduce the possibility of leveraging funding.

2. **Attracting co-investments:** To stretch the public resources leveraged in support of economic investments, other private and public investors should be crowded in to co-finance the operation directly. There are several ways in which financing can crowd in other investors, including by allowing institutions to pass on the longer maturities and lower interest rates they receive on their capital market financing, or by de-risking pre-bankable strategic technology investments. How much investment is supported in the economy through co-financing depends on factors like the nature of the financial products, the economic situation, risk perceptions, and specific features of the sector and project in question.

3. **Economic impact:** The supported investments have both direct and indirect effects on the economy. The direct effects of operations encompass their impact on the local economy and other regions through inputs like labour employed during project implementation. Indirect effects include the induced effects on the economy, such as higher productivity (EIB, 2022a).

The degree to which public capital can be leveraged, the amount of co-financing that can be crowded in, and the final impact of financed activities depend on a number of factors.[13] There is a trade-off between derisking and volumes that can be reached by optimising the public financial institution's balance sheet. Blending operations that bring in private financing often use financial instruments classed as riskier investments (such as first-loss provisions, mezzanine tranches and guarantees), with implications for the financial institution's asset quality and for how much funding can be drawn from capital markets. More financing can be crowded in from private investors where there is greater uncertainty or risk associated with the private investment, including in periods of adverse macroeconomic volatility. The higher quality the technical planning and implementation of investment, the greater its positive impact on economic activity (Chakraborty and Dabla-Norris, 2011; Pritchett, 2000). The extent of market needs matters, too. Countries with a low initial stock of public capital have been found to have significantly higher public investment multipliers than countries with a high initial stock (Vegh et al, 2019).

The European Union has experience with several instruments that leverage public sector money to mobilise private investment. For example:

- The EIB Group, an institution created through capital contributions from EU members, uses its own resources to issue bonds in the market and support investment. Own funds of the EIB Group (made up of the European Investment Bank and the European Investment Fund) of some EUR 81 billion are leveraged to a signed loan, guarantee and equity portfolio of more than EUR 625 billion. For this, it issues bonds to support its lending and equity investments, largely drawing from private investors (three-quarters from fund managers/insurers/pension funds and bank treasuries). Most of these investors are in Europe (two-thirds), but some are abroad (one-third) (EIB, 2023).

- The European Fund for Strategic Investment (EFSI) was created at the time of the Juncker plan. EFSI supplemented the EIB Group's own resources with a specialised instrument designed to support investment. EFSI allocated resources in the form of a guarantee to the EIB Group, expanding the group's operations and providing countercyclical support to the EU economy. Public funding of EUR 21 billion initially, later increased to EUR 33.5 billion, was mobilised in a way that enabled the EIB Group to approve EUR 96.8 billion of financing by the end of 2022. This supported total investment financing in the EU of over EUR 500 billion (EIB, 2022b). How much investment can be supported depends on the risk of the underlying investments, and the need in the economy.

- InvestEU is another initiative designed to leverage EU budget resources. At the core of InvestEU are guarantees from the EU budget of EUR 26.2 billion. These funds are used to back investments that are being financed by implementing partners, such as the EIB or government agencies. InvestEU builds on the successful model of the Juncker plan and various earlier EU financial instruments, making it simpler, more efficient and more flexible for European companies and projects to get funding. The InvestEU guarantee increases the risk-bearing capacity of the implementing partners, and will enable them to support at least EUR 372 billion in additional investments from 2021 to 2028. Every euro of this guarantee is expected to support EUR 14.2 of total investment, building on the ability of implementing partners to raise funds and encouraging the co-financing of investment priorities through public and private sources (European Commission, 2022).

13 These outcomes depend on a range of variables, as well as regulatory capital requirements, mandatory buffers, etc. See, for example, Basel III https://www.bis.org/publ/bcbs189.pdf, https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/capital-requirements-directive-crd-4_en

At a time when EU investment needs are high, EU members should continue to build on past experience in leveraging public resources, making the most efficient use of the EU budget to bring in private resources in support of EU investment priorities.

Box C

Interactions between institutional quality and public R&D spending to support private investment

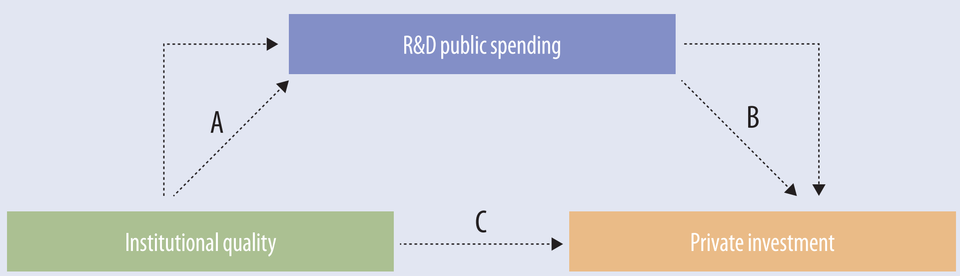
The Draghi report (Draghi, 2024) emphasised the need to mobilise public and private resources in a way that generates large investments. However, the public sector also needs to help create a business environment that provides the right incentives for private investors. Recent research has examined how public and private investment complement each other, and this box looks at these interactions from a new perspective (EIB, 2024).

Public support for R&D is important considering the external factors and market failures associated with innovation and knowledge creation. This is especially true in the European Union, where private R&D spending by one country might impact developments in other countries or across the broader European Union. That is why R&D is among the more frequently mentioned European public goods (Fuest and Pisani-Ferry, 2019). The Letta (Letta, 2024) and Draghi reports call for stronger support for R&D. Less than one-tenth of support for R&D comes from EU programmes, with the rest coming from individual countries, which compete with one another to some extent (Draghi, 2024).

If governments can create an environment that fosters private initiatives, such as a good judicial system, contract enforcement and a general rule of law, the corporate sector can better plan and implement private investments (Figure C.1, path C). Good institutions also enable authorities to plan spending in the long term, beyond the political cycle, including for higher education and R&D (see Figure C.1, path A). This, in turn, can further support private investment by making it easier for firms to find the skills they need, and by producing R&D successes they can benefit from (see Figure C.1, path B). Institutions can thus shape private investment in two ways: directly and through public investment in R&D.

Figure C.1

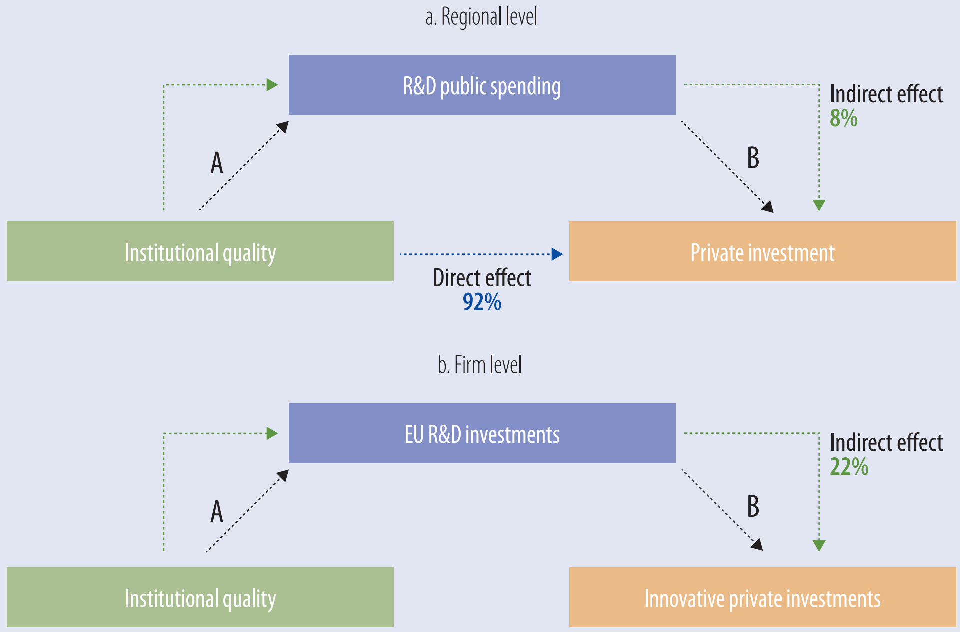
Impact of institutional quality on private investment mediated through public R&D spending



Source: European Investment Bank.

Improving institutions and increasing public R&D spending have a positive and significant impact on private investment, based on analysis of aggregate data on R&D public spending, private investment and institutional quality.[14] The results also confirm the strong influence institutional quality has on public R&D expenditure – meaning the indirect impact it has on private investment. The ratio of indirect effects to total effects is 0.08, meaning that 8% of the effect of the change in the institutional quality index on private investment is mediated by public R&D expenditure. This shows that quality of institutions matters in maximising the impact and catalytic effect of public intervention in R&D.[15]

Figure C.2
Drivers of private investment



Source: *Eurostat, Annual Regional Database of the European Commission (ARDECO), University of Gothenburg, EIB Investment Survey, the European Commission's Kohesio database and EIB staff calculations.*
Note: *The two illustrations represent the direct and mediated effect of institutional quality on private investment, highlighting the relative coefficient. Panel a uses aggregated regional data, and panel b uses disaggregated firm-level data.*

When the analysis is repeated using firm-level data on private investment for innovative products and NUTS 3-level data on EU investment in R&D, the results confirm the direct and indirect impact of institutional quality on private investment.[16] The ratio of the indirect effect to the total effect is 0.22, meaning that about 22% of the effect of institutional quality on private investment is mediated by EU funding for R&D in the NUTS 3 region where the firm is located. A direct relationship between institutional quality (which is measured at the NUTS 2 level) and the firm-

14 The statistical analysis uses mediation to explore the underlying mechanism by which institutional quality and public investment in R&D influence private investment. Eurostat data for gross domestic expenditure on research and development is used for public R&D spending, private investment at the regional level comes from ARDECO (Joint Research Centre of the European Commission, taking investment at constant prices by branches and subtracting O-Q NACE categories from total investment to get the proxy for private investment), and data on the European quality of government index comes from the University of Gothenburg (2010, 2013, 2017, 2021 and 2024 editions).

15 Public investment can also have an impact on institutional quality. Planning for the long term, and using public resources prudently and efficiently may also help authorities improve their capabilities. In this case, public R&D promotes private investment directly through the channels described above, and indirectly through its impact on local authorities' capabilities. Findings confirm this relationship between public investment in R&D and institutional quality as well, showing partial mediation with a smaller effect.

16 The data source for firm-level investment is the EIB Investment Survey (Question 18: What proportion of the total investment was for developing or introducing new products, process or services?). For EU funding in R&D, it is the Kohesio database (data on the NUTS 3 level covering the 2014-2021 period of the multiannual financial framework).

level figures is difficult to establish. However, there is a clear relationship between institutional quality and public investment in R&D, and this investment clearly has a positive impact on corporate decision-making.

It seems obvious that better institutional quality would result in better use of scarce public resources. However, the analysis sheds light on a further element: Institutional quality is crucial to enhancing the spillover effects from public intervention in R&D to overall private investment. The relationship between institutional quality and public intervention may not be sufficiently appreciated in the policy debate.

EU funds play a significant role in sustaining government investment

When recovery and resilience funds expire in 2026, some EU members may struggle to replace EU support for government investment with their own resources. With a financing budget of EUR 650 billion, the RRF is a powerful policy tool that has been instrumental in boosting government investment in the European Union over the past two years (EIB, 2024). The RRF will expire at the end of 2026, with no apparent successor programme. Many fear a drop off in government investment in some EU members after 2026.[17] And yet there is no publicly available estimate of how much RRF funds are contributing to government investment. We have therefore estimated this contribution, using data for the hundred largest beneficiaries of the RRF in each EU country. These data are reported and updated continuously on the European Commission's Recovery and Resilience Scoreboard. According to our calculations, government investment in several EU members has benefited substantially from RRF financing.

The estimated share of government investment financed with recovery and resilience funds over the current EU budget cycle varies widely across countries. We classify private and public beneficiaries to disentangle public investment from capital transfers.[18] The estimated share of public investment financed with RRF funds over the multiannual implementation period is large in some countries, ranging from 0.1% for Luxembourg to 60.2% for Greece (Table 4).

In countries in Central and Eastern Europe, EU resources contributed almost one-third of total government investment. Using the methodology outlined in the data annex of this report, we calculate the share of government investment financed by EU cohesion policy. According to these estimates, EU cohesion policy provides significant support for government investment in Central and Eastern Europe, ranging from 8.8% in Slovenia to 44.4% in Bulgaria (Table 5). Although smaller, this support remains significant in Southern European countries, ranging from 6.6% in Italy to 33.8% in Greece. Its contribution to government investment in Western and Northern Europe is, however, marginal: between 0.1% in Austria and the Netherlands and 1.2% in Germany.

These differences stem not only from the varying levels of cohesion funds allocated to each country, but also the ways each country uses the funds. Countries in Central and Eastern Europe are more likely to use EU funds to finance government investment. Slovenia uses 56% of its allocated EU funds for government investment, and Romania uses 81.2%. Countries in Western and Northern Europe use a smaller share of their EU funds for government investment, ranging from 13.5% in Austria to 51.5% in France.

17 Bear in mind that implementation of the 2021-2027 multiannual financial framework began with a larger delay than usual, and that by end-2024 only 10% of the total resources had been spent. The remaining resources should at least partially alleviate a drop off in government investment.

18 In this classification, we use artificial intelligence, a repository of legal entities per country, internet research and expert judgement. It is based on several assumptions. First, although we can determine whether a funding recipient is a public-sector operator or a private undertaking, we cannot specify whether it benefits from public investment and government expenditure. Therefore, the final evaluation of the RRF's potential contribution to public investment is an upper bound. Second, when a recipient benefits from multiple measures, the amounts are not broken down by measure. Third, we use data from the list of the hundred largest beneficiaries, and not population data, and can therefore only assume that the real total share of public investment financed with RRF funds is similar to that for the hundred largest beneficiaries.

Table 4

The potential role of the Recovery and Resilience Facility in supporting public investment

	Public GFCF over six years	Hundred largest beneficiaries of RRF funds	RRF funds classified as public investment*	RRF allocations overall	RRF allocations considered as public investment	Public GFCF funded through RRF
	EUR bn	%	%	EUR bn	EUR bn	%
Austria	93.9	98.3	28.6	4.0	1.1	1.2
Belgium	95.6	82.7	63.7	5.3	3.4	3.5
Bulgaria	15.3	73.7	37.9	5.7	2.2	14.1
Croatia	21.7	98.7	42.6	10.0	4.3	19.7
Cyprus	5.4	97.6	80.4	1.2	1.0	18.2
Czechia	80.4	92.5	92.7	9.2	8.6	10.6
Denmark	72.5	57.3	36.4	1.6	0.6	0.8
Estonia	13.1	54.6	91.3	1.0	0.9	6.7
Finland	69.9	100.0	46.3	1.9	0.9	1.3
France	678.3	99.8	99.3	40.3	40.0	5.9
Germany	642.9	91.2	28.9	30.3	8.8	1.4
Greece	48.7	70.1	81.5	35.9	29.3	60.2
Hungary	57.5	100.0	63.9	10.4	6.7	11.6
Ireland	68.7	99.4	98.4	1.2	1.1	1.7
Italy	362.0	100.0	90.4	194.4	175.7	48.6
Latvia	11.8	99.9	80.2	2.0	1.6	13.4
Lithuania	15.7	76.8	47.3	3.9	1.8	11.6
Luxembourg	21.1	100.0	30.8	0.1	0.0	0.1
Malta	4.0	69.0	72.5	0.3	0.2	5.9
Netherlands	191.9	94.9	70.1	5.4	3.8	2.0
Poland	201.6	100.0	21.0	59.8	12.6	6.2
Portugal	41.2	100.0	65.2	22.2	14.5	35.1
Romania	87.4	100.0	97.7	28.5	27.9	31.9
Slovakia	27.1	100.0	91.9	6.4	5.9	21.7
Slovenia	18.5	100.0	86.2	2.7	2.3	12.5
Spain	241.3	99.0	79.5	163.0	129.6	53.7
Sweden	163.4	96.9	55.8	3.4	1.9	1.2

Source: *The annual macro-economic database (AMECO) of the European Commission's Directorate General for Economic and Financial Affairs, RRF scoreboard.*

Note: *The six-year public GFCF period is for 2020-2025 (the latest six-year period available, including forecasts). The RRF implementation runs from February 2021 to the end of 2026. Classified projects are those in which the beneficiary is identified (private or public). The remaining projects are discarded for the purposes of the calculations. *The percentage is for the hundred largest beneficiaries.*

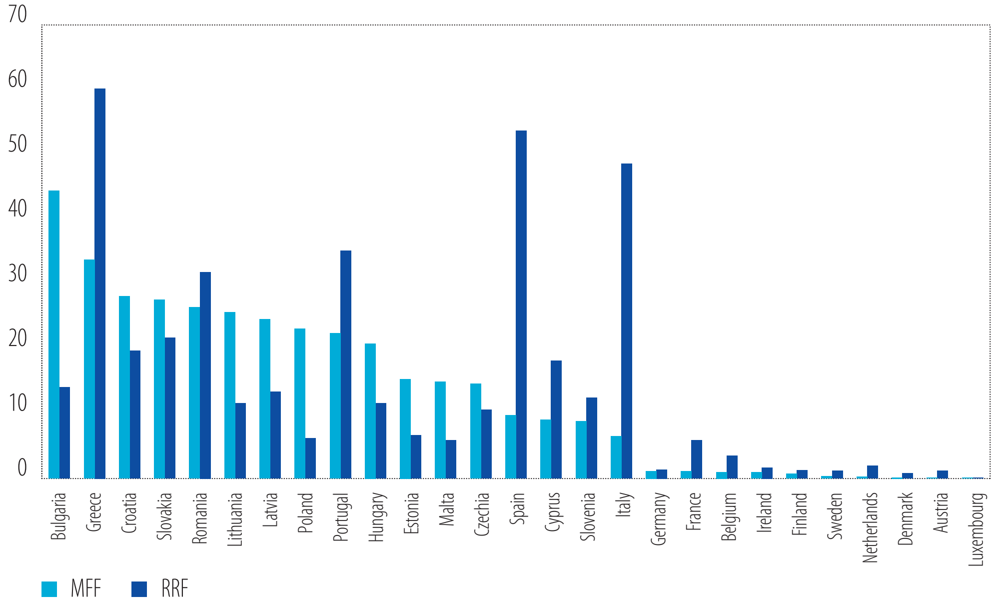
Adding up the estimated shares of recovery and resilience and EU cohesion funds reveals that a number of countries rely heavily on EU financing for government investment (Figure 11). Countries in Central and Eastern Europe and in Southern Europe rely significantly on EU funds to finance government investment. According to our estimates, over the past two years, Greece has funded nearly all its government investment with EU funds. Bulgaria, Croatia, Italy and Spain have financed more than half of their government investment programmes with EU funds. In the case of Greece, Italy and Spain, most funds came from the RRF. The RRF will come to an end just as the European Union begins to enforce tighter fiscal rules under its new governance framework. As a result, government investment could be underfunded in these countries.

Table 5
The potential role of the current EU budget in supporting public investment

Public GFCF	A	B	C	D	E	F
	Seven years of GFCF (from AMECO) (EUR bn)	Cohesion policy funds 2021-2027 (EUR bn)	Share of investment financed by national governments	Weights of EU cohesion policy on public investment ((100-C)*B/A)	Proportion of cohesion policy funds that can be considered as investment	Adjusted weight (D*E)
Austria	106 300	2 888	63.1%	1.0	13.54%	0.1
Belgium	108 100	5 740	56.4%	2.3	43.78%	1.0
Bulgaria	17 400	12 900	17.0%	61.5	72.14%	44.4
Croatia	24 200	10 236	14.9%	36.0	78.26%	28.2
Cyprus	6 000	1 487	34.9%	16.1	56.26%	9.1
Czechia	90 300	26 711	21.2%	23.3	62.64%	14.6
Denmark	82 500	941	51.5%	0.6	27.94%	0.2
Estonia	14 600	5 187	35.0%	23.1	66.58%	15.4
Finland	80 400	3 173	38.9%	2.4	30.76%	0.7
France	779 500	28 600	41.3%	2.2	51.45%	1.1
Germany	726 600	39 429	49.6%	2.7	42.45%	1.2
Greece	53 200	25 734	20.2%	38.6	87.50%	33.8
Hungary	66 700	26 136	16.9%	32.6	63.96%	20.8
Ireland	76 800	2 131	53.6%	1.3	76.06%	1.0
Italy	403 500	74 067	43.1%	10.5	62.69%	6.6
Latvia	13 400	5 215	15.0%	33.1	74.31%	24.6
Lithuania	17 200	7 831	19.9%	36.5	70.42%	25.7
Luxembourg	23 700	87	57.5%	0.2	72.34%	0.1
Malta	4 600	1 199	35.5%	16.8	88.79%	14.9
Netherlands	219 600	3 495	55.9%	0.7	35.26%	0.2
Poland	224 500	92 026	18.0%	33.6	68.83%	23.1
Portugal	45 100	30 895	26.8%	50.1	44.78%	22.4
Romania	95 200	45 080	31.3%	32.5	81.20%	26.4
Slovakia	30 600	16 147	22.0%	41.2	66.97%	27.6
Slovenia	20 400	4 516	28.2%	15.9	55.66%	8.8
Spain	268 600	52 628	32.4%	13.2	73.69%	9.8
Sweden	186 700	4 026	57.2%	0.9	37.33%	0.3

Source: *European Commission's AMECO dataset and EIB staff calculations based on the Kohesio dataset.*
Note: *The proportion of a project's expenditure classified as public investment in the Kohesio database is used to determine the weight of the cohesion policy contribution to public investment for 2021-2027.*

Figure 11
Potential annual contribution of EU funds to public investment (% of total)



Source: *EIB staff calculations based on the Kohesio dataset and the RRF scoreboard.*
Note: *This graph combines the information contained in tables 4 and 5 above. MFF stands for multiannual financial framework, the seven-year EU budget.*

Transitioning to the new fiscal rules may take a toll on government investment

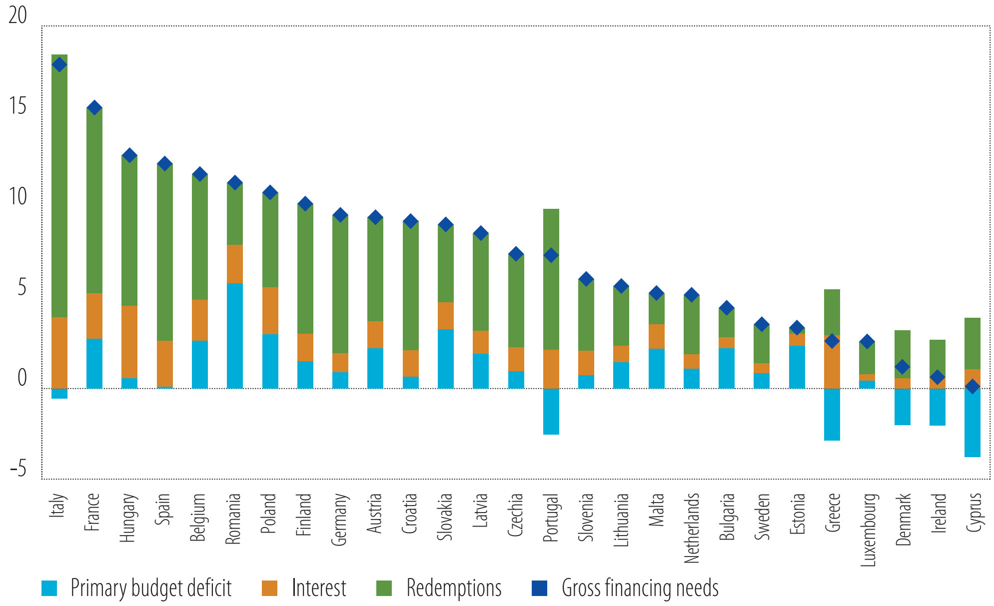
EU gross government debt stood at 80.8% of GDP at the end of 2023, 3.5 percentage points higher than in 2019, prior to the COVID-19 crisis. Aggregate debt in the European Union increased during the COVID-19 crisis to 89.5%, and subsequently fell from 2021 to 2024, declining 6 percentage points of GDP. High inflation in 2022 and 2023 helped erode some of the debt. More concerning than the overall debt surge are the wide differences in debt among EU members, especially the large ones. Debt-to-GDP ratios range from 23% in Estonia to 153% in Greece.

In 2023, 11 EU members reported a budget deficit above 3% of GDP. The COVID-19 crisis and the energy crisis deteriorated the finances of many EU governments, weakening their ability to adapt to overhauled EU fiscal rules. Consequently, many government budgets are under pressure, especially since the revised EU economic governance framework entered into force in April 2024.

Higher borrowing costs are making it difficult for countries to get their finances in order. Gabriele et al. (2017) argue that high debt is easier to sustain if it does not generate substantial financing needs, emphasising that debt needs to be rolled over easily if it is to remain sustainable. Several EU governments will need to raise significant funds in 2025 (Figure 12) – for one of them, close to 20% of GDP. Debt rollovers are also likely to come with interest rates that are still relatively high. While the European Central Bank has a set of instruments to address diverging bond yields in euro area members, the soaring cost of debt poses a risk to EU governments' ability to strengthen their finances while continuing to invest in the short and medium term.[19]

19 The Transmission Protection Instrument is a bond-buying scheme by the European Central Bank that is designed to prevent the spread in borrowing costs between euro-area governments from widening too much. The instrument also counters unwarranted and disorderly dynamics in sovereign debt markets that threaten the transmission of monetary policy across the euro area.

Figure 12
Gross financing needs of EU governments for 2025 (% GDP)



Source: Bloomberg and the AMECO database.

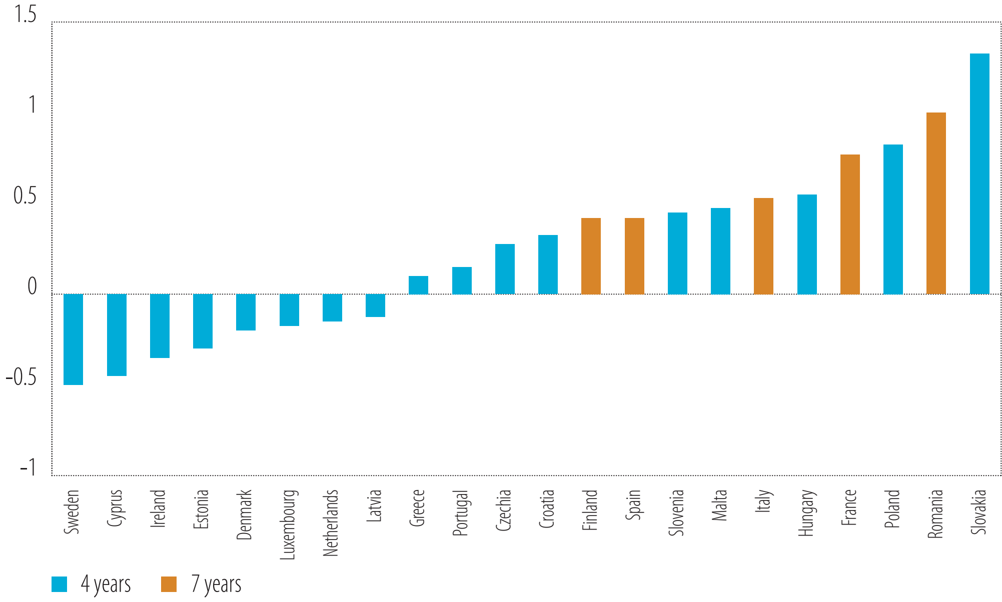
The recent reform of the Stability and Growth Pact improved its design and provides more safeguards for public investment. The reformed pact now highlights a single operational indicator, focuses on finances in the medium term and includes more ways for individual countries to fiscally adjust. The revised framework aims to safeguard reforms and investment in strategic areas. Each EU member should present a structural plan for the medium term that sets out its fiscal path, as well as priority public investments and reforms that function together to ensure gradual, sustained debt reduction and sustainable, inclusive growth.[20]

The new fiscal framework allows countries to adjust their finances more gradually, shielding government investment. The newly agreed fiscal rules allow governments to extend the fiscal adjustment period from four years to up to seven. To qualify for an extension, a country must carry out significant reforms and investments that enhance its growth potential, improve resilience and support fiscal sustainability. In addition, the reforms and investments must serve common EU priorities, such as the green and digital transitions, social resilience and other strategic objectives. Darvas et al. (2024) estimate that for several countries, extending the adjustment period from four years to seven years would allow for an average annual adjustment that is 0.5% of GDP smaller.

Of the countries that met the deadline for submitting their plans, only five have taken advantage of the new investment-friendly provision in the EU fiscal rules (Figure 13). Darvas et al. (2024) warn that the strong incentive for investment and reforms provided by the extension of the adjustment period may be undermined by the minimum adjustment requirements. For instance, if a country is under an excessive deficit procedure, the minimum average annual adjustment is 0.5% of GDP, which is still quite demanding. Furthermore, the provisions require countries to sustain investment levels they had during the RRF, even after the facility ends in 2026. Countries that have taken large RRF loans to finance government investment will find it difficult to maintain this level of investment.

20 The reference trajectory covers an adjustment period of four years. The adjustment period can be extended by up to three years if the EU member underpins its national medium-term fiscal-structural plan with a set of verifiable reforms with clear deadlines and investments that align with certain recommendations, including with respect to country-specific investment priorities. Countries requesting an extension must not allow nationally financed public investment to fall below the level attained in the years preceding the start of the plan.

Figure 13
Average annual change in EU members' structural budget balance (% GDP)



Source: *National medium-term structural plans available as of 6 February 2025, and EIB staff calculations.*
Note: *Calculations use the projected structural budget balance under the baseline adjustment scenario submitted in national medium-term plans.*

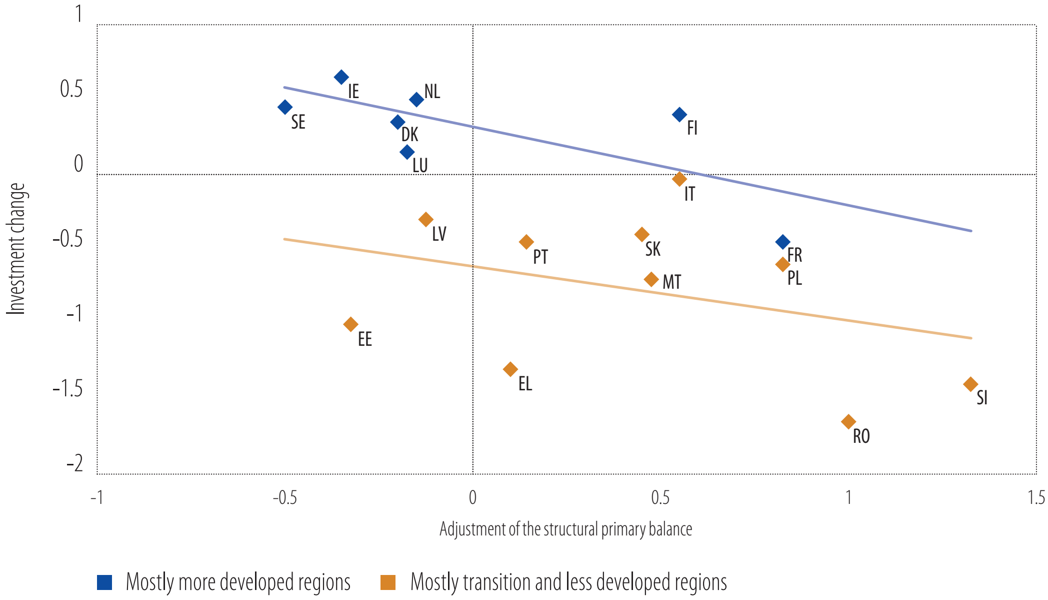
The required fiscal adjustment is substantial for some countries (Figure 13). Four EU countries must increase their structural primary balances by more than 3% of GDP over the adjustment period. This is a significant fiscal adjustment. Experience shows that governments tend to sacrifice investment when they are forced to choose between spending for the long term and more immediate constraints on public finances (Larch and van der Wielen, 2024). Kolev and Schanz (2024) find that countries that announce a fiscal consolidation equal to 1% of GDP reduce government investment by 4% after four years.

The size of fiscal adjustments is thus negatively associated with projected government investment – but European funds might help neutralise part of this effect (Figure 14). National medium-term fiscal-adjustment plans also contain projections on the share of government investment that will be financed with national funds during the adjustment period.[21] This allows the average annual fiscal adjustment to be assessed according to the impact on government investment, comparing the period after the RRF expires in 2026 with the years of RRF financing (2023-2024). Countries expecting larger adjustments will cut nationally financed government investment more. While this is sobering news, there is a silver lining. Countries that project the largest declines in government investment actually finance large shares of that investment with EU structural and cohesion funds (Table 5). Thus, even if nationally financed government investment is low, overall government investment will likely be closer to the average in 2023-2024. For instance, the projected decline in Greece and Romania is more than offset when the share of government investment financed with EU funds is taken into account.[22]

21 Not all national medium-term fiscal-structural plans include such a projection, however. Of the 21 countries that submitted these plans before 9 November 2024, only 17 contain a projection of nationally financed government GFCF for the adjustment period.

22 Assuming that the historical share of government investment financed with EU funds remains the same after 2026.

Figure 14
Fiscal adjustment and change in government investment (% GDP)**, 2023-2028**



Source: *National medium-term fiscal-structural plans and EIB staff calculations.*
Note: *The investment change is calculated as the difference between the projected average, nationally financed government investment for the post-RRF period 2027-2028 and the average total government investment for the period 2023-2024, expressed as a percent of GDP. The adjustment of the structural primary balance is the average annual adjustment that each country proposed in their medium-term fiscal-structural plans for the four- or seven-year period of adjustment starting in 2025.*

Although fiscal rules do not reduce government investment in the long term, the reintegration of the fiscal framework might force countries to make difficult trade-offs in the short term. The academic literature finds that, on balance, fiscal rules do not negatively affect government investment.[23] In the European Union specifically, compliance with the commonly agreed fiscal rules is not the problem. On the contrary, governments that follow fiscal rules have the space to spend on investment (Larch and van der Wielen, 2024). This assessment is based on more than 25 years of compliance with fiscal rules in the European Union. In 2025, however, EU governments will have to make a big adjustment. Fiscal rules have been suspended for five years, and during that time government deficit and debt rose sharply in most EU economies. This transition presents difficult trade-offs, especially for those countries with high debt and deficits.

Government investment in human capital

EU governments invest significant resources in improving people's skills and knowledge, as human capital is a key driver of competitiveness. Human capital can be defined as the skills, knowledge, experience and attributes of individuals that can be used to create economic value. Human capital is thus inherently private property that provides private economic returns to its owner. For that owner, higher human capital leads to higher lifelong earnings and a lower likelihood of spells of involuntary unemployment (Becker, 1962). But in addition to these private returns, human capital accumulation has positive effects for the aggregate economy (Fournier, 2016). Investing in education and health improves the productivity of the workforce, leading to higher economic output and growth. A healthier, more

23 See Brändle and Elsener (2024) for a recent review.

educated population is better positioned to innovate, adapt to modern technologies and perform efficiently. Countries with higher levels of human capital are better placed to attract investment and create high-value industries. A more productive workforce generates higher tax revenues and reduces the need for social welfare programmes, yielding long-term fiscal benefits. All of this is crucial for maintaining and enhancing a country's competitive edge in a globalised economy.

The gains for society go beyond economic benefits. Enhancing human capital can break the cycle of poverty and help reduce inequalities, ensuring that all people can succeed regardless of their socioeconomic background. It reduces the burden of disease and increases life expectancy, bringing down future healthcare costs. Investment in human capital also contributes to social stability by reducing crime rates and promoting civic engagement. Educated individuals are more likely to participate in democratic processes and contribute positively to society (Ponzetto and Toriano, 2014).

When investing in human capital, governments create a virtuous cycle of growth, equity and stability that benefits society as a whole. Individuals may not invest enough in their own education or health due to a lack of information, financial constraints or underestimating the long-term benefits. The existence of these market failures further strengthens the case for government involvement, which can help correct these failures through a wide range of policies, including direct expenditure. This section reviews the role of governments in human capital investment in the European Union. It starts with a comparison of government spending in health and education – two major determinants of human capital – across EU members and major economies outside the European Union. An analysis of the effectiveness of government spending shows that the quality of institutions matters.

EU governments spend heavily to develop human capital

A portion of current government spending contributes to investment in human capital. In a narrow sense, the term "investment" refers to spending to acquire fixed assets. But some current government expenditures could also be considered investment, as they directly or indirectly finance human capital accumulation. In the European Union, investment spending only makes up about 5% of total government expenditure on health and education. Buildings and equipment alone cannot provide education and health services that build human capital – this requires government spending on the people and systems that provide health and education services as well. Similarly, as argued in Chapter 4, providing social and affordable housing goes beyond governments' buying and building dwellings. Housing also contributes to maintaining and enhancing human capital.

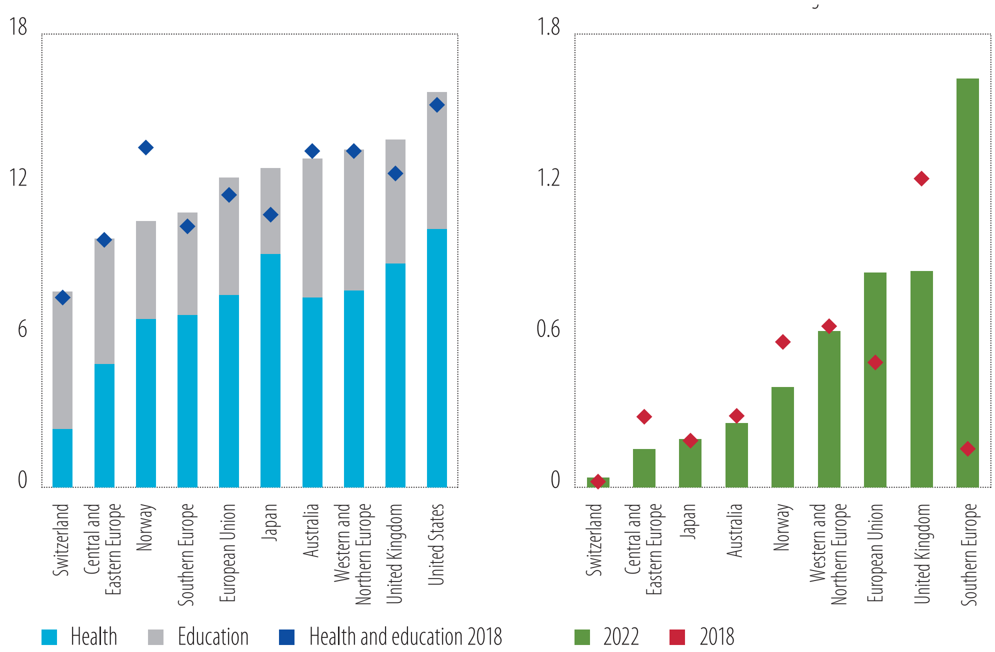
On average, government spending on health and education accounts for 12% of GDP in the European Union, with wide variation across EU members (Figure 15a). As a share of GDP, Sweden spends twice as much on health and education (14.2%) as Ireland does (7.4%). On average, EU members in Western and Northern Europe spend a higher share of GDP, while those in Central and Eastern Europe spend a lower share. The figures for Western and Northern Europe are comparable to other advanced economies, like the United Kingdom, Australia or Japan. In the European Union, health and education combined are the second-largest government expenditure, outpaced only by social security (19% of GDP). Outside the European Union, Japan, the United Kingdom and the United States spend more than the EU average on health and education, while Korea, Norway and Switzerland spend less.[24]

For the European Union, government spending on health and education has increased 0.7 percentage points of GDP from 2018 to 2022 (Figure 15a). Higher health spending in Southern Europe accounts entirely for the increase. Outside the European Union, government spending on health and education increased in Japan, Korea, the United Kingdom and the United States. While

24 The marked decline in Norway from 2018 to 2022 stems from high oil and gas prices in 2022, which lead to a 60% increase in GDP. Oil and gas constitute a substantial share of Norwegian exports.

governments in Japan and Korea increased spending on health and education, the increases in the United Kingdom and the United States went entirely to healthcare, while education spending declined.

Figure 15
Government spending on health, education and housing (% GDP)



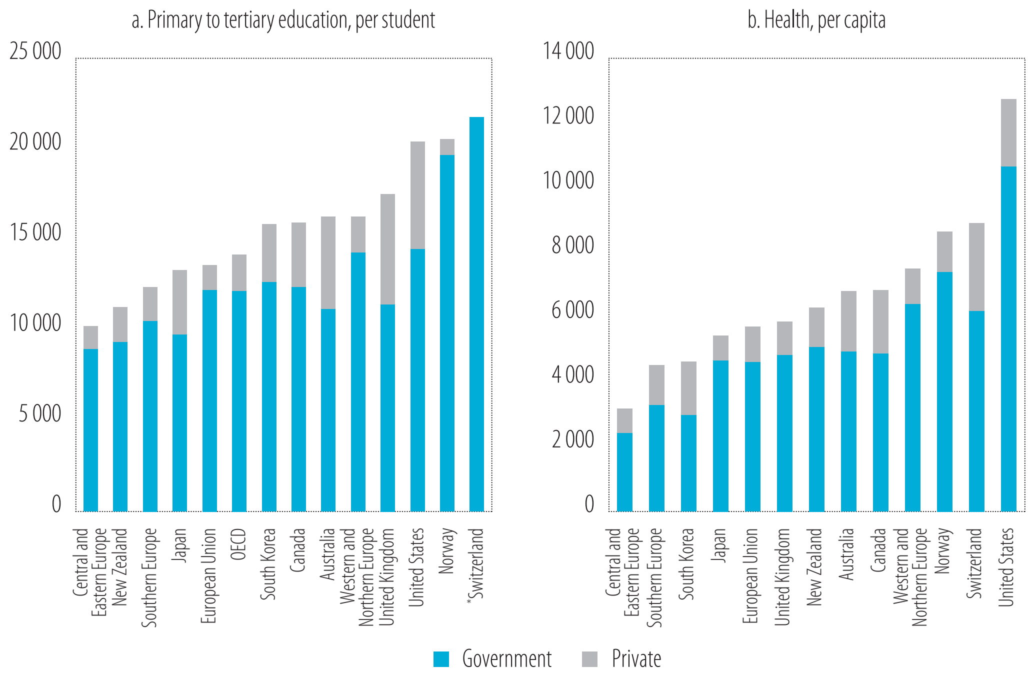
Source: *Eurostat and OECD government finance statistics.*
Note: *Education expenditure includes government spending on pre-primary, primary, secondary and higher education. Government spending on social and affordable housing here includes classification of the functions of government (COFOG) spending categories 6.1 Housing and community amenities: Housing development and 10.6 Social protection: Housing. For Greece, the data on total expenditure on housing are for 2019.*

Government expenditure on affordable and social housing in the European Union is slightly less than 1% of GDP (Figure 15, right panel). This spending varies substantially across the European Union. In 2022, spending in Italy was 30 times higher than in Slovakia, as a share of GDP. The second highest share, in France, is 12 times higher than in Slovakia. Outside the European Union, the share in the United Kingdom is roughly the same as the EU average. Other OECD countries for which data are available have substantially lower spending on housing as a share of GDP.

Average government spending on health and education per person in the European Union is among the highest in OECD member countries (Figure 16). EU government expenditure per capita on health and on education per student are topped only by those of Norway, the United States and Switzerland. Within the European Union, governments in Western and Northern Europe spend the most on health and education per person. Countries in Southern Europe and in Central and Eastern Europe spend the least, and less than most advanced countries outside the European Union.

Private spending on health and education in the European Union make up a smaller part of total expenditure (Figure 16), lower than in other OECD members. Private spending accounts for, on average, about 10% of total expenditure per student and 20% of total health expenditure per capita. Within the European Union, the variation is substantial. For education, figures vary between 3% in Finland and 17% in Spain. For health, the range is from 13% in Luxembourg to 38% in Greece. Private spending levels also differ substantially, ranging from USD 294 per student in Romania to USD 2 913 per student in the Netherlands for education, and from USD 438 per capita in Croatia to USD 1 740 per capita in Belgium for health.

Figure 16
Spending on education and health (PPP USD)



Source: *OECD education and health statistics.*
Note: *Education expenditure includes 2021 spending on primary, secondary and tertiary education per student. Private sector includes households and non-educational private entities. Government health expenditure is for 2021 and includes compulsory health insurance schemes. Private spending includes voluntary health insurance schemes and out-of-pocket expenditure. The lastest figures available for South Korea are for 2021. *Data for private education spending for Switzerland is missing. PPP stands for purchasing power parity.*

The effectiveness of government spending on human capital development

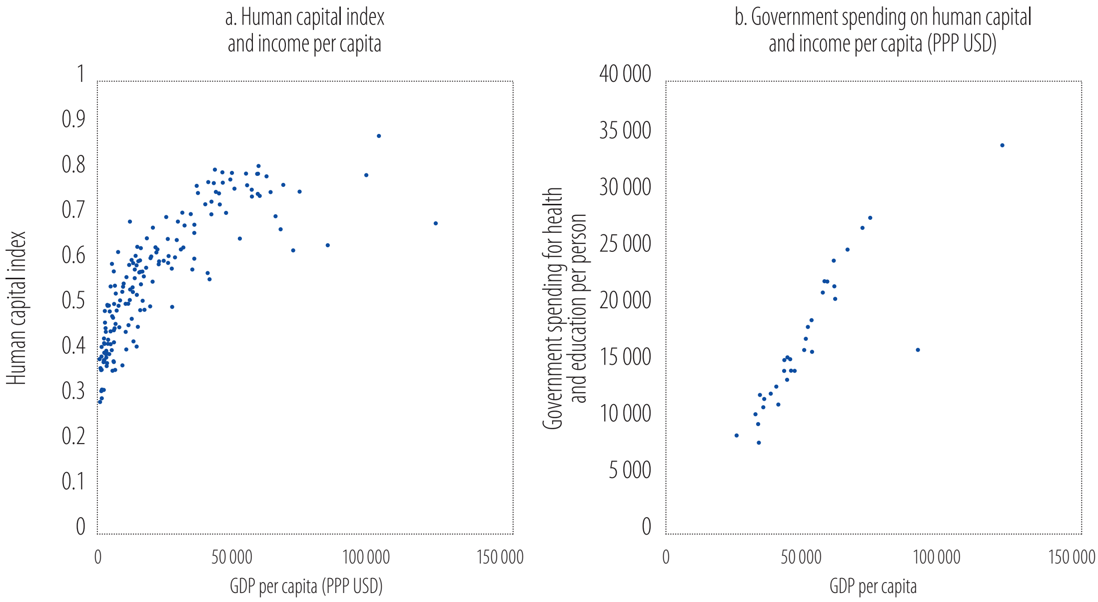
Higher income countries spend more to develop human capital, but human capital appears to disconnect from a country's income after a certain threshold (Figure 17). Human capital increases with economic development and the amount spent on health and education. The higher the income per capita, the higher government spending on health and education (Figure 17b) – per person and as a share of GDP. There is ample evidence in the literature that education outcomes in advanced countries are not well correlated with increased government spending on education.

Higher income is also associated with higher levels of human capital (Figure 17a). However, this relationship appears to be nonlinear. Below a certain income threshold, human capital levels increase quickly with income per capita. Above that threshold, however, the relationship is not so clear. Certain countries with income per capita of USD 50 000 to USD 70 000 have human capital indices that are lower than countries where income per capita is less than USD 20 000.

Comparing the effect of health and education spending on outcomes provides a way to compare the effectiveness of government spending. The vast literature on the effects of government spending on education finds that spending matters for learning outcomes, but that the relationship is not linear. The efficiency of government spending depends on teaching practices, school organisation and parental support (Hanushek and Kimko, 2000; Gundlach et al., 2001). Our intention in this report is not to study such structural relationships, but rather to provide a benchmark for government spending on education and health in the European Union, comparing outcomes achieved per euro spent. To this end, we use data envelopment analysis techniques introduced in Farrell (1957).[25] This method provides a way to measure the efficiency of transforming inputs – in this case, the financing of the education or health system – into outputs. For outputs, we take outcomes that characterise human capital, like average scores on the OECD's Programme for International Student Assessment (PISA), the share of population with higher education, life expectancy at birth or the mortality rate of young children.[26] (See also Box D.)

Figure 17

Human capital, government spending and income per capita



Source: *Human development project and world development indicators, World Bank Group. OECD education and health statistics.*
Note: *Data for the human capital index is from 2020. GDP per capita is for 2019. Government spending for health and education is for 2021. PPP stands for purchasing power parity.*

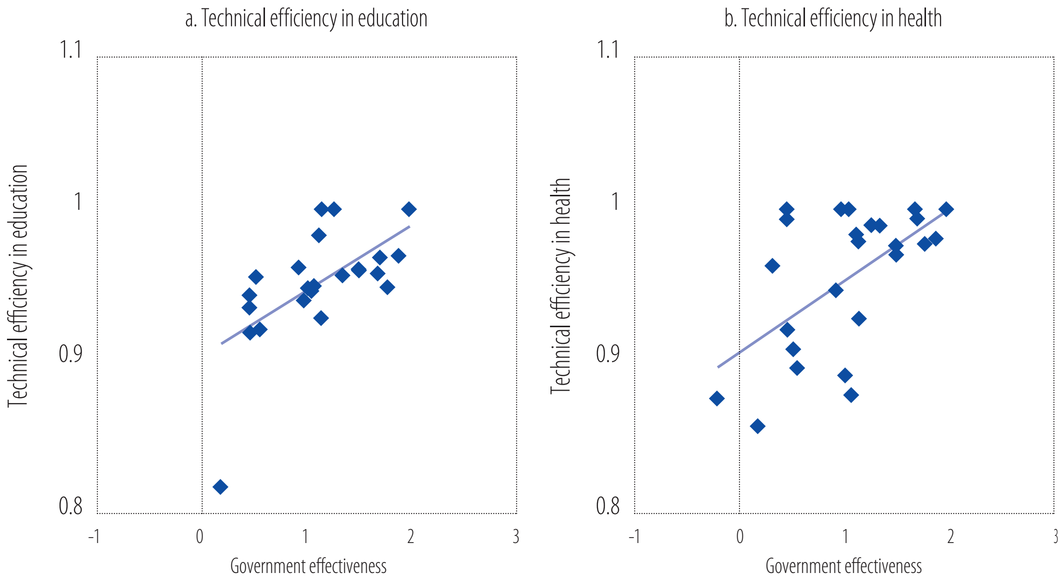
Comparing estimated efficiencies reveals that better outcomes are not necessarily more expensive. The data envelopment analysis (see Box D) shows that countries achieving the highest outcomes per euro spent are not necessarily those that spend the highest amounts per capita. By improving the efficiency of their spending, many countries could achieve better outcomes with little or no new spending, or could reduce their expenditure and still achieve the same outcomes. While the analysis provides no guidance on what underlies the efficiency of the best performers, it is worth noting that efficiency scores for education and health are positively associated with government effectiveness, as measured by the World Bank index of government effectiveness.[27]

25 An introduction to data envelopment analysis can be found, for instance, in Coelli et al. (1998).

26 PISA is an OECD programme that measures 15-year-olds' ability to use their reading, mathematics and science knowledge and skills to meet real-life challenges. In 2022, 81 countries took part in the assessment. PISA scores and the other outcomes listed are standard in the literature. See for instance Afonso and St. Aubyn (2005).

27 According to the World Bank, the government effectiveness indicator captures perceptions of the quality of public services, the quality of civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Figure 18
Estimated technical efficiency is positively associated with measures of good governance



Source: EIB staff calculations and the World Governance Indicators Database, World Bank Group.
Note: Technical efficiency is estimated using data envelopment analysis. See Box D for further information.

The estimated efficiencies imply that, in aggregate, EU governments could save some 2.5% of GDP by becoming more effective in their intervention, without affecting human capital. If all EU governments increased their technical efficiencies in line with those achieving the highest outcomes per euro spent, the potential savings would be substantial, amounting to about three-quarters of total EU government investment. This number is clearly an upper bound, as improving government efficiency takes years and reforms are not easy to design, technically or politically. Nevertheless, striving to improve efficiency provides a viable alternative to addressing trade-offs when budgets are under pressure, especially in countries with severe fiscal constraints. As argued in Darvas et al. (2024), the combined effect of several reforms concerning social investment could substantially improve some countries' fiscal sustainability.

These findings add to the ongoing discussion on fiscal trade-offs. Consensus is building that EU governments must increase investment in fixed assets (Draghi, 2024). This, together with binding fiscal constraints, puts pressure on EU governments that face the difficult choice between increased government investment in fixed assets and increased, or at least sustained, government spending on human capital development. Finding ways to improve the impact and efficiency of spending could offset quantity. Spain's Inclusion Policy Lab is a leading example of evidence-based social policymaking.[28]

28 The Inclusion Policy Lab in Spain is an initiative of the Ministry of Inclusion, Social Security and Migration. Founded in 2021, the lab aims to strengthen social inclusion and generate scientific evidence to inform social policymaking. The lab has overseen the delivery and evaluation of 32 social inclusion projects, benefiting around 175 000 people directly or indirectly. These projects are linked to Spain's minimum income scheme, which has reached 2.2 million people. The Inclusion Policy Lab focuses on innovative social inclusion programmes and rigorous evaluations to understand what works best in reducing poverty and promoting social integration.

Box D

Linking government expenditure to human capital outcomes

We use data envelopment analysis to compare government spending on health and education against human capital outcomes. The analysis provides a simple, non-parametric technique for evaluating the efficiency of decision-making for certain groups, such as firms or government agencies. It assesses the relative efficiency (also called technical efficiency) of decision-making groups by comparing their ability to convert multiple inputs into multiple outputs. This is done without assuming any functional form of the distribution of inefficiencies or the production function.

The approach does not measure absolute efficiency. Rather, it constructs an efficiency frontier from the best decision-making groups in the sample, and uses this frontier to compare the efficiency of the other groups in the sample. The frontier can assess how much input can be proportionally reduced without changing output quantities, or how much output can be proportionally increased without changing inputs.

In our simple framework, we construct separate efficiency frontiers for the education and healthcare systems of EU members, similar to Afonso and St. Aubyn (2005). Because of missing data, we exclude from the sample Cyprus, Malta and Greece in the case of education, and Cyprus and Malta in the case of healthcare. In our simple model, the education and healthcare systems transform total expenditure in health and education, government and private, into outcomes related to human capital. Thus, the inputs in the production of human capital are expenditure on education per student and on health per capita in USD adjusted by purchasing power parity (PPP). Both expenditures are scaled by gross national income per capita to account for the effects of higher income on spending.

The model looks at outcomes related to human capital. For education, we take the simple average of PISA scores for mathematics, reading and science in 2015, 2018 and 2022, as well as higher, or tertiary, education attainment rates for 25- to 34-year-olds in these three years. For health, we use life expectancy at birth and child survival rate beyond 12 months from 2015 to 2021. These measures are standard in the literature and are also used in Afonso and St. Aubyn (2005). Efficiency frontiers are then calculated for each year, using a variable returns-to-scale technology.

Table D.1

Descriptive statistics of efficiency scores

	Minimum	First quartile	Median	Average	Third quartile	Standard deviation
Education	0.817	0.942	0.961	0.958	0.983	0.038
Health	0.857	0.937	0.980	0.965	0.996	0.037

Source: *EIB staff calculations using OECD education and health statistics.*
Note: *The statistics are computed over countries and years and are for output-oriented efficiency. The maximum efficiency is normalised to 1.*

The mean efficiency score in the education sector is 0.96. This means that, on average, countries achieve 4% less output with the same amount of inputs as the most efficient countries (Table D.1). The lowest score, 0.82, implies that the least efficient education system delivers outputs that are 18% less efficient than those of the most efficient countries, using the same amount of inputs.

While the range of efficiency scores in the health sector is not very different from that in the education sector, the distribution of efficiency scores differs substantially. It is more polarised than that of the education sector, in that it has more observations closer to the lower end and more observations closer the higher end of the distribution. Thus, a bigger divide exists in the efficiencies of EU health sectors. This divide is also regional. Countries in Central and Eastern Europe occupy the lower part of the distribution. While education is not as polarised, countries in Central and Eastern Europe still dominate the lower part of the distribution there, too.

Technical efficiency in both sectors is positively associated with the World Bank index of government effectiveness. This is the case even if we control for stable, quasi-fixed over time, country-specific characteristics and time trends (Table D.2). Without claiming causal effects, this correlation points to possible gains from reforms aimed at increasing government effectiveness in general, and at improving government spending efficiency in particular.

Table D.2

Association between efficiency scores and the World Bank's government effectiveness index: A two-way panel fixed-effects model

	Efficiency scores	
	Education	**Health**
Government effectiveness	0.032* (0.012)	0.011 (0.009)
	Fixed effects	
Country	Yes	Yes
Time	Yes	Yes
Sample size	72	175
R-squared	0.927	0.950
Within R-squared	0.084	0.014

Source: *EIB staff calculations using OECD education and health statistics and the World Governance Indicators database of the World Bank Group.*
Note: *Standard errors are clustered at country level. * denotes significance at the 5% confidence level.*

Finally, to quantify the aggregate effect of varying efficiencies across countries, we compute the savings gains if all countries were to achieve the same efficiency as the most efficient countries. To this end, we compute the aggregate EU ratio of extra inputs to GDP, or money needed to match the best in class, and average it over the years in the sample. Finally, assuming that the government share in total expenditure remains constant, we calculate the government share of savings as a percentage of GDP. We estimate that total savings for the European Union amount to some 2.9% of EU GDP and that the government share is 2.5%. This amount is of a similar magnitude as the GFCF of the general government in the European Union, which averaged some 3.4% of GDP over the past five years.

Government policies for affordable housing

Access to affordable housing can improve the allocation of human capital in the economy and thus raise productivity. Higher availability of affordable housing allows individuals and families to relocate more easily to areas with better job opportunities, improving overall job matching in the economy. It may also reduce the financial stress associated with high housing expenses, enabling workers to invest more in education and training, which enhances their productivity. By fostering a stable and skilled workforce, affordable housing could thus contribute to higher overall economic output and growth.

While direct government spending for affordable housing is small (Figure 15, right panel), other policies can be used to create a potentially powerful policy mix for housing affordability.

Despite the economic significance of housing, housing policies are still primarily considered social in character. Housing policy advocates make little use of the arguments articulated in urban economics and economic geography to support affordable housing. Instead, they mainly cite social and sustainability cases for intervention, such as health, environmental and climate protection, or energy conservation.

Reflecting the tendency to focus on social policies, affordable housing policies in the European Union are numerous and remarkably varied, and do not necessarily take into account the impact on competitiveness. Housing policies in Europe are formulated at all levels of government – local, regional, national and supranational. They target a wide range of affordability concerns, from assisting individual households with heating bills to incentivising multibillion-euro EU green development projects. They also use different tax, spending and regulatory tools. Variations across countries are significant. Almost all EU members apply a broad and comprehensive set of tools, but with different priorities that align with country-specific demographic, historical and sociocultural factors. Due to differences in homeownership and rental rates, two regional groupings with similar policies can be observed: approaches used in Western and Northern European countries, and those in Central and Eastern European and Southern European countries. Four policy clusters can be discerned in this complex landscape.[29]

Demand-side policies for market-based housing

Demand-side policies for the market-based housing approaches assist renters, prospective buyers and homeowners.[30] The main tools are rent controls and housing allowances. Rent controls typically address the initial rent levels, regular rent and cost increases; lease features (duration; deposit); tenant-landlord relations (restrictions on termination; notice periods); quality and maintenance standards; and, more recently, short-term holiday rentals. Although widely used, the administrative costs of rent controls and the ways they may disincentivise private investment in rental properties have not been systematically quantified.

Housing allowances use means- and/or income-related transfers to lower-income households to help them pay for rental and other housing costs. Eligibility is mostly based on a household's income, size, composition and housing costs. In most countries, housing allowances are designed as entitlement programmes, meaning that all applicants who meet the eligibility criteria receive the benefit, subject to available funding. The design of housing allowances has been the focus of much of the literature on housing affordability.

Homebuyers are some of the biggest beneficiaries of housing policies in the European Union. 18 EU members provide support, in the form of grants for the purchase or construction of a dwelling, preferential terms for mortgage loans, down payment assistance, mortgage guarantees or preferential tax treatment of housing saving schemes. Fewer countries support existing homeowners, and that support mainly includes deductions on mortgage interest payments and tax relief for specific groups (families with children, young families, elderly people, etc.).

The home ownership is associated with policy tools employed at the national level. Countries with large private rental sectors (France, Germany, the Netherlands, the Nordic countries, etc.) tend to have elaborate policies for rentals, while countries with high homeownership rates (Ireland and countries in Central and Eastern Europe and in Southern Europe) often lack such policies, and gear public support towards owners that occupy their properties. Total government spending on housing

29 The analysis that follows uses data from the OECD Affordable Housing Database.
30 While some social housing tenants pay rent, they are typically supported through social housing programmes.

allowances averaged 0.25% of GDP in 2022, ranging from less than 0.1% in Central and Eastern Europe and Southern Europe to 0.4-0.9% in France, Germany, the Netherlands and the Nordic countries.[31] Somewhat less – about 0.15% of GDP on average in 2022 – went to tax deductions to support homebuyers, with countries in Central and Eastern Europe and in Southern Europe spending less than 0.1% on average, vs. 0.4% for Sweden and 1.2% for the Netherlands. Tax revenue foregone to support existing homeowners averaged 0.6% of GDP on average in 2019, with Belgium, Finland, Luxembourg and Poland spending 0.1-0.4%, and the Netherlands and Sweden spending up to 1.3% of GDP.

Social housing policies

Social housing policies are distinct from other housing policies in several respects, because they assist more vulnerable segments of the population financially, socially or otherwise. The supply and operation of social housing is therefore planned and financed primarily by the public sector, though with significant private-sector participation in many countries. Public housing tenants are also better protected, and rents are generally more subsidised (often in combination with other social assistance) than those paid by low-income households receiving allowances for private rental housing.

Social housing comprised over 14 million dwellings or 8% of the total housing stock in the European Union in 2021. Almost all EU countries have some form of social housing. The sector is largest in Austria, Denmark and the Netherlands (over 20% of the total housing stock), moderately sized in Finland, France and Ireland (10-20% of the stock), and small in Central and Eastern Europe and Southern Europe. The share of social housing in the total housing stock has decreased by 3 percentage points since 2010, although the number of vulnerable people such as the homeless and irregular migrants has increased significantly. The decline is related to a slowdown in new social housing construction and the privatisation of the stock, whereby social dwellings are converted into market-rate rental housing (for example, in Germany).

Public spending to support social rental housing averaged 0.06% of GDP in 2022, the latest year for which figures are available. Austria and France spent 0.2%, Germany 0.07%, and other countries less than 0.05%. This spending includes the direct provision of social rental housing (typically to the local authorities that own and manage the stock), and subsidies to non-government providers (grants, public loans from specific credit institutions, interest-rate subsidies and government-backed guarantees). The correlation between the level of public spending and the size of the sector is weak, however, as eligibility criteria, rent-setting models (income-based, market-based, cost-based and utility-based) and providers vary widely, as does management (for-profit, non- or limited-profit, cooperatives, or public authorities at different levels of government).

Public support for property developers

Along with its limited ability to directly finance social housing, the public sector is also at a relative disadvantage in influencing housing supply. That is why many housing affordability policies aim to increase the supply of housing at below-market rents or prices by supporting private property developers. Typical measures include grants, low-interest loans or loan guarantees for developers for the construction of owner-occupied dwellings; reduced VAT or other tax rates paid by developers for newly built dwellings or the transformation of office space into residential homes; and the sale of plots of publicly owned land at reduced prices for building affordable housing. These dwellings typically target low- to middle-income households. Property developers are usually required to set aside a minimum share of dwellings (25% of apartments in a housing block, for example) for social housing or other tenants selected by public authorities.

Almost all EU countries have such support measures in place. In some cases, a single scheme subsidises the development of new dwellings and the households that purchase them. In others, it is

31 These figures include personal housing benefits and budgetary costs of reduced rents for social housing tenants, which in the statistics are lumped together with housing allowances for private market renters.

difficult to distinguish between support measures for affordable and social housing. The budgetary implications of public support for private developers are rarely quantified.

Public support for housing improvements and renovation

Almost universally, supply-side measures aimed at existing private homes emphasise sustainability. This may be one of the areas in which the European Union has been most active with funding and regulation. These measures target different types of dwellings (those that are of poor quality, were built in specific areas or periods, etc.) and cover things like energy efficiency upgrades, repairs, accessibility adaptations and building regeneration. Such initiatives are relevant for housing affordability because they help improve housing quality and contain energy costs for households. Typical tools include grants, tax relief, loans at preferential rates, loan guarantees and insurance programmes. The beneficiaries can be homeowners, landlords of rental properties, local governments, homeowner associations, cooperatives, etc.

Public spending on home improvements averaged 0.12% of GDP in 2022. It varied widely from one country to the next, with Italy spending about 0.5% of GDP; Austria, Estonia, Germany, Slovakia and Sweden spending 0.15% to 0.35%; and most other countries spending less than 0.01%. The same regional pattern can be seen as with other housing policies. The Netherlands has invested heavily in building new affordable housing to address shortages in urban areas. Germany, France and Austria focus on renovating existing homes to improve energy efficiency (as with eco-neighbourhoods in France). They also provide funding for new housing development that is often subject to strict energy performance standards (France, Germany and the Nordic countries). By contrast, in Central and Eastern Europe and in Southern Europe, such projects are largely driven and funded by the European Union.

Policy effectiveness and potential for reform

Considering the wide scope and variety of housing policies, analyses of their benefits and costs are rare and fragmented. Empirical work has tended to focus on single measures (rent controls, work disincentives created by housing allowances for low-income earners, etc.) implemented in individual cities or countries, with findings that are hard to generalise. This contrasts, for example, with the depth of theoretical thinking and empirical work on the distributive and allocative dimensions of housing affordability. Assessments of housing policies have therefore tended to rely on arguments for or against different approaches, and on identifying gaps in knowledge about the effects of policies.

One important insight from such assessments is that regarding housing as merely a shelter and housing policies as primarily social in character underestimates the importance of housing for the modern economy.[32] Affordable housing affects the formation of human capital, and the home is increasingly a place of lifelong learning and work. There is also a growing recognition that cities are not a passive factor in growth. They can give rise to distinctive and complex agglomeration economies that affect labour markets and spur innovation. Yet, with few exceptions, over the past decade governments and policymakers have focused on fine-tuning and tweaking existing approaches rather than reassessing the productive role of affordable housing and implementing deeper reforms.

On the positive side, one insight from the assessments of policy interventions during recent crises is that the institutional infrastructure built around housing policies can be adapted flexibly for other purposes. For example, the well-established administration of housing allowances and rent controls enabled fiscal support to be disbursed to households quickly during the COVID-19 pandemic and the energy price surge when Russia invaded Ukraine. It also facilitated the implementation of temporary moratoriums on mortgage payments and eviction bans. The decentralised implementation mechanisms of many housing policies can be viewed in the same light. Regions and municipalities are often best placed to design and manage tailored policies to provide affordable housing.

32 See, for example, Maclennan et al. (2015).

Conclusion and policy implications

Addressing the structural challenges facing the European Union requires substantial investment. The Draghi report (Draghi, 2024) emphasises the need for massive investment to speed up the green and digital transformations of the European economy, and strengthen EU competitiveness, economic security and defence. Although the private sector will make many of these investments, government investment has a substantial role to play as well. Investment is needed not only to provide critical infrastructure and public goods, but also to catalyse economic development. It spurs private investment and often complements investments in climate change or innovation.

The strong increase in government investment over the past five years is a policy success. The twin green and digital transition, along with the years of underinvestment following Europe's sovereign debt crisis, put a focus on the importance of government investment. That investment got a significant boost from the sizeable policy packages rolled out to address the COVID-19 economic crisis and the energy crisis. The Recovery and Resilience Facility and the suspension of EU fiscal rules gave governments the space needed to increase investment. The expansion of incentives and financial instruments to channel private resources towards desired investment outcomes has also been widely explored.

Coordinating a rise in public investment at the EU level brought additional benefits. As shown in the analysis here, there are significant spillover effects on output and investment when increased government investment is coordinated at the EU level. While it is still early to properly assess the impact of the RRF, it is already clear that this EU-coordinated programme has had a significant effect on government investment across the European Union at a time when large investments are needed to address structural challenges for the EU economy.

Pressure on countries to improve their finances will require them to make politically difficult decisions, particularly if they want to safeguard public investment in the short run. While the RRF and the allocation of EU structural and cohesion funds still leave some room for additional public investment, some countries may face difficult trade-offs. Although reinstating EU fiscal rules is not expected to impact public investment in the medium term, compliance will require many EU countries to make hard fiscal choices. Fiscal restraint is inherently difficult and often unpopular. Historically, fiscal adjustments have often resulted in cuts to public investment, as these cuts are less politically costly in the short term. However, the revised EU economic governance framework strives to protect public investment, and recent evidence shows that, historically, the fiscal rules laid out under the framework have not impeded government investment. Instead, government investment suffered as countries felt pressure to maintain other public spending, and they may feel that pressure again.

Improving government efficiency and public spending could free up fiscal space without reducing public services. Reforming government investment to improve the efficiency of social services such as education and health systems – effectively bringing efficiency up to the highest standards across the European Union – could free up substantial fiscal resources. This is a challenging task, and no simple reform template exists. Although such reforms take years to design, agree and implement, they can bring substantial benefits that will pay off in the long term.

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Chapter 3

Enablers and constraints for firms' investment

Investment by firms recovered relatively quickly from the pandemic and the energy shock, but it has stalled in the last year and a half – putting at risk the substantial capital spending needed for the green and digital transition. After Europe's sovereign debt crisis in 2011-2012, real corporate investment took five years to return to pre-crisis levels. After the pandemic and the energy shock, it took less than two years, as supportive public and monetary policies allowed firms to invest in digitalisation and energy efficiency while preparing to transition away from fossil fuels. More recently, however, firms' real investment has flagged as the economy has lost steam. Policy support has become much more targeted, even though financing conditions are still tight in historical terms. The current environment of weak overall demand, a lack of skilled labour, elevated uncertainty regarding geopolitical risks, and looming tariff hikes and sanctions, is causing firms to hold back some of their investment. The peak of the energy crisis may have passed, but energy prices remain well above pre-crisis levels and are dampening the production and the long-term prospects of the most energy-intensive sectors. Overall, EU firms are investing less than US firms.

Firms' expectation that financial conditions will improve may support investment, but lower profits and high uncertainty could hinder it. In the euro area and in non-euro area countries, monetary policy has begun to loosen. The costs of bank borrowing and corporate bond yields have started to decline from the highs recorded at the beginning of 2024. Firms are taking out loans again as credit conditions ease. These developments bode well for investment going forward, especially as policy support withdraws and firms have less profits to invest. Geopolitical uncertainty, however, remains a drag.

However, the EU financial system remains ill-suited to adequately finance the economic transformation required to push through the green and digital transition. The EU financial system depends heavily on banking, and this focus continues to constrain specific investment as firms do not have many alternative funding sources that will support risky investments. Analysis based on the EIB Investment Survey (EIBIS) indicates that capital spending on intangible assets, innovation and digitalisation is hampered by the underdevelopment of specific types of finance, such as private equity, venture capital or listed equity. Moreover, fast-growing European companies have difficulty finding the funds they need to scale up.

Reducing investment impediments could bolster corporate investment. The EIBIS, however, suggests that little progress has been made in this regard. A large share of firms still report that uncertainty, a lack of skilled labour and heavy regulations limit their capital expenditure. Europe needs to create a more business-friendly environment. The fragmentation of the EU single market also blocks firms' development and limits their potential.

There is a limit to how much public support can buoy investment. To meet its goals, Europe must channel public funds towards the financial instruments that can best catalyse private investment. In recent years, targeted financial support has helped firms to innovate and green their production, and has enabled small companies to grow. Higher public indebtedness and more stringent fiscal discipline mean that many EU members cannot continue to provide this level of support, and they must focus on measures that are targeted and cost-effective. These kinds of policy interventions are more effective when they are designed at the EU level and benefit fully from EU integration, and target a specific policy objective. Getting the most out of EU-wide policies, however, also requires better integration of Europe's financial markets.

Introduction

This chapter focuses on non-financial firms, looking at their resilience, their capacity to invest and remain competitive while embarking on the twin green and digital transition, and their ability to face new geopolitical challenges. Monetary policy has successfully tamed inflation without triggering a recession, and government policies protected firms from the effects of the COVID-19 and energy crises. That support allowed firms to continue to adopt digital technologies, shore up their supply chains and invest in climate change mitigation and adaptation measures. However, investment stalled in the first half of 2024, weighed down by lower corporate profits, high borrowing costs and geopolitical uncertainty. To reignite investment, Europe needs to focus on targeted financial incentives that use limited public means in the most effective manner. It must remove or lower barriers to investment and push forward on EU integration, which would strengthen the single market and provide EU firms with opportunities to grow and compete more effectively in a global marketplace.

This chapter is divided into three sections and four boxes. The first section gives an overview of recent developments in corporate investment and profits. It reviews the impact of the energy shock, analyses the strengths and weaknesses of EU firms and elaborates on the investment outlook. It includes a box focusing on energy costs, the energy market transformation and firms' competitiveness

The second section talks about possible sources of funding for investment, such as bank finance, specific finance segments for small and medium-sized enterprises (SMEs), private equity, venture capital and scale-up finance, and equity finance in general. It includes a box summarising the main results of the EIF Venture Capital Survey.

The third section discusses investment barriers and analyses the impact of public support on investment. First, it shows the need to remove structural impediments to unlock investment. Second, it assesses the effectiveness of financial instruments and grants in supporting innovation and the green transition. It also includes two boxes. The first estimates how allotment of subsidies coordinated at the European Union level can lower the risk of resource misallocation. The second box elaborates on the effectiveness of financial products offered by the European Investment Bank.

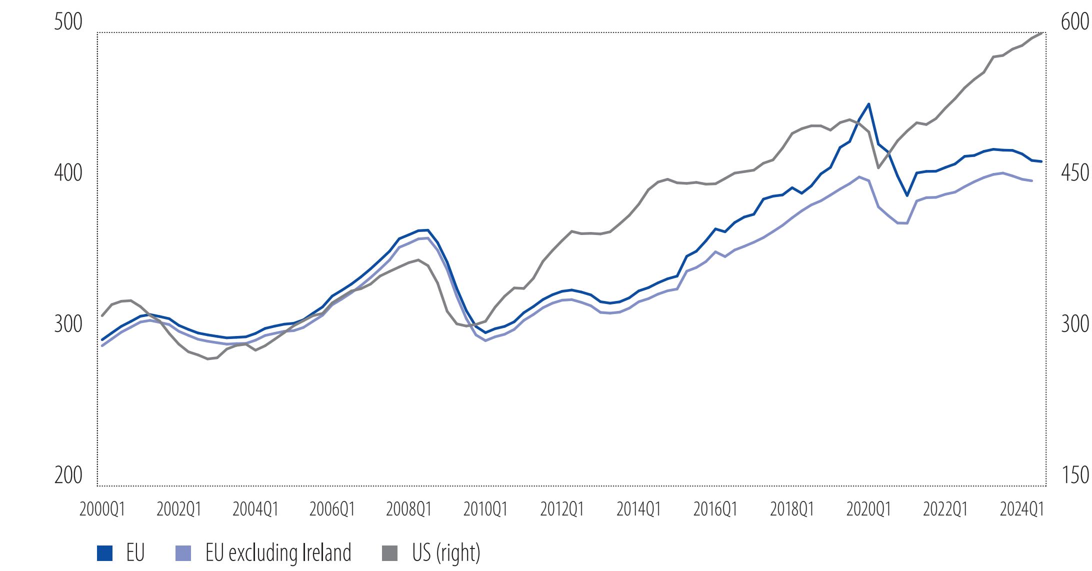
Investment remains weak, and is only expected to pick up slightly

Corporate investment performed relatively well throughout the pandemic recovery as well as during the energy crisis and monetary policy tightening designed to tame inflation. However, corporate investment has stalled since the end of 2023, as credit became harder to obtain, heady profits earned from built-up demand caused by COVID-19 restrictions began to abate and economic growth started to soften. At the same time, persistently high energy costs made it difficult for some manufacturers to compete internationally. Data from the EIB Investment Survey (EIBIS) does not point to a substantial acceleration in investment.

Investment remains almost flat

Corporate investment had already started to wane in the last quarter of 2023. Figure 1 reports developments in firms' real investments since the beginning of 2000, comparing the European Union to the United States. If anything, EU corporate investment performed better than expected during the energy crisis and tighter monetary policy. Real investment was stronger than what might have been expected in such an adverse environment (European Investment Bank (EIB), 2024b). More recently, investment has remained flat. Also, investment's relatively strong performance after the pandemic and energy shock hides a substantial gap created with the United States. As shown in Figure 1, by mid-2024 real corporate investment was just 1 percentage point higher than the level before the COVID-19 crisis in the European Union, while it was 12% higher in the United States.

Figure 1
Real corporate investment (left axis: EUR billion; right axis: USD billion)**, adjusted to 2015 prices**



Source: *EIB staff calculations based on Eurostat and Federal Reserve Economic Data (FRED).*
Note: *Four-quarter moving average. The latest figures available are for the third quarter of 2024.*

Figure 2
Investment intensity and profits over time

Source: *EIB staff calculations based on EIBIS 2018-2023.*

The nature of firms' investment also differs between the European Union and the United States. In the latest EIBIS, the share of EU firms investing in expansion is 6 percentage points lower than the share of US firms (26% vs. 32%, respectively). Looking ahead, EU firms generally expect to invest in replacing capacity rather than expanding it. This contrasts sharply with US firms. In the United States, 47% of firms say they will expand capacity in the next three years, compared with 26% in the European Union.

The more profitable companies are, the more they invest. For each EU country, Figure 2 plots the share of companies reporting elevated profits (of more than 10% of turnover) together with the net balance of firms expecting to raise rather than lower investments, comparing the investment results with the deviation from the historical average. In 2024, 16% of European firms reported profits above 10% of turnover. Regarding the investment plans, in 2024 the share of EU firms expecting to lower investment rather than to increase it is below the historical average, pointing to a relatively cloudy outlook. However, the signals received from both indicators vary widely across countries. The figure suggests an increasing relationship between profits and investment plans, illustrated by the trend line. In general, the more profitable companies are, the more they invest. This applies to the country level as well. Generally, the more elevated the profit ratio, the more firms plan to invest.

Higher energy costs weigh on energy-intensive industries

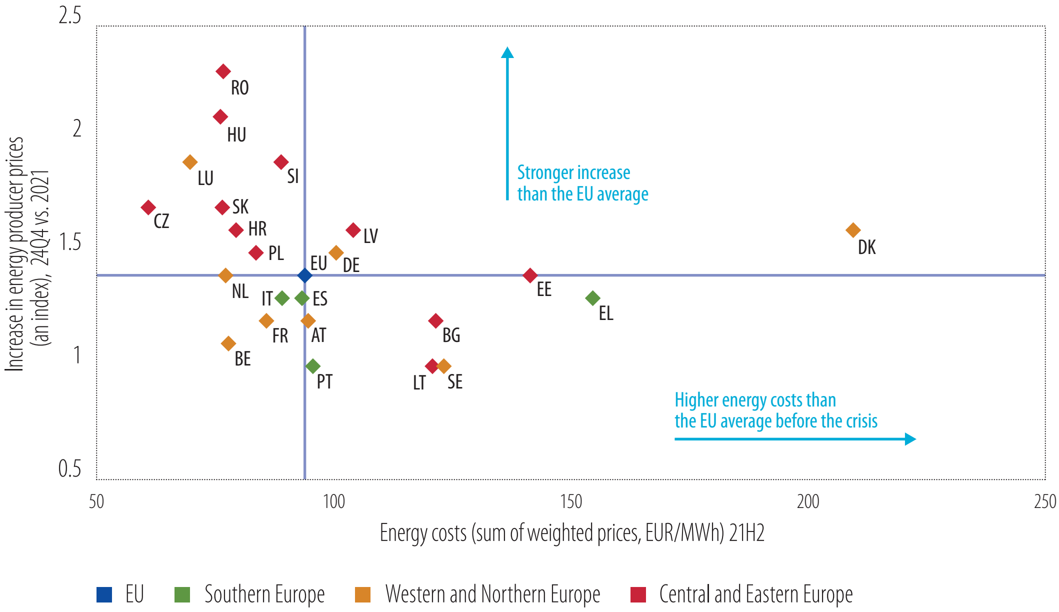
Energy costs have receded, but they remain above pre-crisis levels. Figure 3 plots the change in energy prices compared with the second half of 2021, before the start of the energy crisis. In the last quarter of 2024, the international prices of oil, coal and gas had roughly returned to 2021 levels. International prices influence energy costs paid by businesses, but other factors, such as taxes and distribution costs, also matter. In the third quarter of 2024, the energy prices paid by EU firms were 40% above the 2021 level, before the energy crisis began. Firms in most EU countries saw a similar increase, with only Lithuania, Portugal and Sweden recording stable or slightly declining energy costs over the period.

International prices for coal, gas and oil have affected prices paid by firms very differently across EU economies. This variety is partly explained by differences in the energy mix, but it is also due to other factors like settlement contracts, taxes, regulation, transportation costs, local margins and whatever policy exists in the country. Looking across regions, the increase was clearly more pronounced in Central and Eastern Europe. As Figure 3 shows, energy prices have more than doubled in Hungary and Romania.

Higher energy costs are a drag on activity in energy-intensive industries. Figure 4 puts fluctuating energy costs into perspective by plotting the change in production in energy-intensive industries. In most countries, the production of energy-intensive sectors is lower than before the energy crisis began in the second half of 2021. For the European Union as a whole, production declined 5%. Production has only increased in Greece and Lithuania, and it remained fairly stable in France and Spain. As indicated by the downward-sloping grey line in Figure 4, the higher the rise in energy cost, the larger the decline in the production of energy-intensive sectors. It is 3% lower in Europe as a whole, where prices rose by 40%. Across countries, the decline in production is close to 20% in Hungary, where energy prices more than doubled. It reaches 7% in Germany, where prices increased by 50%. Thus, energy-intensive industries continue to face energy costs above those of major competitors.

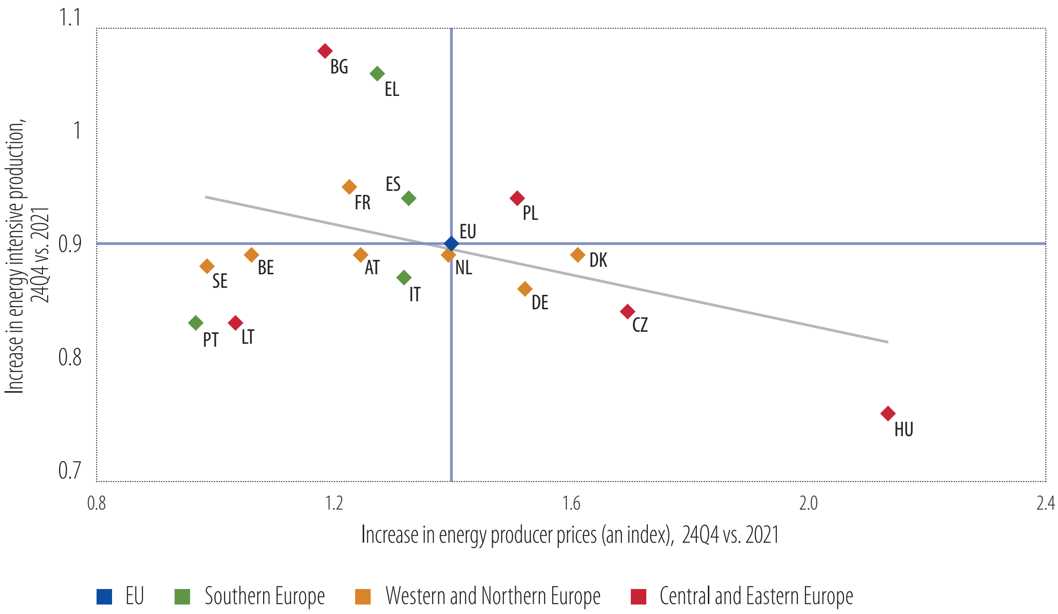
High energy costs are more than a short-term worry. They also threaten EU competitiveness in the medium term. The EU energy market is being transformed, but it will take more than a decade for renewable energy to replace the role of fossil fuels in setting electricity prices. Box A discusses the need to transform the EU energy market, and how energy prices are weighing on industrial competitiveness.

Figure 3
Energy prices paid by firms before the crisis and the change



Source: *EIB staff calculations based on Eurostat and the European Commission.*
Note: *The latest figures available are from August 2024. The x-axis is measured as the sum of weighted electricity and gas prices for the second half of 2021. The y-axis is the energy total output price index (2021=100) for the fourth quarter of 2024 compared with 2021.*

Figure 4
Change in energy costs and in the production of energy-intensive sectors



Source: *EIB staff calculations based on Eurostat.*
Note: *The latest figures available are from August, 2024. The y-axis represents the share of energy-intensive production in manufacturing in the fourth quarter of 2024 vs. 2021. The x-axis is the energy total output price index (2021=100) for the fourth quarter of 2024 compared with 2021.*

Box A

Short- and medium-term impact of energy costs on EU competitiveness

The energy sector is of key importance in shaping Europe's competitiveness, sustainability and resilience. Several recommendations, such as the Draghi (2024) and Letta (2024) reports, address the pressing energy challenges faced by the European Union, while also positioning it to lead the global transition to clean energy.

If ambitious EU climate targets are accompanied by a cohesive plan to achieve them, decarbonisation could be an opportunity for Europe. A failure to coordinate policies, however, could damage competitiveness – and the steps made to decarbonise the EU economy could be delayed or even outright rejected. Affordable energy is central to the competitiveness of EU industry. Ensuring a secure and adequate supply of clean energy at globally competitive prices is necessary for the European Union to fully exploit its industrial strengths and seize the opportunities of the green transition.

To succeed, Europe needs a joint decarbonisation and competitiveness plan that aligns all policies with EU objectives. Priority areas include bringing down energy costs for end users by transferring the benefits of decarbonisation and doing everything to keep down costs while accelerating the decarbonisation of the energy sector. The second priority is capturing the industrial opportunities presented by the green transition – from remaining at the forefront of cleantech innovation, to manufacturing cleantech at scale, to leveraging the opportunities created by the circular economy. The third is levelling the playing field in sectors that are more exposed to unfair competition from abroad or face more exacting decarbonisation targets than those faced by international competitors.

Energy costs and investments

High and volatile energy prices put EU firms at a significant disadvantage compared with companies in major trading partners, like the United States and China. Energy prices have historically been higher in the European Union than in the United States, but the 2022 energy crisis widened this gap even further.

Wholesale and retail prices for gas are currently three to five times higher in Europe than in the United States, and they are two to three time higher than their historical average. Wholesale and retail prices for electricity (with a focus on industrial sectors) are currently two to three times higher than US prices, and up to 80% higher than the historical average.

High prices are driven by delays in installing new clean energy capacity and rapidly depleting domestic resources for fossil fuels, as well as the European Union's limited collective bargaining power despite it being the world's largest buyer of natural gas. This is largely because purchases are made by public and private groups within EU countries, without leveraging EU market power. As a major net importer of fossil fuels, the European Union is particularly vulnerable to sharp rises in fossil fuel prices. Reducing its dependency on imported fossil fuels would thus have clear socioeconomic benefits, increasing Europe's resilience and autonomy.

High energy costs are also driven by higher carbon prices and taxation, and by the incomplete state of the energy union, which results in wide differences in prices across EU members.

As natural gas will remain an important part of Europe's energy mix in the medium term, the European Union should seek to reduce the volatility of natural gas prices – for example, by increasing joint procurement to leverage its market power and by establishing long-term partnerships for reliable and diversified trade. Europe should also reduce its exposure to the volatile spot market prices for energy, by moving away from sources that are linked to spot pricing. It could also reduce volatility in EU gas markets by limiting speculation.

With renewables set to supply an increasing share of Europe's energy, the European Union must ensure that the lower costs of these energy sources are transferred to the energy bills of consumers and businesses. It should create an environment with more stable long-term prices, using tools like power purchase agreements and two-way contracts for difference, which will also help roll out renewables faster. Finally, it should focus on the flexibility of renewable power sources, like ways to respond to fluctuations in demand and storage, to integrate clean energy into the electricity system efficiently.

The European Union needs to fully unlock the potential of clean energy by focusing on investments in electricity grids to improve transmission and distribution. Effective grid planning by the European Union and member countries is key, as is the ability to accelerate permit processes, mobilise public and private financing, overcome equipment supply issues and innovate in grid designs and processes. Being able to assure a steady supply of energy at affordable prices requires massive investment in renewables, technological development, flexibility and expanded grid capacity. The energy sector needs projected investment of EUR 642 billion over the next decade.

Europe needs a comprehensive strategy on investment – one that reflects the rising cost of decarbonising the economy in an increasingly capital-intensive energy sector. To marshal the investment needed, the European Union should craft a multifaceted approach that encourages collaboration between the public and private sectors, deploys innovative financing mechanisms and creates supportive policy frameworks. The massive investment needs cannot be met by public funds alone. To bridge the gap, the European Union must unlock its vast pool of private capital available and use policies and financial instruments to help channel funds into remaking the energy sector.

Profits are returning to normal levels

Profits are falling back to Earth as inflation eases. Figure 5 plots the evolution of prices (captured by the value-added deflator) together with a proxy for the contribution of profits to prices, which is represented by unit margins.[1] When energy prices rose sharply, firms raised their own sales prices to offset the impact and increase profits, which enabled them to continue investing. However, since inflation peaked in late 2022, profits have abated. In the middle of 2024, profit margins receded, thereby deflating price pressures.

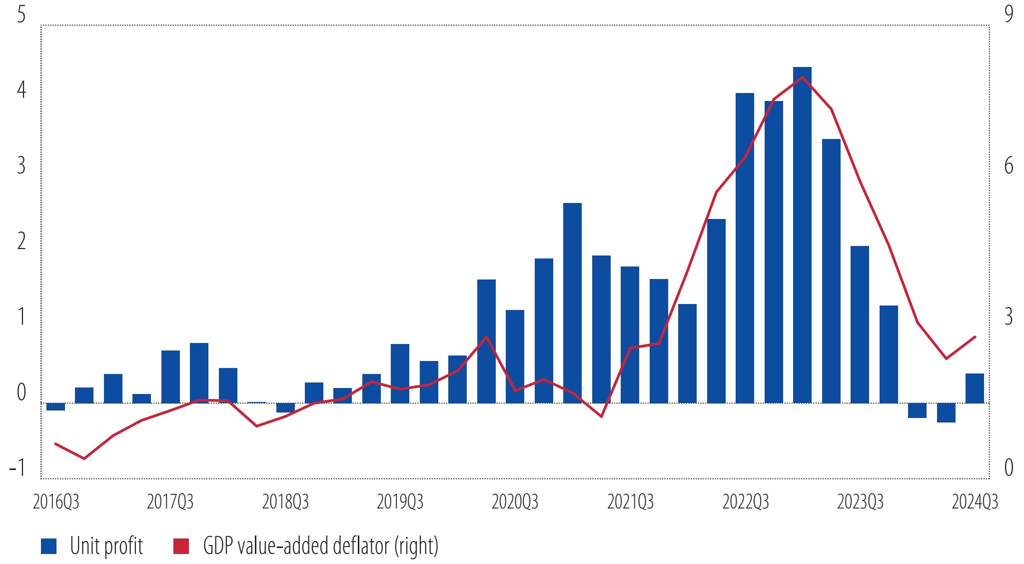
As profits normalise, they are growing below the historical average in most sectors. In the EIBIS 2024, 80% of firms said they were profitable – including 16% that were highly profitable (profits above 10% of turnover). This is similar to rates recorded in 2023, when 80% of firms were profitable and 17% were highly profitable. Figure 6 shows the share of companies with profits above 10% of turnover (elevated profits) for 12 sectors. Most sectors are below the 45-degree line, with profits tending to fall short of their normal development. In a few sectors however, profits in 2024 were above their historical average, for example in trade, transportation, computers, electronics and electrical equipment and tourism

1 The gross domestic product (GDP) deflator reflects the evolution of the price of one unit of goods consumed domestically. It results from changes in unit labour costs (compensation of employees per unit of real GDP), unit taxes (which reflect taxes on production net of subsidies per unit of real GDP) and unit profits (gross operating surplus per unit of real GDP).

(which are well above the 45-degree line). One explanation may be that these sectors, which were most affected by the COVID-19 crisis, rebounded strongly. Another is that firms in these sectors were not hit by the energy crisis at first, but by a more general increase in prices. This enabled them to continue attracting workers and investing.

Figure 5

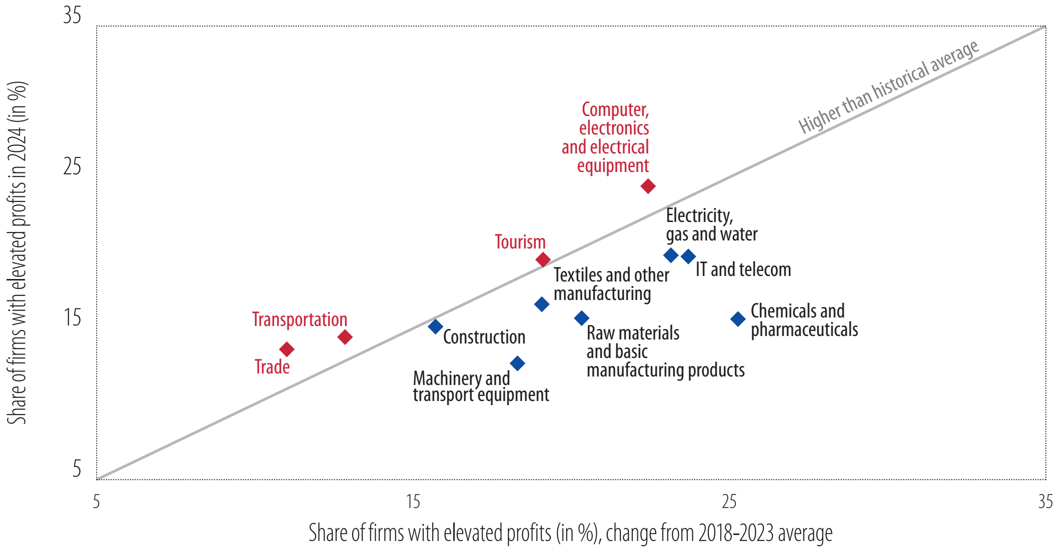
Profit margins and GDP deflator (in %)



Source: *EIB staff calculations based on Eurostat.*
Note: *The latest figures available are from the third quarter of 2024.*

Figure 6

Share of firms with elevated profits vs. the historical average



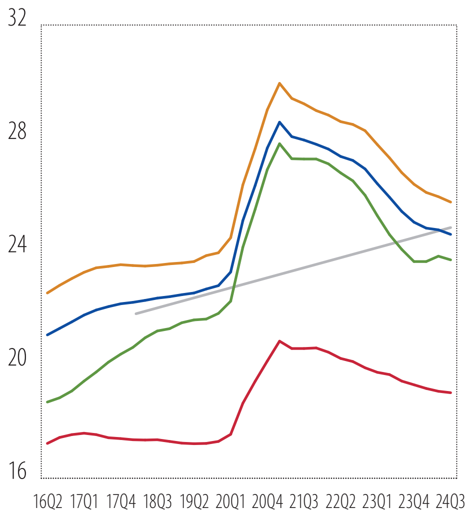
Source: *EIB staff calculations based on EIBIS 2018-2024.*
Note: *The figures use averages for 2018-2023 and the latest data from 2024.*

Firms reduced debt, but weak demand is making them vulnerable

Cash holdings are back to levels seen before the COVID-19 pandemic. Figure 7 shows the evolution of firm holdings of cash and liquid assets as a percentage of gross domestic product (GDP) for the European Union and three regions. These positions have increased faster than GDP since the beginning of 2016 because low interest rates gave firms little reason to use these funds for investment. During the COVID-19 crisis, firms took on debt (often guaranteed by government programmes), and their liquid asset ratio rose by more than 5 percentage points in Western and Northern Europe, in Southern Europe and for the European Union as a whole, and by almost 4 percentage points in Central and Eastern Europe. However, in the beginning of 2024, firms largely depleted these cash buffers to reimburse the debt contracted, and cash holdings returned to pre-pandemic trends.

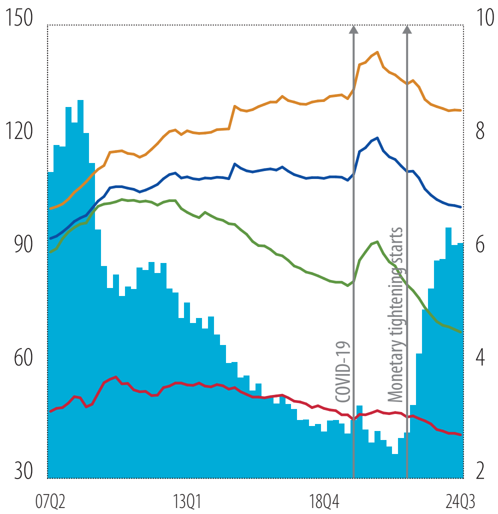
Firms repaid their COVID-19 debt and continued to deleverage, but interest payments on remaining debt continue to rise. Figure 8 shows the evolution of the indebtedness ratio as a share of GDP for the European Union as a whole and for the three main regions. During the COVID-19 crisis, firms used government guarantee programmes and raised debt in a very uncertain environment. The increase in the debt ratio is clearly visible for the European Union, for Western and Northern Europe and for Southern Europe. Four years later, firms have repaid COVID-19 debt and continued to deleverage, so that in the middle of 2024 debt ratios were below pre-crisis levels. Still, firms in Western and Northern Europe are much more indebted than before the crisis, while those in Central and Eastern Europe are much less indebted. The gap between indebtedness in Southern Europe and in Western and Northern Europe has also widened. Figure 8 indicates that monetary policy tightening has kicked in, increasing interest expenses despite the deleveraging.

Figure 7
Cash and liquid deposits of EU firms (% GDP)



Source: *EIB staff calculations based on Eurostat.*
Note: *Non-financial firms only. The latest available figures are for the third quarter of 2024.*

Figure 8
Debt ratio and interest expenses of EU firms (% GDP and/or gross value-added)

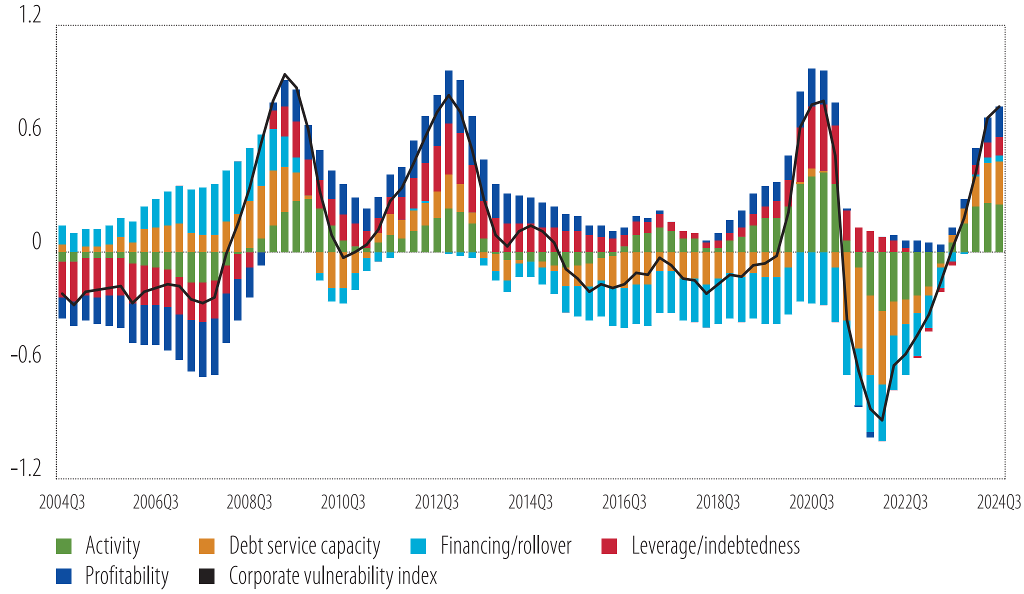


Source: *EIB staff calculations based on Eurostat.*
Note: *Non-financial firms only. Debt includes loans and bonds. Quarterly data is used to calculate paid interest expenses. The latest available figures are for the third quarter of 2024. Four-quarter moving averages.*

Corporate vulnerability is rising as overall activity remains subdued. Figure 9 plots the Corporate Vulnerability Index, a synthetic aggregate based on 24 series of data reported by various sectors. As shown in the figure, the series assembles components related to activity, profitability, financing and debt rollover, and debt servicing and leverage (EIB, 2022). The indicator rose in the beginning of 2022, in step with the removal of policy support deployed during the COVID-19 crisis, the start of the energy crisis and tighter monetary policy (EIB, 2024b). In the first half of 2024, the index is above the historical average since 2003. The indicator points to more vulnerabilities than usual. It is halfway to the historical peaks seen during the global financial crisis in 2008, the sovereign debt crisis in 2010-2012, and the onset of the COVID-19 crisis in the first half of 2020. Weaker company balance sheets do not bode well for investment.

Figure 9

Corporate vulnerability index, by components



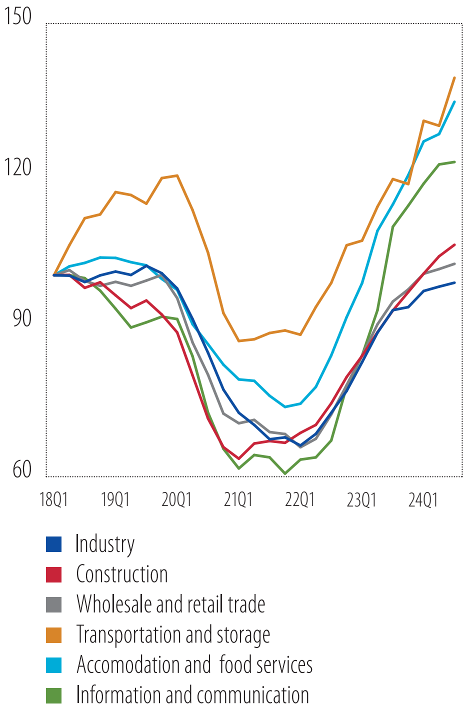
Source: *EIB staff calculations based on Eurostat and the European Central Bank (ECB).*

Notes: *The corporate vulnerability indicator is a weighted average of more than 20 variables related to EU firms' performance and balance sheet structure. See Harasztosi (forthcoming). The latest available figures are for the third quarter of 2024. Positive values indicate an increase in vulnerability.*

The number of firms declaring bankruptcy is generally on the rise. As vulnerabilities increase, bankruptcies follow. As shown in Figure 10, the number of firms ceasing to operate continues to grow in most sectors. Bankruptcy figures remain below pre-pandemic levels in some of the sectors, but they are well above them in others, such as transportation and storage, accommodation and food services and information and communication. The recent rise in bankruptcy rates across sectors suggests that, after rebounding from historic lows during the pandemic, companies are now going bankrupt again in reaction to weak economic activity and tighter financing conditions.

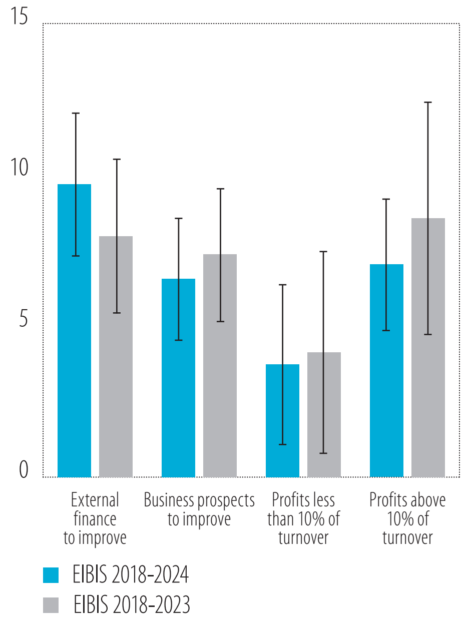
EIBIS results do not signal a major upturn in firms' investment, as improved financial conditions are counterbalanced by reduced profits. Several firm characteristics affect the investment outlook. We use probit models to estimate the impact of financial indicators on investment plans, after controlling for several factors. Estimates from the models can be used to compare signals from the EIBIS in 2023 with those recorded this year. The results are reported in Figure 11. Profitable firms are more likely to increase investment. Firms with profits above 10% of turnover are up to 8 percentage points more likely to increase investment. The impact of improved business prospects and better access to external finance and internal finance are all positive and of a similar magnitude: around 8 percentage points. The effects, which are significant, confirm the major relevance of the availability of internal and external finance for investment decisions. Looking ahead, firms' ability to finance investment internally will be diminished, while external finance will be more available and less costly. Still, none of these dynamics is significant enough to trigger a major change in the investment outlook compared with 2023.

Figure 10
Firms ceasing to operate (an index, 18Q1=100)



Source: EIB staff calculations based on Eurostat.
Note: Four-quarter moving average. The latest available figures are for the third quarter of 2024.

Figure 11
The impact expectations of firm profits have on the probability of accelerating investment (in percentage points)



Source: EIB staff calculations based on EIBIS 2018-2024.
Note: A probit model is used to estimate the likelihood of investing the following year or over the next three years. Country, size and sector dummies are used as controls. The data is for EU firms. The black lines represent 95% confidence intervals

A gradual improvement in external finance for investment – but gaps remain in funding for innovation

This section reviews the latest developments in external finance, showing that financial conditions have started to loosen since the middle of last year. For bank finance, the cost of borrowing has declined and credit standards have softened. The improvement in external finance bodes well, as firms turn to external sources to finance capital expenditure. However, the improvement in external finance depends on further loosening of monetary policy.

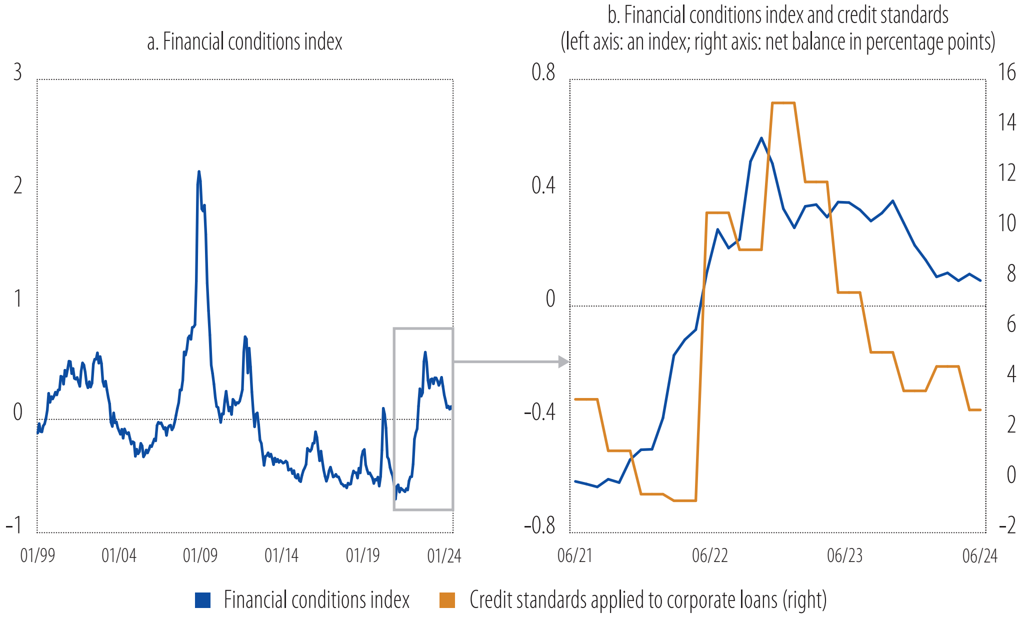
EIBIS 2024 shows that an increasing share of firms are finance constrained. Strategic segments of the EU financial system are underdeveloped and show no signs of catching up, making it difficult for firms to find the funds required for transformative investments. Promising firms need more diverse funding sources, such as private equity, venture capital, scale-up finance and funding from public exchanges, including both initial public offerings (IPOs) and secondary offerings.

Loosening financial conditions for investment

The EU financial conditions index and credit standards are slowly improving. Financing conditions started to improve in the middle of 2023, in line with an expected loosening of monetary policy. However, as shown in Figure 12, the financial conditions index continued to reflect a difficult environment in the summer of 2024. In parallel, credit standards began to soften by the beginning of 2023. In the third quarter of 2024, euro area banks reported a net tightening of credit standards for loans and credit lines, bringing numbers back up to levels seen in the first quarter of 2022. Although the monetary tightening in the euro area had not yet started at that time, banks were already pricing in higher rates. The EIB's Central, Eastern and South-Eastern Europe (CESEE) Bank Lending Survey shows that credit demand remained strong, driven by the retail business, and credit supply improved after contracting for four semesters. However, the banks surveyed indicate that demand and supply are expected to soften in the near term (EIB, 2024a).

The outlook for external finance is improving. Since internal and external financing conditions have a bearing on investment, they must be considered together to assess the investment outlook. Drawing from the EIBIS, Figure 13 plots an indicator of the outlook for internal finance together with an indicator of the external finance outlook for firms in each EU country. Except for Romania, where both internal and external finance are reported to have deteriorated, all EU countries report improvement of at least one of the indicators. The 45-degree line shows which countries saw more improvement in internal financing conditions (below the line) or in external ones (above the line). As most countries are plotted above the line, the reported improvement is generally more pronounced for external finance.

Figure 12
EU financial conditions index (de-meaned) **and credit standards**



Source: *EIB staff calculations based on Andersson et al. (2021).*
Note: *The values are de-meaned over the 1999-2023 period. Panel b shows the credit standards applied to corporate loans. An increase in each indicator reflects a tightening. The latest figures available are for July 2024.*

Figure 13
Outlook for the availability of internal and external finance (change in net balance, in %), **2024 vs. 2023**

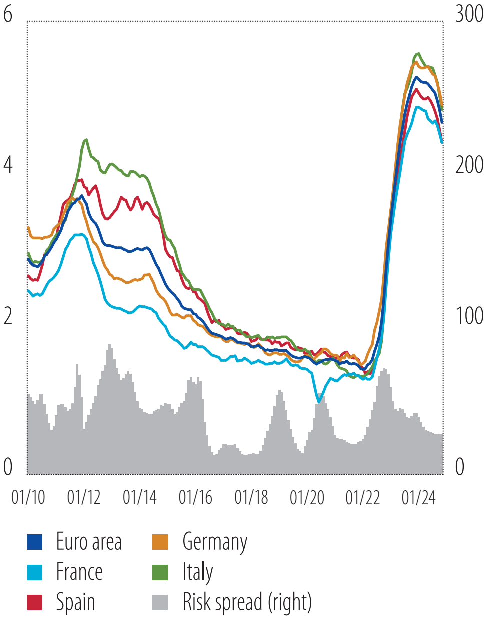
Source: *EIB staff calculations based on EIBIS 2019-2024.*

Bank financing has recovered slightly

Firms' bank borrowing costs are edging down, and risk premiums remain contained. Figure 14 reports the composite cost of bank borrowing for companies in the major euro area economies. From the start of the monetary policy tightening in June 2022, until its end in September 2023, rates rose by 450 basis points, and bank borrowing costs by around 400 basis points. As markets began to expect central banks to loosen monetary policy shortly after rates peaked, higher interest rates did not have time to fully pass through to bank rates, but the historical relationship was still maintained. Since the start of 2024, bank borrowing costs have been declining in step with monetary policy loosening. The decline has been shared across the major euro area economies. In parallel, Figure 14 also shows that credit risk remains contained, although bankruptcies are on the rise amid higher cost of financing (see Figure 10).

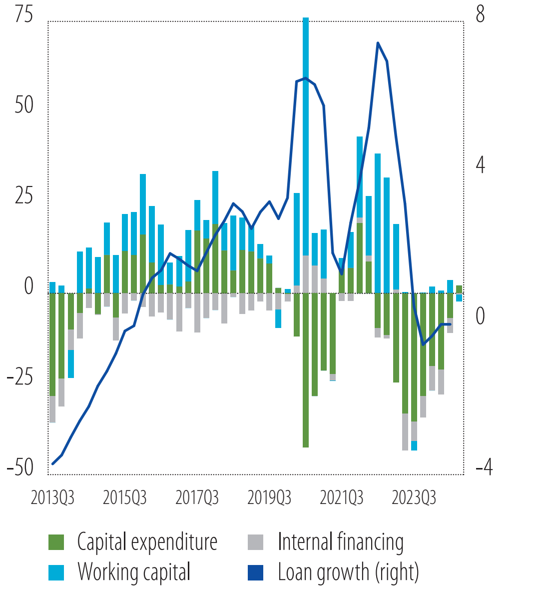
Firms' demand for loans has started to recover very slowly and is largely driven by the need to finance operations. Figure 15 plots annual growth in corporate loans together with the factors driving loan demand. From the middle of 2022 until the end of 2023, demand for corporate loans slowed from the very brisk pace recorded during the COVID-19 crisis. Demand even declined slightly further from the end of 2023 until the middle of 2024, mostly owing to weak economic activity and tight financial conditions. Loan demand started to recover slightly as financial conditions eased, but the recovery remains unclear. Moreover, it is fuelled by the need to finance operational expenses, and not yet investment. Loan demand for capital expenses remains below the historical average, dragging down overall corporate loans.

Figure 14
Corporate bank borrowing costs and risk premium (left axis: in %; right axis: basis points)



Source: *EIB staff calculations based on the ECB, Refinitiv Eikon and Eurostat.*
Note: *Borrowing costs are a three-month moving average. Risk premiums are the difference in the spreads of A and BBB-rated EU corporate bonds. The latest available figures are for November 2024.*

Figure 15
Annual growth in corporate loans and the factors driving loan demand (net balances, left axis: in percentage points; right axis: in %)



Source: *EIB staff calculations based on the ECB and Refinitiv Eikon.*
Note: *Uncertainty is calculated as the weighted average of bond and stock volatility and the ECB indicator for composite risk. The latest available figures are for the second quarter of 2024.*

As central banks remove excess liquidity, a smoothly functioning market for securitised assets may be a source of funding

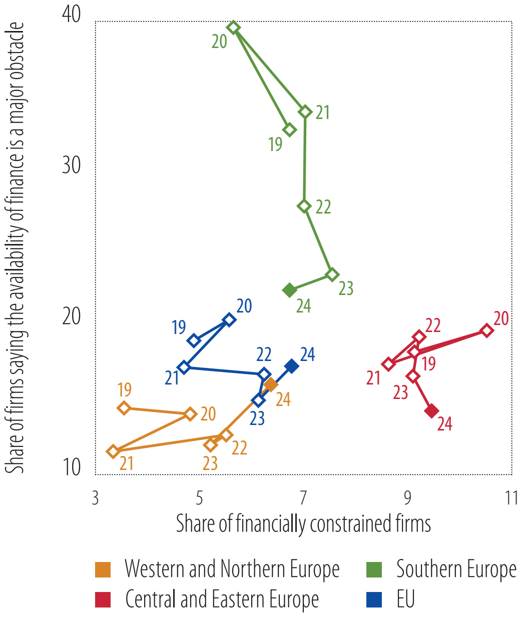
The share of firms that are financially constrained remains structurally high and is still growing. Figure 16 shows the evolution across several waves of the EIBIS in the share of financially constrained firms and of firms that report finance as an investment barrier for the European Union as a whole and for the three main regions. In the European Union and in Western and Northern Europe, the share of financially constrained firms stands at the highest level since 2019, 2 full percentage points higher than before the COVID-19 crisis. In Figure 16, a move up and to the right suggests that conditions for external finance are weighing more heavily on investment. As there is no clear upward move in Figure 16, firms are not reporting financing as a barrier to investment more frequently. However, access to external finance remains more problematic for certain types of firms, such as small businesses and fast-growing firms.

A smoothy functioning securitisation market could fill in gaps in bank credit. Securitisation allows financial institutions to transfer credit risk from their loan portfolios to investors with a higher risk appetite. This frees up bank capital and bank funding, which banks can then leverage to unlock finance. Securitisation also provides a more diversified loan portfolio for investors, allowing them to reduce risk across multiple borrowers and sectors. Moreover, when banks originate loans that are later securitised, they free capital or funds for borrowers like small firms, which are typically finance-constrained. However, securitisation activity in Europe is well below that of the United States. Since 2019, it has represented an average of just 0.1% of total bank assets in Europe – five times less than in the United States.[2]

2 Agencies such as Freddie Mac and Fanny Mae are not taken into account in this computation.

Figure 16

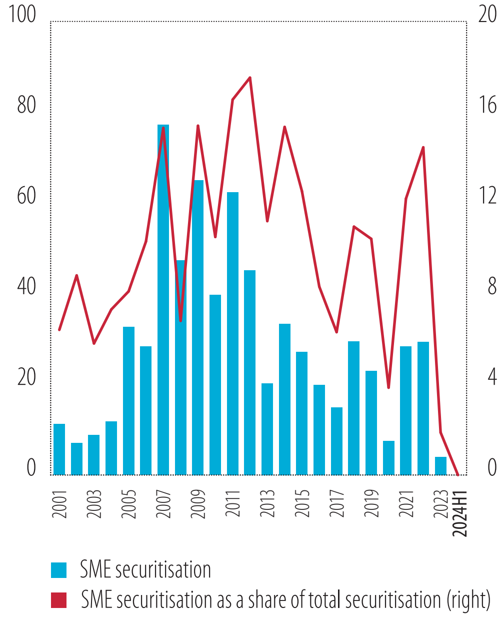
Share of finance-constrained firms and firms that report finance as an investment barrier (in %)



Source: *EIB staff calculations based on EIBIS 2019-2024.*

Figure 17

Issuance of SME securities in Europe (left axis: volume in EUR billion; right axis: % of total securitisation)



Source: *The EIF's European Small Business Finance Outlook based on data from Invest Europe and Botsari et al. (2024).*

Note: *Data is for firms located in Europe only.*

European activity for securitisation of small business loans remains subdued. While SME securitisation reached EUR 29.3 billion in 2022, close to 2021 levels (EUR 28.4 billion), SME securities issuance remained particularly weak throughout 2023 and into 2024. As shown in Figure 17, SME securitisation activity stalled completely during the first three quarters of 2023, with only a modest EUR 4 billion recorded in the fourth quarter.[3] This level of issuance is far below historical trends. The drop-off continued in the first quarter of 2024, with no SME securitisation activity registered. The recent drop in issuance might be explained by an increase in the cost of capital and perceived higher risk, caused by a volatile economic environment, which has led to a decline in the demand of such products. However, even before the COVID-19 outbreak, SME securities issuance in Europe had been hit by several factors, such as the stigma of the asset class following the global financial crisis, new regulation and excess liquidity provided by the European Central Bank (ECB).

As the ECB removes excess liquidity, asset-backed securities are likely to become more relevant as a funding source. Until very recently, euro-area banks were retaining asset-backed securities on their balance sheets to post them as collateral, as the ECB was operating under full liquidity allotment (Schnabel, 2024), a system under which the central bank provides unlimited liquidity at a fixed rate against eligible collateral. As the ECB removes excess liquidity, asset-backed securities are likely to become more relevant as alternative funding sources are needed. Ongoing discussions about Europe's capital markets union should focus on creating a supportive regulatory environment for SME securitisation. It would help financial firms better support growing companies.

3 It is important to highlight that the rise in synthetic SME transactions, such as unrated bilateral deals, is not captured in these statistics. These synthetic deals have become a significant alternative financing source, especially as true sale transactions are largely absent. This shift in the market suggests that while traditional SME securitisation remains subdued, alternative forms of securitisation continue to play a role in supporting SME financing.

Private equity, venture capital and scale-up finance are underdeveloped

High-growth, innovative companies face more financial constraints than the average firm. Their business models make traditional financing less accessible, as their lack of financial track-records and stable revenue makes banks more reluctant to lend to them. They also face higher technological, regulatory and demand risks, which increases financing costs. Additionally, it can be harder for them to use assets as collateral, as intangible assets are difficult to value. In Europe, unlike in the United States, using patents as collateral is limited or non-existent. Consequently, securing financing – especially equity – is a big challenge for these companies, even if they are backed by venture capital (European Investment Fund (EIF), 2024a). We analyse private equity and venture capital investment in Europe compared with other advanced economies, such as the United States, and its role in finance that enables firms to scale up.

Venture capital and private equity finance is strikingly underdeveloped in Europe. As shown in Figure 18, the European Union consistently records lower venture capital and private equity investment in non-financial firms as a share of GDP when compared to the United States and the United Kingdom. From 2013 to 2023, the average share of venture capital investment in non-financial companies in Western and Northern Europe was only one-third of that in the United States and United Kingdom. The gap is even wider in Southern Europe and in Central and Eastern Europe, with venture capital investments at roughly one-tenth of the US level. Private equity investment levels in Western and Northern Europe and in Southern Europe are about half the US level and in Central and Eastern Europe they are one-seventh the US level.

Venture capital and private equity are crucial financing sources for innovation and fast-growing firms, and the structural underdevelopment of these segments does not bode well for Europe's growth. Large institutional investors, such as pension funds, provide a much smaller share of funds for venture capital and private equity. Pension funds account for only 4% of capital raised by venture capital funds,[4] and just 0.02% of EU pension fund assets under management were invested in European venture capital in 2022. Corporate venturing[5] has grown in the last decade, especially in the high-tech, aerospace and energy sectors (see Siota et al., 2020). However, European venture corporates, or companies that provide venture capital directly to growing businesses, are more likely to invest abroad (see Gavigan et al., 2024). Overall, corporate investors accounted for 11% of venture capital funds committed in 2023 (Invest Europe, 2024a).

Since 2022, tightened financial conditions have been a drag on venture capital and private equity activity. As shown in Figure 19, the European venture capital and private equity markets recovered quickly from the initial shock of the COVID-19 pandemic, and fundraising activity reached record highs in 2022. However, private equity investment declined by 18% in 2023 compared with 2022, to EUR 96 billion. Venture capital followed a similar trend, reaching EUR 13 billion in 2023. The latest data for 2024 show signs of stabilisation in European venture capital and private equity markets, as private equity fundraising and venture capital investments recorded a moderate increase (see also Invest Europe, 2024b). The overall lower activity levels of the last two years contrasts with almost 15 years of continuous growth.

The latest waves of the EIF venture capital and private equity mid-market surveys confirm the bleak picture. Box B summarises the main finding of the most recent results of the EIF Venture Capital Survey (EIF, 2024a).[6] In 2024 market sentiment deteriorated further, according to fund managers' assessment of the situation. Geopolitical and macroeconomic uncertainties continue to weigh on EU private equity

4 Invest Europe (2024a). Average of 2013-2023.

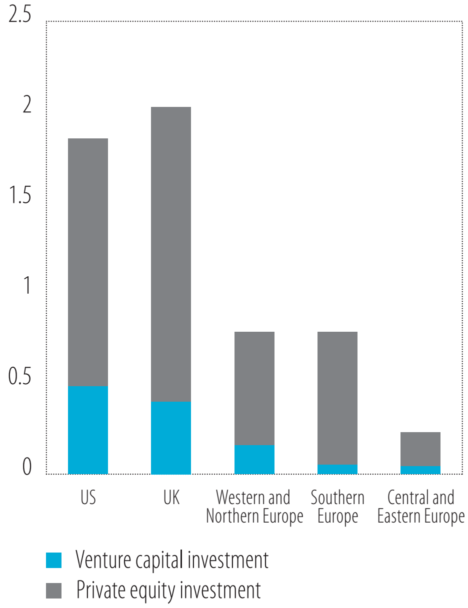
5 Corporate venturing consists of venture capital investments by specific financial companies, and venture corporates refers to firms that directly provide venture capital for other firms.

6 The EIF Private Equity Mid-Market Survey 2024 was performed together with the EIF Venture Capital Survey 2024. For more details, see EIF (2024b).

and venture capital markets. However, the EIF survey results also suggest that the bottom may already have been reached, and a moderate upturn may follow, as reflected in respondents' expectations for the 12 months following the summer 2024 survey.

Figure 18

Venture capital and private equity investments (% GDP), **average 2013-2023**

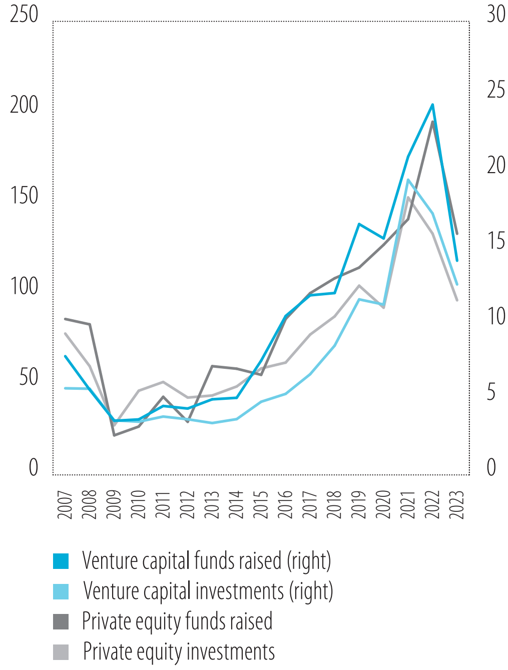


Source: *EIB staff calculations based on Bloomberg data for venture capital and private equity investment and GDP data from the International Monetary Fund (IMF).*

Note: *Includes only venture capital and private equity investment in non-financial firms.*

Figure 19

Activity in private equity and venture capital (left axis: private equity in EUR billion; right axis: venture capital in EUR billion)



Source: *Botsari et al. (2024), based on Invest Europe data.*

In Europe, 261 firms emerged from 2013 to 2023 as having a strong likelihood of being able to effectively scale up their operations.[7] This represents a small fraction of the 32 million companies registered in Europe. These scale-up firms are mostly active in information and communications technologies (34%), but also in finance (10%) and manufacturing (17%). Scale-up firms are very important for EU economic competitiveness. They are strategic for Europe to remain at the forefront of technology. As detailed in Chapters 1 and 5, the European Union increasingly lags behind the United States in productivity growth and spending on research and development (R&D).

As firms grow, they have an increasingly hard time finding finance. Ten years after they are founded, EU scale-ups have raised, on average, 50% less capital than their US counterparts. Figure 20 follows cohorts of scale-ups in San Francisco, London and the European Union, where scale-ups are diffuse in several locations. The initial average amount raised is similar. However, San Francisco scale-ups raise capital much faster than EU scale-ups, and raise more of it with fewer financing rounds. EU companies

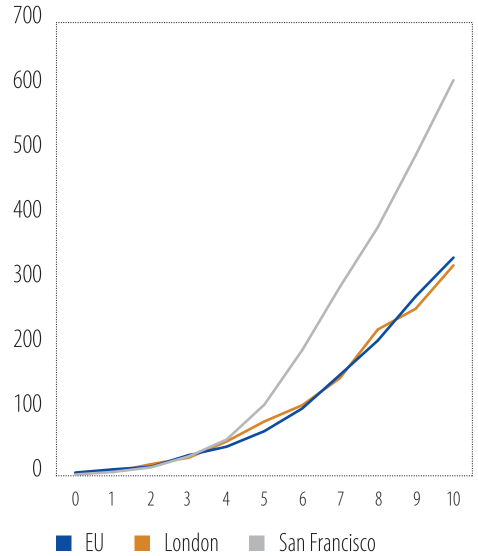
7 For this report, we define scale-up firms as companies that have successfully concluded a deal with a post-money valuation between $500 million and $10 billion. While market valuation makes the definition vulnerable to fluctuations in companies' market value, similar definitions are widely accepted in the literature. For example, unicorns are defined as companies with a market valuation above $1 billion (see Fratto et al., 2024).

face increasingly severe funding constraints in the scale-up phase. 82% of scale-up deals in the European Union involved a foreign lead or sole investor, compared with only 14% in San Francisco (see Fratto et al., 2024).

EU policies must figure out how to ensure a robust pipeline of innovative companies capable of delivering breakthrough technologies. While these innovative firms make up only a small fraction of smaller firms – with just 0.2% of EU small and medium firms receiving venture capital, private equity or angel financing[8] – they are a major source of growth. Ensuring that these companies thrive has exponential benefits for economic dynamism. From 1995 to 2019, half of publicly traded firms in the United States received venture capital financing at some point in their life (Lerner and Nanda, 2020).

Figure 20

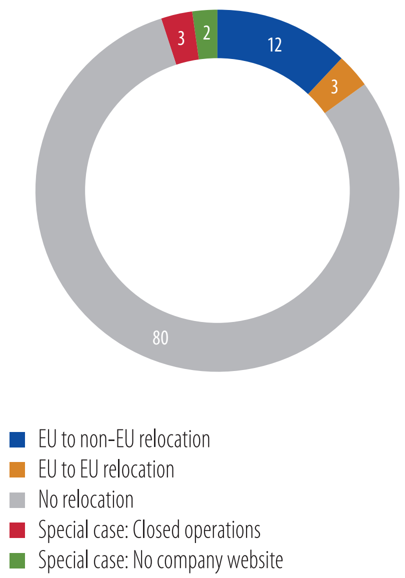
Cumulative capital raised by scale-ups during their first ten years of business (USD million, current prices)



Source: *EIB staff calculations based PitchBook Data, Inc.*
Note: *The sample consists of a strongly balanced panel of companies that completed at least one deal of USD 500 million to USD 10 billion from 2013 to 2023. The nationality of the general partner is determined after the company reached a market valuation of USD 500 million. For further details, see Fratto et al. (2024). For all charts using PichBook data, the data have not been reviewed by PitchBook analysts and may be inconsistent with PitchBook methodology.*

Figure 21

Scale-up firms that relocated for better business and growth opportunities (% of firms)



Source: *EIB staff calculations are based on PitchBook Data, Inc.*
Note: *The sample consists of companies that completed at least one deal from 2013 to 2023 and that have a market valuation of USD 500 million to USD 10 billion. The country is based on the location of the company's headquarters. (see Fratto et al. (2024)).*

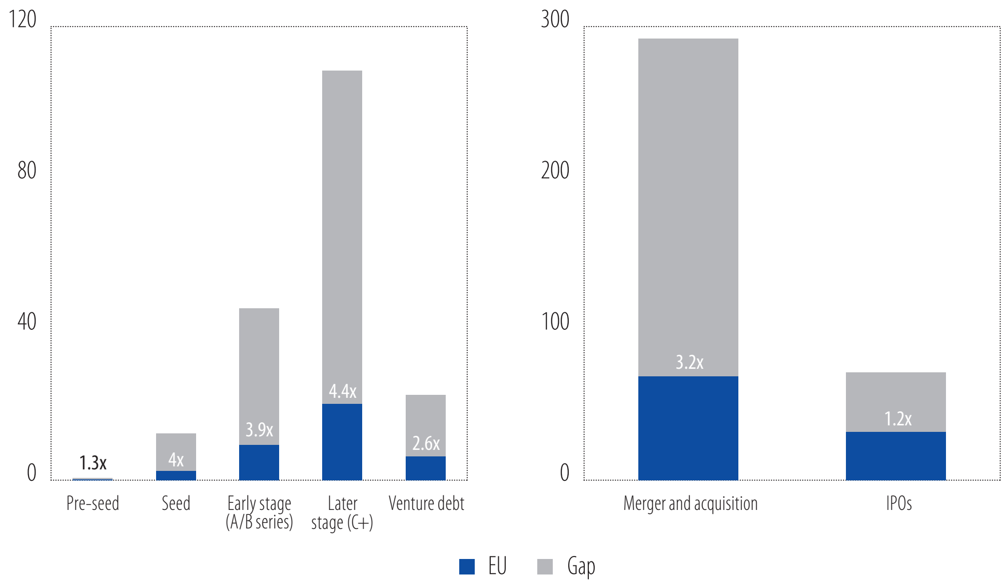
As a result of barriers to growth, European scale-ups are more likely to relocate abroad (Figure 21). EU scale-ups are more likely to relocate than peers in San Francisco (15%), and they mostly go to the United States. Relocations tend to occur right after a funding round, particularly during earlier stages like Series A/B, often as a condition for investment (Fratto et al., 2024). Europe is losing its best companies. EU companies that relocate are more likely to provide investors with an exit, whether via an IPO or an acquisition, than those that decide to stay. These relocations have economic costs, such as an entrepreneurial brain drain and missed opportunities for the country of origin. Successful EU companies

8 EIB staff calculations based on PitchBook and the European Commission's Joint Research Centre (2023).

that relocate or expand abroad but maintain a presence in the country of origin may continue to help build markets in that country, but perhaps with lower impact.

Companies have more appealing exit options outside of Europe. Venture capital fund managers have said that it is important to improve the ability of EU companies to sell shares through an IPO (EIF, 2024b). On average, EU scale-ups reach the exit stage nine years after being established. One-third of EU scale-ups exited through IPOs on US stock exchanges, while over 50% of acquisitions of these scale-ups involved a foreign buyer, usually from the United States (compared to 13% for San Francisco scale-ups). Moreover, the decision to relocate influences the probability of success, as relocations are associated with a higher likelihood of being bought out, merging with another firm or undergoing an IPO. EU companies listed abroad see their market valuations increase more after an IPO, despite generally raising less capital. Private equity buyout deals (the largest exit strategy) are around 2.5 times larger in the United States than in the European Union. The presence of foreign investors in earlier funding rounds often means a higher likelihood of being acquired by foreign buyers, especially in the absence of a European lead (private or public) investor.

Figure 22
Capital invested and the gap with the United States (EUR billion)**, by instrument type**



Source: *EIB staff calculations based on PitchBook Data, Inc.*

The European venture capital market has developed significantly in the last 20 years, but gaps remain, particularly at the later stages. Across all stages, the EU venture capital market is about EUR 150 billion smaller than the US one (including venture debt; see Figure 22). The gap is particularly large in the later stage financing (C+), both in relative terms (US financing is 4.4 times EU levels) and in absolute values (a difference of EUR 88 billion). In a typical year, investments from the EIB Group and the European Innovation Council account for 3.5% of all venture capital and venture debt investment.

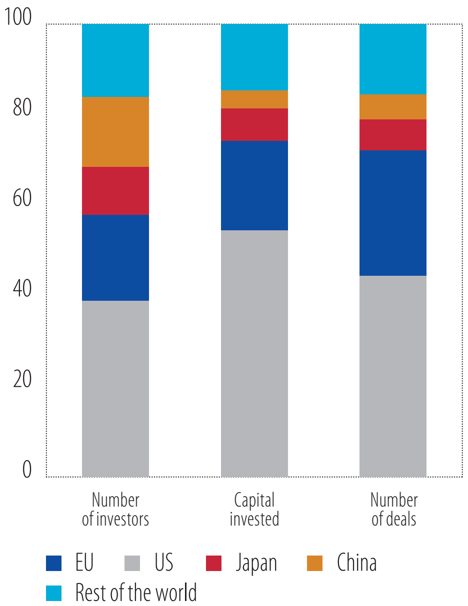
To develop innovation finance, Europe needs a plan to mobilise institutional investors and advance key reforms. The lack of scale and shallow depth of European venture capital markets reduce financing opportunities for innovative companies, increase their financing costs and affect investors' returns. Europe needs larger venture capital funds capable of providing large investments for scale-ups, and investors with technical expertise[9] who can serve as lead/co-lead investors and draw in other, more

9 Including specialised venture capital funds, public direct equity co-investors and corporate investors.

general investors. Mobilising institutional investors and others by providing de-risking tools, public capital with a long-term horizon (equity and debt) and a diversified source of financing through public support could strengthen the EU funding environment. To bring more limited partners[10] into the market, Europe needs to address regulatory barriers and different risk appetites, and promote first-time investments. Advancing the capital markets union and pursuing a fully unified market for European IPOs would improve access to financing for all companies and provide better exit options for venture capital-backed companies.

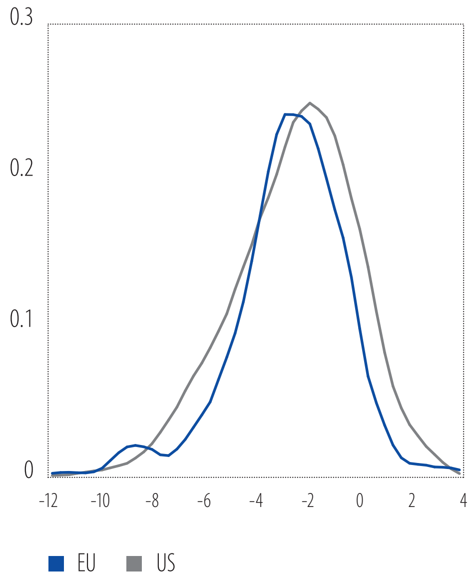
EU companies can provide exit opportunities for venture capital investors. The poor exit options for EU startups are seen as a main reason for the slow development of venture capital. Europe trails the larger entrepreneurial hubs in the United States, particularly at the scale-up phase, when it becomes pressing to identify exit opportunities for the initial investors. Being acquired by an incumbent is one of the predominant exit options. We therefore look at the behaviour of EU firms as potential acquirers of existing startups, with a particular focus on the world's top innovators (Joint Research Centre, 2023).[11]

Figure 23
M&A activity by top global innovators (in %), **2016-2022**



Source: *EIB staff calculations based on PitchBook Data, Inc.*
Note: *The region refers to the location of the investor's headquarters. The sample include all companies featured in the JRC R&D Scoreboard (2023) that completed merger and acquisition (M&A) deals from 2016 to 2022. PitchBook analysts have not reviewed the information presented.*

Figure 24
Distribution of capital invested per innovator (2016-2022), **rescaled by market capitalisation**



Source: *EIB staff calculations based on PitchBook Data, Inc.*
Note: *The x-axis shows the capital that companies listed on the JRC R&D Scoreboard (2023) invested to acquire startups. The formula is ln(capital invested from 2016 to 2022) – ln(market capitalisation in 2022). PitchBook analysts have not reviewed the information presented.*

EU companies are not providing an exit option. US investors represent 40% of investment in top innovators, in terms of R&D spending and mergers and acquisition activity between 2016 and 2022, while EU investors make up only 19%. However, from 2016 to 2022, US investors accounted for a larger

10 For example, domestic mutual funds, pension funds, insurance companies, corporates, sovereign wealth funds and other patient capital investors.
11 Top innovators are defined as companies that invest the most in R&D in the world, as identified by the JRC R&D Scoreboard.

share of capital invested for mergers and acquisitions (54%) and deals completed (44%), compared with 20% of capital invested and 27% of deals completed by EU investors (Figure 23). US firms tend to attract larger investments than companies in other regions of the world, including the European Union. The amount of capital invested by innovative US companies from 2016 to 2022 is generally larger than for EU counterparts. This is partly attributable to the difference in market capitalisation between US investors and EU investors. Rescaling the amount invested over the period by the market capitalisation of each company, it appears that EU innovators invest as much as US innovators (Figure 24). However, EU innovators generally acquire companies abroad, so just 2% of the capital invested by the top EU innovators goes to acquire EU startups – 43% is invested in US startups, 11% in UK startups and 44% in the rest of the world (Fratto et al., 2024).

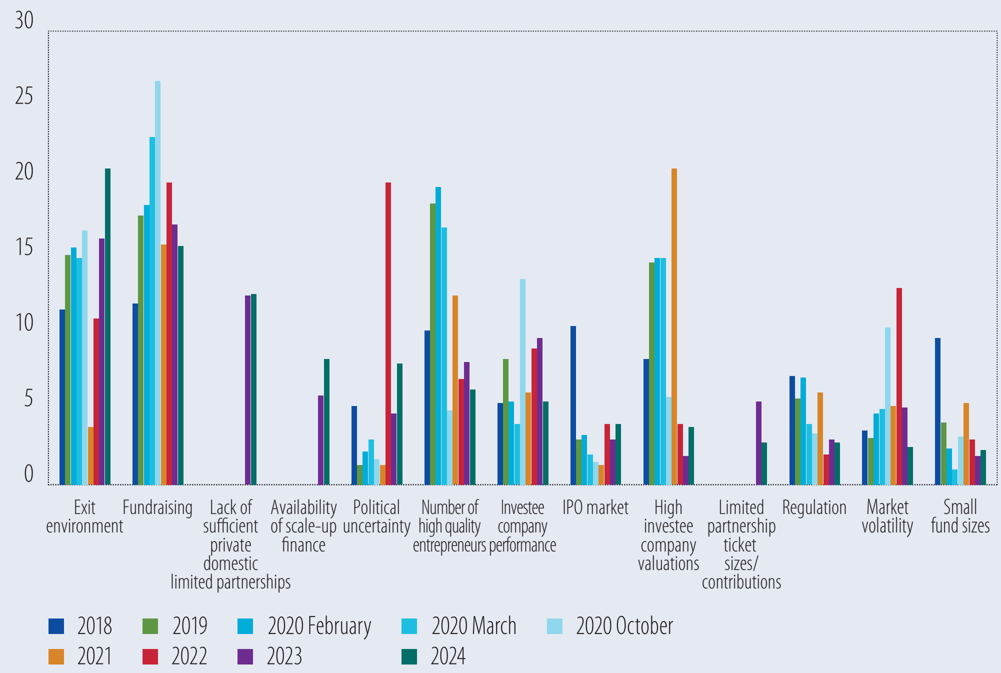
Box B

The venture capital market environment remained challenging in 2024

The findings of the EIF Venture Capital Survey 2024 show how current economic challenges are affecting the sentiment of venture capital fund managers. Although market conditions have improved slightly from a year ago, they are still perceived as difficult, and the environment is very negative for fundraising and exit strategies. However, when interviewed in the summer of 2024, fund managers said they were more optimistic about the next 12 months.

Figure B.1

Major challenges facing the development of venture capital (% of respondents)



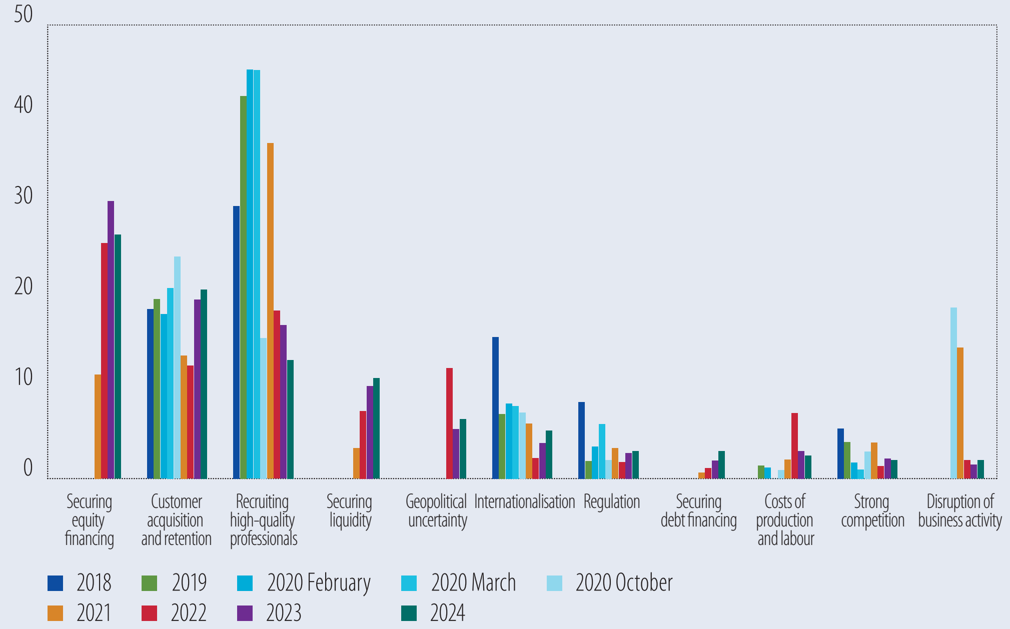
Source: *EIF (2024a).*
Note: *Since 2022, the category "political uncertainty" was broadened to include "geopolitical uncertainty and related consequences." In 2023, the category "investee company performance" was changed to "portfolio company performance" while the categories "availability of scale-up finance for venture-backed companies," "lack of sufficient private domestic limited partnerships" and "limited partnership ticket sizes/contributions" were introduced for the first time.*
Question: *"Please select the biggest challenge you currently see in your venture capital business." This question allowed respondents to choose multiple answers. The chart shows the answers that respondents marked as their first and most important challenge. Categories selected by 1% of respondents or less are not shown.*

Figure B1 shows that in 2024, the exit environment surpassed fundraising as the primary concern for fund managers. This is also reflected by increasing insolvencies among portfolio companies. At the same time, insufficient liquidity in the IPO market and a thin market for mergers and acquisitions are complicating the exit environment.

Firms within venture capital portfolios still say that their main challenges are recruiting skilled professionals and securing finance (Figure B2), particularly during the scale-up phase. The lack of private domestic partners and large institutional investors contributes to these issues.

Despite a challenging market, fund managers are optimistic about future investment activity and portfolio development. A large share of managers report having companies in artificial intelligence, deep tech and cleantech in their portfolio, and they expect these types of investments to remain important in the future. Artificial intelligence, biotech and energy/climate are also seen as the most promising sectors for investment in the next three to five years.

Figure B.2
Major challenges faced by venture capital portfolio companies



Source: *EIF (2024a).*
Note: *Some categories were not available in all years. For example, the category "geopolitical uncertainty" has only been available since 2022. The category "disruption of business activity" read "disruption of business activity or changes to how the business operates (such as to export restrictions)" in the 2024 survey questionnaire.*
Question: *"Please select the biggest challenges you see for your portfolio companies over time." This question allowed respondents to choose multiple answers. The chart shows the answers that respondents marked as their first and most important challenge. Categories selected by 1% of respondents or less are not shown.*

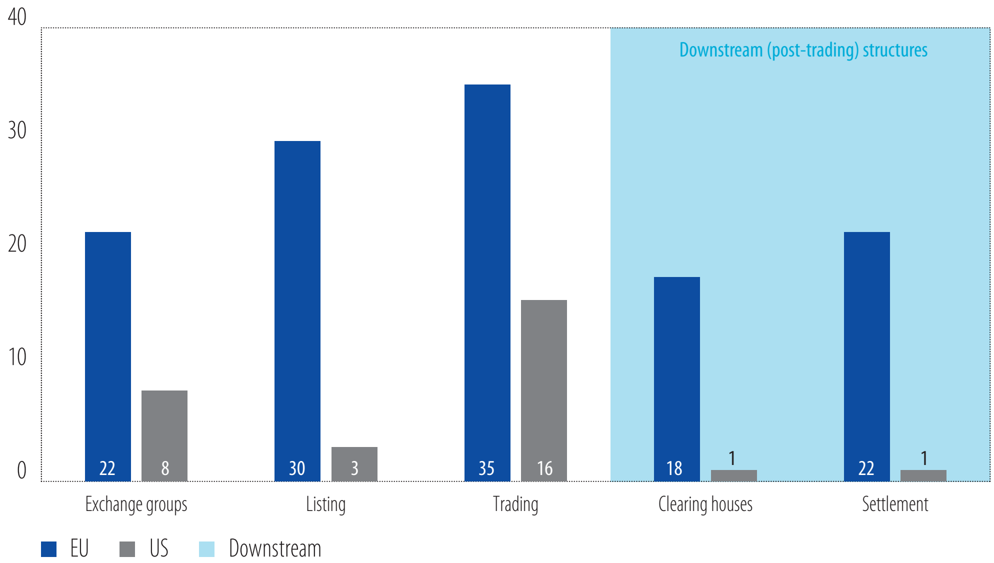
A need for broader access to external equity

Beyond the disparities in private markets, significant gaps between the European Union and the United States also exist in public equity markets. Despite a stock market capitalisation that is four times higher than in the European Union (see Section 3.3 of Chapter 1), the US equity market maintains a simpler, more integrated market structure – especially in the post-trade infrastructure (see Figure 25).

By contrast, the EU post-trade infrastructure is fragmented, with around 20 times as many post-trade providers. This complexity may help explain the smaller, less developed stock markets, and why the EU share of global stock market capitalisation and IPO activity is lower than its share of global GDP. As almost every EU member has its own stock exchange, stock trading and post-trade activities take place on many markets. This fragmentation raises costs and hampers liquidity.

Figure 25

Comparison of the integration of US and EU financial markets, various indicators



Source: *EIB staff calculations based on New Financial (2021).*
Note: *Clearing houses include LCH Clearnet (owned by the LESG group), which after Brexit was authorised to provide service to all EU members until 30 June 2025.*

Figure 26

Differences in the size, integration and depth of capital markets across countries

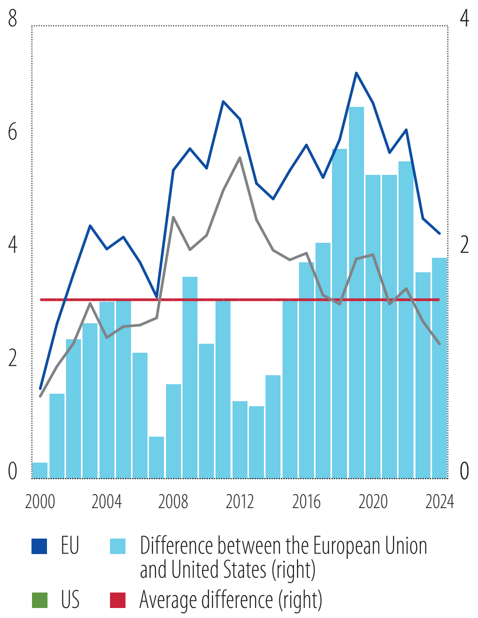
	US	UK	DE	FR	NL	DK	SE	LU	BE	IE	ES	FI	IT	AT	PL	PT	EL	CY	HU	RO	CZ	MT	HR	BG	SI	LT	SK	EE	LV
Market size and integration	2.86	2.11	0.64	0.63	0.55	0.54	0.51	0.48	0.42	0.39	0.29	0.08	0.08	-0.13	-0.26	-0.41	-0.41	-0.58	-0.58	-0.64	-0.65	-0.72	-0.75	-0.82	-0.86	-1.01	-1.11	-1.17	-1.31
Market depth	2.47	1.44	0.13	0.41	1.13	1.30	1.58	0.87	0.28	0.31	-0.04	0.48	-0.17	-0.30	-0.41	-0.28	-0.62	0.07	-0.61	-0.67	-0.58	-0.05	-0.40	-0.62	-0.41	-0.34	-0.65	0.43	-0.61

Source: *EIB staff calculations based on data from Bloomberg, CapitalIQ, Eurostat, the IMF, the European Commission's Directorate-General for Financial Stability, the Financial Services and Capital Markets Union and the Association for Financial Markets in Europe.*
Note: *In the figure, all indicators are standardised with mean 0 and standard deviation of 1. Market size and integration includes total market capitalisation (log scale) and a composite indicator of rest of the world integration.*[12]

12 The composite indicator of rest of the world includes cross-border M&A transactions, equity and bond issuance, private equity, foreign exchange trading, interest rate derivatives and portfolio holdings. Market depth includes public market financing (market capitalisation relative to GDP) and capital raised through IPOs relative to GDP, as well as pre-IPO risk capital (venture capital investment relative to GDP). The pool of investors includes household holdings of listed equities, bonds and investment fund shares, and institutional investors (pension funds and insurance firms), relative to GDP. Average 2016-2023.

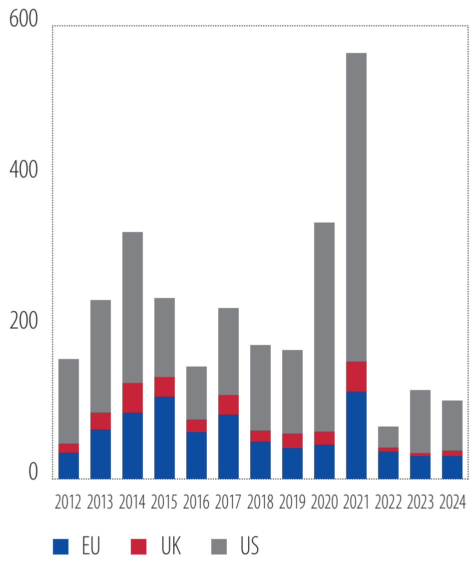
Public equity markets are less developed in Europe, with wide variation in size and depth across EU countries. Our composite indicators, standardised with a mean of 0 and a standard deviation of 1, reveal substantial heterogeneity across countries (see Figure 26). The United States leads in market size and integration with an indicator of 2.86, followed by the United Kingdom at 2.11 – both markets far exceed Germany and France by more than one standard deviation. Most Central and Eastern European countries have negative indicators, showing below-average market size and integration. For market depth, which includes public equity market financing (market capitalisation and IPO activities relative to GDP), pre-IPO risk capital (venture capital/private equity investment relative to GDP), and the pool of investors (retail and institutional), Sweden and Denmark are one standard deviation above average, close to the United Kingdom and the United States.[13] Estonia stands out in Central and Eastern Europe, surpassing Italy and Austria, primarily because of recent increases in venture capital/private equity investment.[14]

Figure 27
Differences in equity and risk premiums
(left axis; in %; right axis: percentage points)



Source: *EIB staff calculations based on Refinitiv Eikon.*
Note: *The latest available figures are for August 2024.*

Figure 28
Public market issuance activities
(USD billion)**, by region**



Source: *EIB staff calculations based on Bloomberg and the IMF.*
Note: *The latest available figures are for August 2024. Public market issuances include IPO and secondary offerings of non-financial firms, excluding private placements.*

The equity risk premium in Europe exceeds that in the United States. The equity risk premium represents the excess return investors require for holding equity compared with holding a safe asset. It has a bearing on corporate investment. A lower equity risk premium results in a lower cost of capital for equity, thereby improving corporate access to external equity. The equity risk premium is structurally higher in the European Union than in the United States, by a range of 150-200 basis points (Figure 27).[15]

13 Sweden's average market depth slightly exceeded that of the United Kingdom for the 2016-2023 period.

14 In fact, according to the latest data from the European Commission's Directorate-General for Financial Stability, Financial Services and Capital Markets Union (DG-FISMA, 2024), annual venture capital and private equity investment in Estonia averaged 0.18% and 1% of GDP from 2016 to 2023, among the highest rates among EU members. For more details on data collection and methodologies, see DG-FISMA (2021).

15 Unlike the readily observable costs of bank borrowing or debt, the equity risk premium is not directly observable, and must be estimated. The most common tool for this is dividend discount models, which are well known in the financial industry. For further details, see Box A in EIB (2018) and Geis et al. (2018).

While the US cost of equity has declined since 2016, approaching levels seen in the 2000s, it remains elevated in the European Union. Consequently, the EU-US gap has widened, from approximately 100 basis points during 2000-2015 to over 200 basis points during 2016-2024. Factors like lower growth expectations, more costly and less liquid exchanges, lower financial literacy and higher overall aversion to risk all contribute to the underdevelopment of EU equity markets and the equity risk premium difference with the United States.[16]

A higher equity risk premium reduces public market issuances. This can be seen in the structurally lower level of amounts raised by IPOs and secondary offerings in the European Union compared to the United States in past decades (Figure 28). Public issuances are partly cyclical, declining in downturns and increasing in upturns – a pattern observed in the European Union, United States and United Kingdom.[17] However, this cyclicality is less pronounced in the European Union, for which public issuance was approximately two times lower than the United States for 2012-2024.

As IPO activity is strongly correlated with market depth, differences in market size tend to widen over time. Market depth, as proxied by the ratio of total market capitalisation to GDP, has shown a significant correlation with IPO activities in past decades, with considerable differences across regions (Figure 29). The United States, the United Kingdom, Switzerland, and several Western and Northern European countries, including Sweden, Norway, Denmark and the Netherlands, are positioned higher up and more to the right than the vast majority of EU countries, indicating both high market capitalisation and an active IPO landscape. Conversely, most other EU countries, particularly those in the Central and Eastern Europe, are clustered around the lower left-hand corner or the 0-axis, reflecting low levels of IPOs and shallow market capitalisation. This disparity suggests that deeper capital markets, supported by better infrastructure and a larger pool of investors, facilitate more IPOs, which in turn increase market capitalisation and attract further investment – widening gaps over time.

Market size, including integration with the global market, and market depth significantly affect firms' access to external equity markets. Analysing the determinants of external equity issuance (public and private) at the firm level, it emerges that one standard deviation increase in market size and integration increases the probability of external equity issuance by 15 basis points, while one standard deviation increase in market depth increases it by about 22 basis points (Figure 30). Given that less than 1% of EU firms use equity financing,[18] each change would result in a 20-30% increase in the share of equity-issuing firms, and 50-55% when cumulated.

Firms located in larger, deeper and more integrated markets are more likely to issue new equity to finance their investments. This further emphasises the significance of the EU single market and the need to better integrate capital markets across EU countries. As shown in Chapter 1, better market integration enhances resource allocation, promotes diversification and improves risk-sharing. Integration makes fragmented markets larger, more liquid and more accessible, reducing capital costs, improving funding availability, and lowering margins and volatility. It also fosters innovation and risk management, leading to more portfolio diversification and resilience to local shocks. Ultimately, this helps narrow the equity risk premium gap between the European Union and the United States and brings equity issuance costs down.

Access to equity finance is especially important for young firms that cannot yet finance their operations and investments internally. The results highlighted in Figure 31 show that external equity is more frequently used by firms that share certain characteristics. To start with, firms that are not yet profitable are more likely to raise equity. This is consistent with the trade-off theory of capital structure

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16 In general, equity risk premiums are influenced by overall economic health and predictability. Stable inflation, interest rates and economic growth reduce premiums, whereas volatility and uncertainty in these factors increase them (Damodaran, 2022). Illiquidity and higher risk aversion also raise premiums. Bekhtiar et al. (2019) find that EU private investors exhibit greater risk aversion than US households.

17 Firms are more likely to issue equity when there are favourable market conditions and ample liquidity, reflecting the market's capacity to absorb new shares, as evidenced by Hanselaar et al. (2019).

18 Based on data from EIBIS 2016-2024, weighted by firms' value added.

(Kraus and Litzenberger, 1973), which suggests that firms balance the tax benefits of interest payments against bankruptcy costs. For firms losing money, the interest tax shield has no value, and they may be closer to bankruptcy. The pecking order theory of capital structure (Myers and Majluf, 1984) posits that firms prefer internal financing, then debt, and finally equity. Debt ranks higher than equity in the hierarchy of claims because it is less information-intensive and requires a lower return. As firms that are losing money are unable to finance investments internally and may not be able to obtain bank loans or other forms of credit, equity finance remains the only financing option.

Figure 29

Market depth and IPO activities

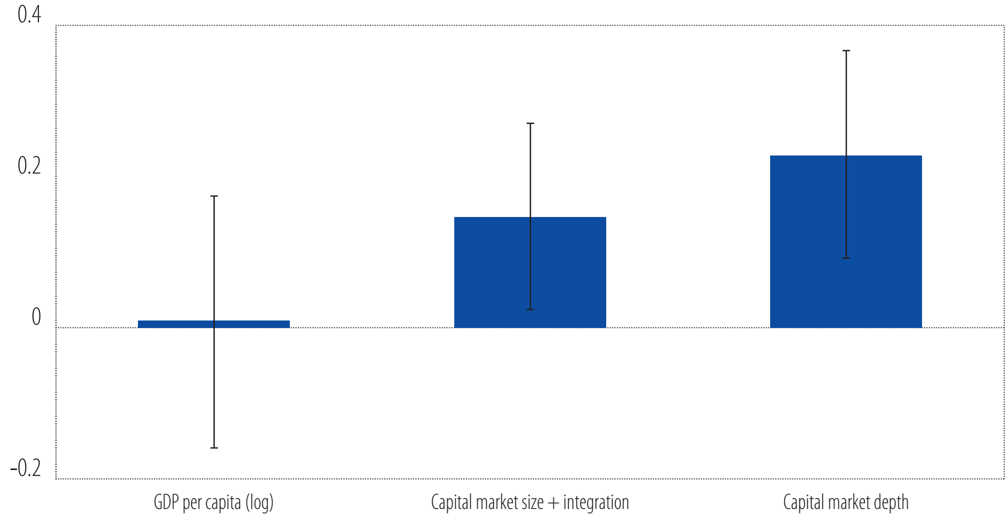
Source: EIB staff calculations based on the IMF, Bloomberg and Capital IQ. IPO data is restricted to approved and closed deals.

High-growth and high-tech firms, which are crucial for Europe's future competitiveness, are more likely to issue equity. Figure 31 shows that young firms, both large and small, are more likely to issue equity. Young firms do not have a credit history, making them hard for lenders to appraise. Though equity is more information-intensive, equity holders have a claim on future earnings that can compensate for the higher risk of that claim, making equity attractive for high-growth firms. Firms operating within the high-tech sector are twice as likely to issue equity than those in the mid-tech and other sectors.[19] Given the greater R&D intensity and higher propensity for intangible investment among high-tech firms, it is unsurprising that they are more likely to utilise equity financing. However, EIBIS data show that US firms are over three times more likely to use equity financing than their EU counterparts. This discrepancy can be attributed, at least in part, to the higher share of high-growth, high-tech and R&D-intensive firms in the United States,[20] leading to a greater share of firms using equity. The remainder can be attributed to generally easier access to external equity in the United States across all industries, reflecting the systemic and environmental components of larger, deeper and more integrated capital markets, as previously discussed.

19 The tech classification follows Fuest et al. (2024), with the categories "high-tech" (aerospace, alternative energy, biotech, software, etc.); "mid-tech" (automobiles, chemicals, telecoms, etc.) and "others" (banks, construction, media, other services, utilities, etc.).

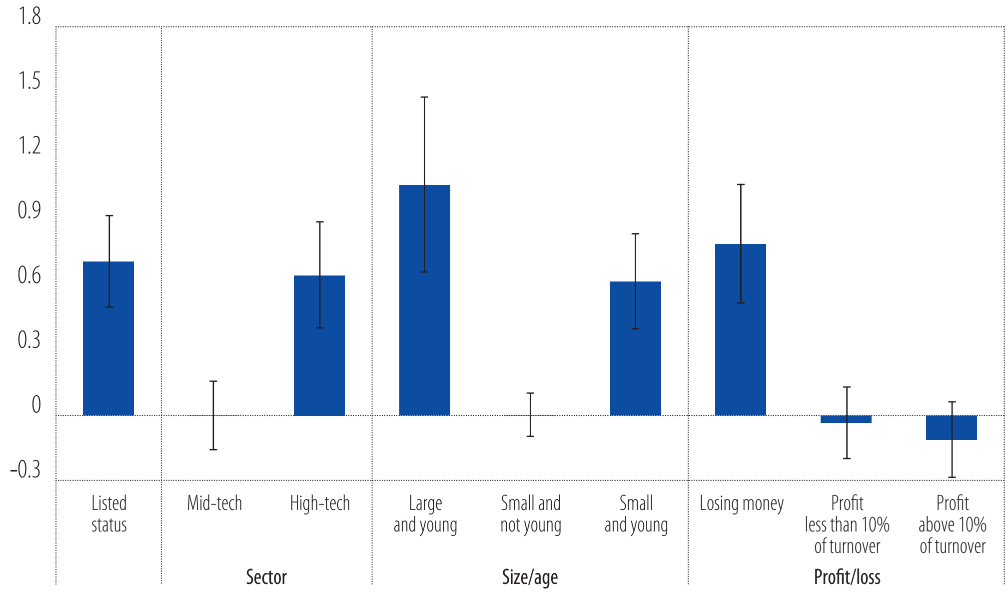
20 Fuest et al. (2024) attribute US business enterprise expenditure on R&D to the United States' larger share of high-tech industries and its overall higher R&D intensity. Additionally, data from EIBIS 2016-2023 show that US firms had a higher average three-year annualised employment growth than their EU counterparts.

Figure 30
Estimated impact of macroeconomic factors on the probability that firms will issue equity
(in percentage points)



Source: EIBIS-Orbis 2016-2023 sample based on Betz et al. (forthcoming).
Note: For an explanation of indicators for capital market size and capital market depth, see footnote 12. The black lines indicate 90% confidence intervals.

Figure 31
Firm characteristics influence equity issuance (in percentage points)

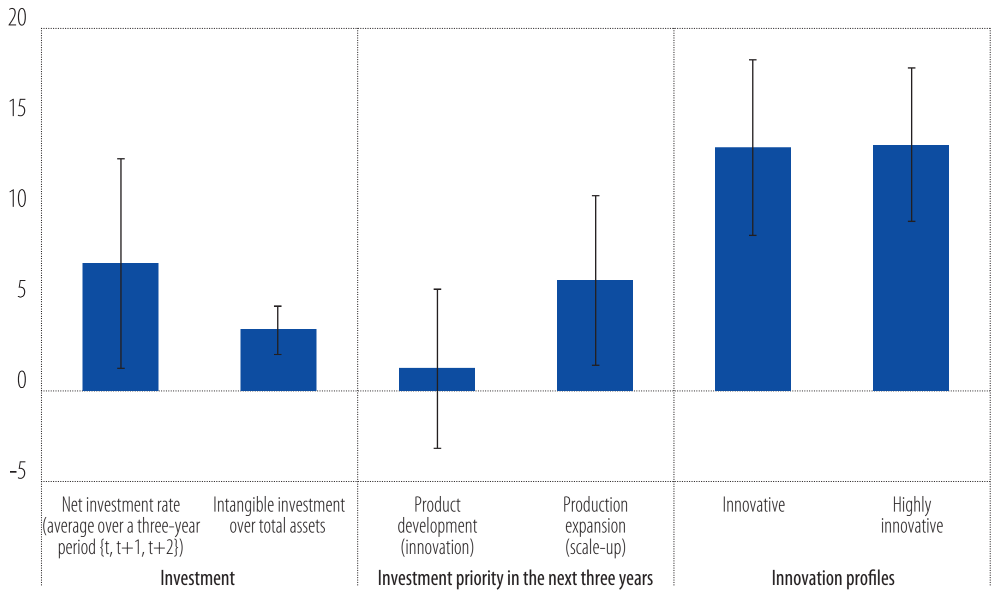


Source: EIBIS-Orbis 2016-2023 sample based on Betz et al. (forthcoming).
Note: The tech classifications follow Fuest et al. (2024): High-tech (such as aerospace, alternative energy, biotech and software); mid-tech (such as automobiles, chemicals and telecoms) and others (such as banks, construction, media, other services and utilities). The black lines indicate 90% confidence intervals.

Equity financing is shown to have a significant impact on firms' innovation and overall investment (see Figure 32). Using propensity score matching to compare firms that issue equity with a control group of similar firms, equity-financed firms show an investment growth rate that is 7 percentage points higher (as proxied by net fixed asset growth) during the period following the issuance of equity and the two subsequent periods. They also show higher investment in intangible assets (3.4 percentage points, or almost 70% higher). Equity-financed firms are also 13 percentage points more likely than the control group to develop innovative products new to the country or world, and 6 percentage points (or 18%) more likely to prioritise production expansion or scaling up in the next three years. These findings are also consistent with those of Didier and Cusolito (2024), indicating that financially constrained firms, particularly those with high R&D levels, benefit the most from capital market financing. Equity issuance, rather than bonds, drives rapid expansion in R&D-reliant firms, highlighting its effectiveness for innovation. This underscores the importance of developed equity markets for innovation and suggests that limited equity access can distort investment and hinder growth. Additionally, Haskel and Westlake (2018) note the growing importance of intangible assets like patents, trademarks and software, which are harder to use as collateral. Equity issuance is thus associated with more rapid production expansion at high R&D firms, especially for intangible assets (Didier and Cusolito, 2024).

Figure 32

Estimated impact of equity issuance on firm performance (in percentage points)



Source: *EIBIS-Orbis 2016-2023 sample based on Betz et al. (forthcoming).*
Note: *Highly innovative firms are those with new products/services within a country or globally and investing in R&D. The investment growth rate is calculated as the growth rate of net fixed assets. The black lines indicate 90% confidence intervals.*

In summary, our results indicate that the size and global integration of capital markets, as well as their depth, significantly influence firms' access to external equity. A one standard deviation increase in these factors raises the probability of equity issuance by 15 basis points (for market size and integration) and 22 basis points (for market depth). Cumulating the two effects would result in a doubling of the share of equity-issuing firms.[21] Firms that issue equity, compared to a control group with similar characteristics, are more likely to be innovative, introducing products that are new to the world or the country, and are also more likely to invest in intangible assets. They have an investment growth rate that is 7 percentage points higher during the issuance year and the following two years. Additionally, these firms are more likely to prioritise expanding production or scaling up over the next three years. This highlights the importance of deepening capital markets and advancing the capital markets union to increase market size and integration. This is particularly relevant as the European Union suffers from a dearth of scale-up financing compared to the United States, with EU firms raising significantly less capital, which hampers their growth and global competitiveness.

21 By comparison, EIBIS 2016-2023 data indicate that US firms are over five times more likely to issue equity than their EU counterparts.

Accelerating investment by delivering targeted policy support and removing barriers

The current weakness of corporate investment is at odds with the huge investment needed for the green and digital transition. According to Draghi (2024), additional investments of EUR 750 billion to EUR 800 billion a year are needed to ensure Europe is competitive in the future. Most of the additional funding would need to come from the private sector, which historically has financed around 80% of productive investment in Europe. But Draghi (2024) also argues that the private sector will need public support. The public sector can help the private sector in two ways. First, it can create a business environment that is conducive to private investment, and second, it can design supporting policies to align incentives across firms, contain uncertainty and possibly support investments with targeted financial incentives.

We analyse policy actions to support corporate investment in general, and for specific types of assets. We first analyse the role of investment barriers and show that removing them also improves growth, especially in investment-intensive sectors. Creating an effective business environment remains the best stimulus for investment, and the EIBIS has repeatedly shown that policymakers have room to manoeuvre to reduce investment barriers. We then analyse the impact of targeted financial incentives used by the public sector to support firms' investment across EU countries. As the capacity of the public sector to provide these financial incentives is diminishing, it is all the more important to analyse their effectiveness. We provide evidence that targeted support has a positive impact, especially on transformative investments. The impact can be optimised when the interventions are designed and coordinated at the EU level. This section also contains a box summarising a study on the effectiveness of EIB instruments.

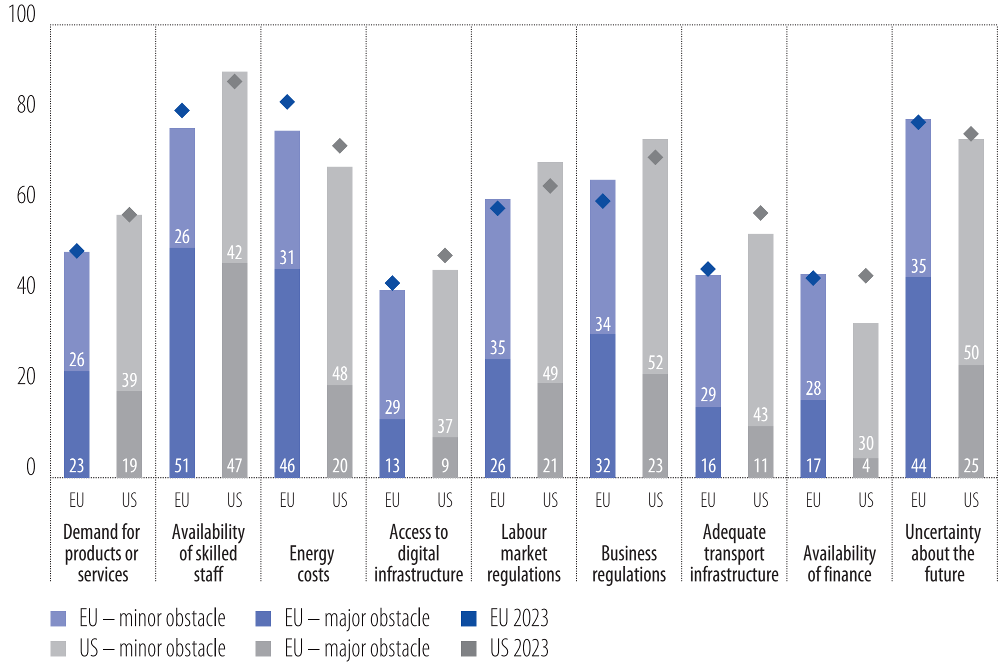
Lowering barriers to raise firms' investment

EU firms cite the availability of skills, the cost of energy and uncertainty about the future as the biggest obstacles to investment. Since its inception, the EIBIS has asked respondents to expound on the investment barriers they see. Figure 33 compares the responses of firms in the European Union to those in the United States. In Europe, the shortage of staff with the right skills is the most frequently cited major obstacle to investment, reported by 51% of EU firms. This is followed by energy costs (46%) and uncertainty about the future (44%). In the United States, the shortage of skills is also the most frequently cited major investment obstacle (47%), but less than 25% of US firms view any of the other items as major obstacles. Figure 34 also shows that the survey responses for 2024 are similar to those for 2023 – suggesting that the EIBIS captures structural aspects of the business environment. The cost of these investment barriers, in terms of investment lost, is analysed below.

Countries with fewer investment barriers have higher rates of investment. Figure 34 provides descriptive evidence of the link between the investment environment as measured by the EIBIS, aggregate investment as proxied by gross fixed capital formation,[22] and GDP per capita. The horizontal axis on the left panel plots the average number of major investment obstacles reported by firms. The vertical axis plots gross fixed capital formation minus investment in construction, scaled by GDP. It turns out that countries with a better investment environment also have higher investment rates. Figure 34 also highlights countries' positions relative to one another, and shows that firms in Denmark, Finland and Sweden report the lowest number of major investment obstacles, on average.

22 Gross fixed capital formation from the construction sector is excluded.

Figure 33
Barriers to investment in Europe and the United States



Source: *EIBIS 2023-2024.*

Countries with higher investment rates also have higher GDP per capita. The horizontal axis on the right panel of Figure 34 plots log GDP per capita. Unsurprisingly, wealthier countries have higher investment rates on average, if only to maintain their larger capital stocks. Figure 34 is consistent with the view that a better investment environment supports higher investment which, in turn, leads to higher GDP per capita. However, countries differ in myriad ways that are impossible to control for. Therefore, Figure 34 does not offer conclusive evidence, but instead points at what to analyse more closely.

We analyse the relationship between investment barriers and investment in different industries. Industries that are technologically more dependent on investment should grow faster in a better investment environment.[23] The approach used here exploits variations between industries in specific countries, and is therefore less prone to the omitted variable concerns that plague cross-country analyses. The dependent variable is value-added growth from 2015 to 2019. Investment is cyclical, and limiting the analysis to this time period avoids picking up the effects of the pandemic and the energy shock. The explanatory variable of interest is the interaction between industry-level investment intensity and the average number of major investment obstacles at country level, as reported in the 2016 EIBIS (the actual survey was done in 2015). The investment environment is measured at the outset of the four-year period captured by the dependent variable. It is important to note that the investment environment as measured by the EIBIS is stable over time, such that the results likely also apply during other times, provided there are no major shocks.

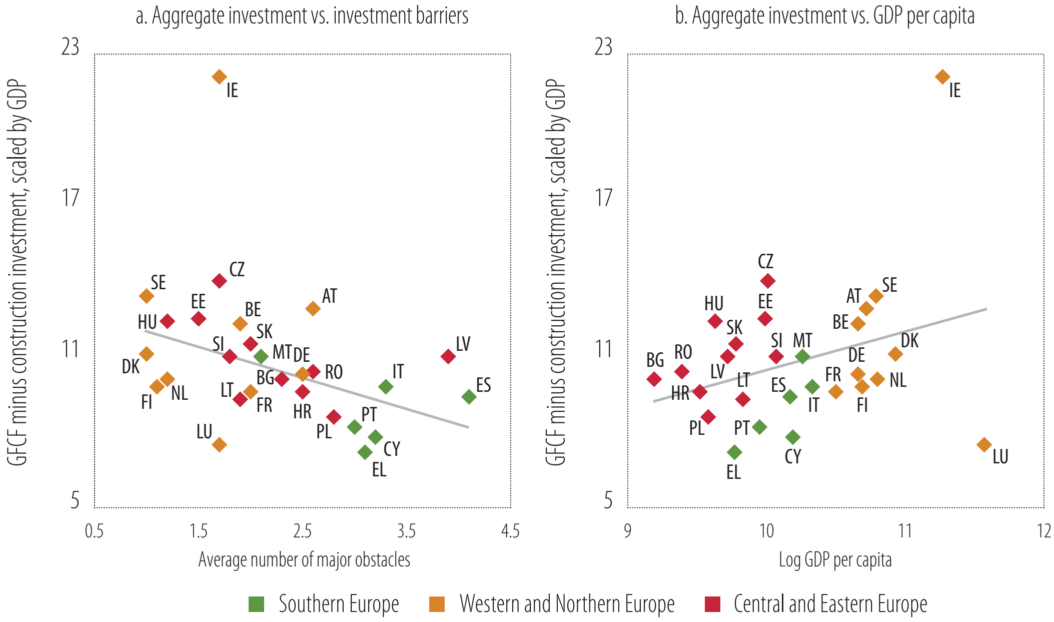
A better investment environment is conducive to higher output growth, especially for investment-intensive industries. Figure 35 shows that output growth is higher in countries that report fewer

23 The empirical strategy that arrived at this conclusion was pioneered by an influential paper on the link between finance and growth: Rajan and Zingales (1998).

investment obstacles.[24] Firms in a country that is in the 25th percentile of the distribution of the obstacle in question report an average of 1.5 major obstacles to investment, while firms in the country in the 75th percentile of the obstacle distribution report an average of 2.4 major obstacles. The regression suggests that reducing investment barriers to shift a country from the 75th to the 25th percentile of the obstacle distribution increases output by 3.3 percentage points over the four-year period. In addition, it can be shown that the sensitivity of output growth to the investment environment is higher for industries that require more investment in technology.

Figure 34

Investment barriers, investment and GDP per capita



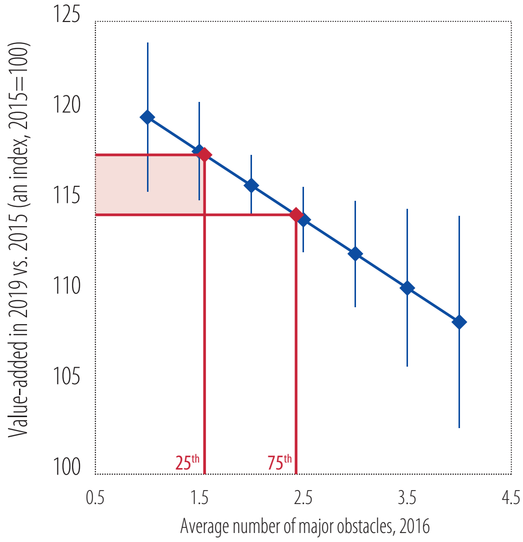
Source: *EIB staff calculations based on EIBIS 2016-2023 and Eurostat.*

Firms with good investment opportunities may benefit the most from a better business environment. The previous edition of the investment report (EIB, 2024a) examined the link between investment and the investment obstacles for individual firms. Within a single industry and country, evidence exists of a two-way causality between the investment obstacles perceived by firms and their rates of investment. Investment barriers reduce investment and, at the same time, firms with greater investment opportunities are more likely to encounter obstacles. Growing firms may therefore be more likely to report obstacles. While at first glance, the results may appear inconsistent with the evidence presented above, a combined reading suggests that a better business environment supports growth and investment. At the level of the individual firm, within a given sector and country of operation, the most dynamic, fast-growing firms are the ones that encounter barriers. At the aggregate level, however, an operating environment characterised by fewer investment obstacles supports higher levels of investment.

24 The figure reports the fitted values from a regression of value-added growth from 2019 relative to 2015 at the Nomenclature of Economic Activities (NACE) two-digit level on the share of industry value added, and the interaction between industry-level investment intensity, the average number of major investment obstacles at country level (as reported in the 2016 wave of the EIBIS), and country- and industry-level fixed effects. Investment intensity is measured as gross fixed capital formation scaled by value added and aggregated across all countries with the available data. The NACE classification of economic activities in the European Community is used for a wide variety of European statistics in the economic, social, environmental and agricultural domains.

Figure 35

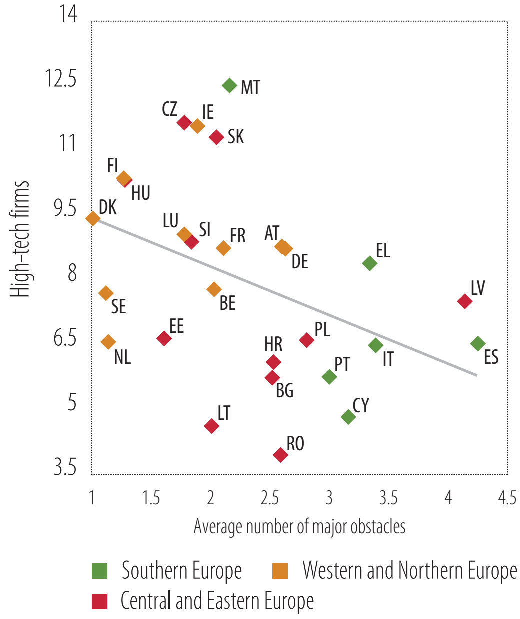
Investment obstacles and value-added growth



Source: *EIBIS 2016, Eurostat, EIB staff calculations.*
Note: *Fitted values from a regression of value-added growth from 2019 relative to 2015. Industry-level figures for value-added follow the NACE two-digit level classification system.*

Figure 36

Share of firms (in %) **in high-tech sectors and obstacles encountered in different EU countries**



Source: *EIBIS 2016-2023, Eurostat, EIB staff calculations.*
Note: *High-tech industries include pharmaceuticals, ICT, aerospace and defence, and R&D in biotech and natural sciences and engineering, based on Fuest et al. (2024).*

Countries with fewer investment obstacles have better chances of escaping the middle-technology trap. Figure 36 provides insight into why this is the case. Countries with a better investment environment have a greater share of firms that operate in high-tech sectors. Fuest et al. (2024) argue that a strong presence in these industries is critical to escape what they call the "middle-technology trap," a situation in which economies focus their innovation efforts on mid-tech sectors rather than high-tech sectors, with less ability to develop high-tech sectors.

Supporting intangible investments

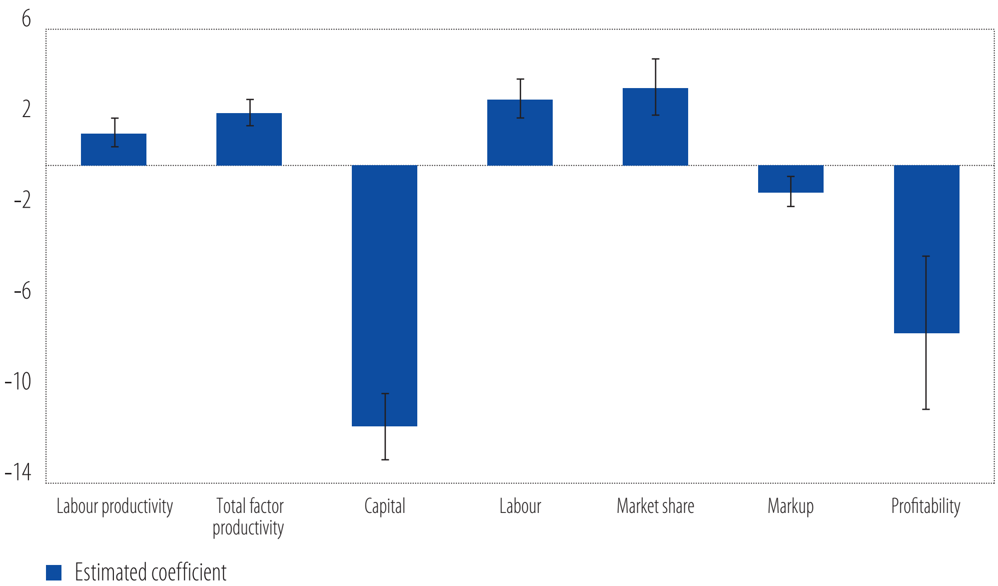
Over the past 40 years, developed economies have seen a significant increase in the importance of intangible capital. This implies a shift in production towards a more intensive use of assets in information technology, R&D and organisational capital, and a growing need for investment in skills and workforce training. This trend has significant implications for firms as well as the overall economy. Intangible assets can be deployed simultaneously across multiple locations and production processes, which improves the potential for economies of scale and scope (Crouzet et al., 2022). A more intensive use of intangible assets may also affect businesses' ability to enter and compete with different industries (De Ridder, 2024). It is therefore crucial, alongside these theoretical insights, to empirically verify the relationship between intangible investment, productivity and other firm-level outcomes.

Firms with high intangible investments perform better and are more likely to be leaders. As shown in Figure 37, high-intangible firms are more productive and have higher market share but lower profitability.[25] This may indicate that high-intangible firms are more likely to be fast-growing firms that are performing well, and that are at a relatively early stage of their life, when the priority is to expand market share (at the cost of lower profitability).[26] In line with their higher productivity, high-intangible investors are also more likely to be leaders in their sector and country (falling in the 90th percentile of the labour or total factor productivity distribution).

High-intangible firms are more likely to report financial constraints and skill shortages, but financial support can help.[27] The constraints and shortages may reflect the firms' strong demand for financial and labour resources due to their fast growth and increasing market share. Figure 38 shows that high-intangible investors are more likely to be financially constrained, and that financial support is more likely to be allocated to financially constrained firms. When high-intangible firms receive financial support, the probability of facing financial constraints decreases by 14%, or around 2 percentage points. These results are in line with previous research revealing that R&D spending is more sensitive to credit constraints, especially during crises (see Aghion et al., 2012). During the COVID-19 crisis, however, investment in intangibles declined less than in tangible assets, as swift policy support prevented a sharp increase in the number of financially constrained firms, thus mitigating the adverse effect of the crisis on investment, and especially on investment in intangible assets (see Bauer et al., 2024).

Figure 37

Characteristics and performance of firms that invest heavily in intangible assets (average annual growth over three years, in %)



Source: *EIBIS 2016-2023 based on Caggese, et al. (forthcoming).*
Note: *Estimated coefficient of linear regression by controlling for lagged total assets; age; and country, sector and year fixed effects.*[28] *The black lines indicate the 95% confidence interval based on robust standard errors.*

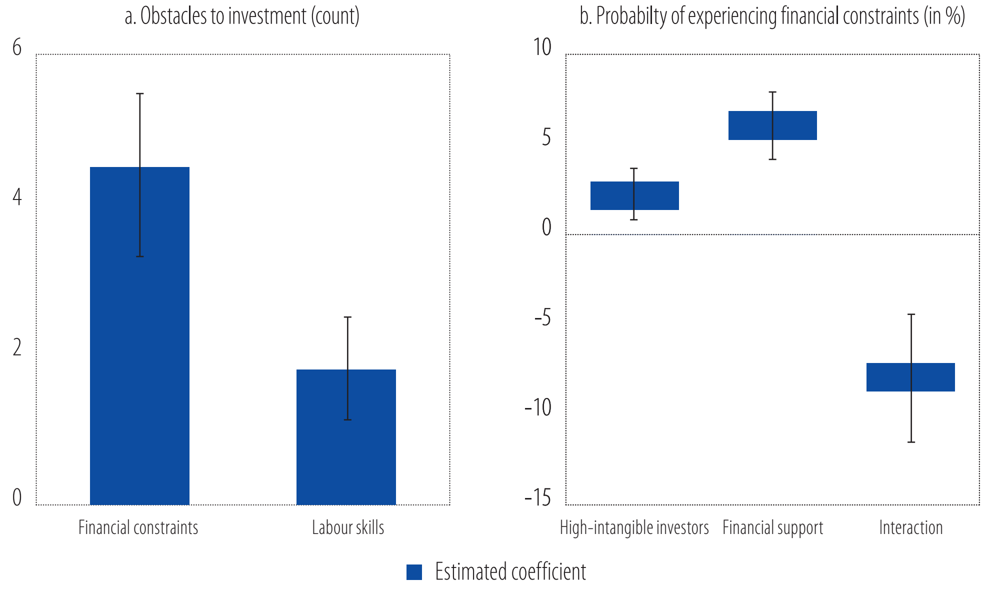
25 "High-intangible investors" are firms with a ratio of intangible investment (R&D, software, data, IT networks and website activities, employee training, improving organisation and business processes, etc.) over fixed assets that is in the top 25% percentile of the whole distribution. Total factor productivity and the associated markups are calculated at the two-digit industry level (pooling observations across countries) and based on a translog production function (Caggese et al., forthcoming).

26 Nevertheless, more in-depth analysis shows that for both old and young high-intangible investors, productivity is higher than for low-intangible investors. Old and young investors differ in their focus on market share and profitability, as older firms are relatively more consolidated and profitable. For a more detailed analysis, see Caggese et al. (forthcoming).

27 Financial support refers to grants and loans with favourable conditions. The EIBIS provides details on forms of external investment financing accessed by firms. Grants are provided for each survey wave from 2016 to 2024, while details on loans with favourable conditions are provided for 2022 and 2024.

28 Variables are defined as $\ln(Y_t) - \ln(Y_{t-3})$ for log variables, and as the ratio of three years' change to the base year for profit ratio (return on assets), with a total sample of 100 000 to 150 000 observations, depending on the variable. Labour productivity is defined as production over the number of employees (y/l). Total factor productivity (TFP_{TL}) and the associated markups are estimated based on translog (TL) production functions (PF). Capital refers to tangible capital intensity, defined as the ratio of fixed assets over total assets.

Figure 38
Obstacles and enablers of high-intangible investors (in %)



Source: *EIBIS-Orbis 2016-2023 sample based on Caggese et al. (forthcoming).*
Note: *Estimated coefficient of linear regression by controlling for lagged total assets; age; and country, sector and year fixed effects. The black lines indicate the 95% confidence interval based on robust standard errors.*

High-intangible firms are more likely to receive financial support when they operate in high-tech sectors, according to an analysis of financial support provided across sectors. In other sectors, the allotment of financial support is not related to the amount of investment in intangible assets (Caggese et al., forthcoming). The absence of correlation is at odds with the observation that, even in non-high-tech sectors, high-intangible firms tend to be more financially constrained.

Young high-intangible firms need specific public policies that enable entrants to grow and compete effectively. Academic literature finds evidence of a shift towards increasing concentration, firm size, markups and aggregate profit as production technology leans towards intangibility. This evolution might affect the efficient use of resources (see De Ridder (2024), De Loecker et al. (2020) and De Loecker and Mongey (2021)). Our empirical findings highlight that large firms tend to increase markups, while young high-intangible firms expand employment and market share more than older firms that use more intangible assets, charge lower markups and earn less. In some cases, targeted support may be justified for young high-intangible firms, which suffer more from financing bottlenecks. However, the best policy remains developing a proper regulatory framework to provide a level playing field and allow new entrants to grow, thereby fostering competition.

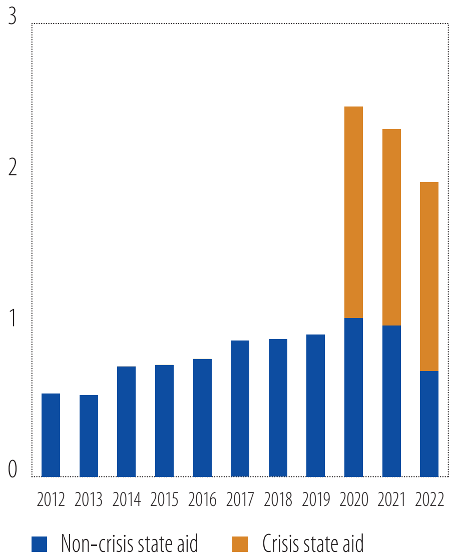
The effect of state aid to firms

State aid encompasses all forms of government-controlled financial resources that may be transferred or granted to undertakings, companies and industries on a discretionary basis. The criteria for a public measure to constitute state aid are laid down in the Treaty on the Functioning of the European Union (TFEU). These criteria refer to an intervention by the state, or through state resources, that give the recipient a selective advantage that actually or potentially distorts competition and affects trade between EU countries. State aid is generally prohibited, but it may be used under certain specific conditions (see the Data Annex for more details).

Government support can ease financial constraints and encourage firms to make investments they might otherwise avoid. This support can be particularly valuable for innovative projects, environmental initiatives and infrastructure development in poorer or structurally disadvantaged regions. However, government support also carries risks. It can distort competition, favouring specific firms or sectors and leading to resource misallocation.

Figure 39

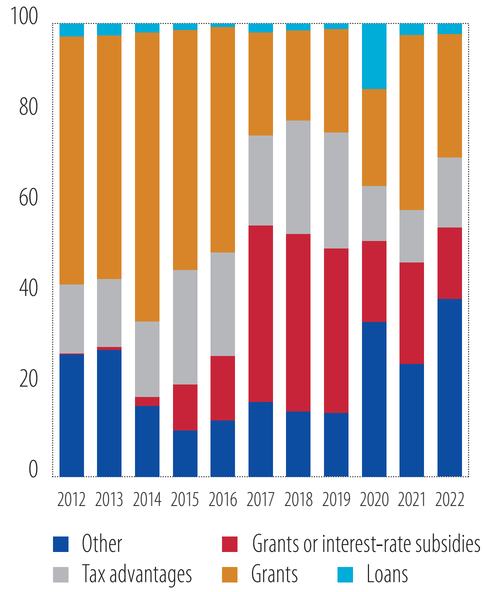
EU governments' spending on state aid
(% GDP)



Source: *EIB staff calculations based on the European Commission (2024), State Aid Scoreboard.*

Figure 40

Financial composition of state aid
(% of total)



Source: *EIB staff calculations based on the European Commission (2024), State Aid Scoreboard.*

Note: *The depicted instrument categories are distinct. There are cases where grants or interest rate subsidies cannot be separately allocated to projects due to deficiencies in data reporting. These cases are reported under the joint category of grants or interest rate subsidies. The category "other" combines instruments like guarantees, equity intervention and subsidised services, etc.*

Within the European Union, state aid averaged 0.8% of GDP from 2012 to 2019. Figure 39 shows the estimated evolution of state aid as a share of EU GDP from 2012 to 2022 (the latest data available). State aid accounted for about the same share of output from 2012 to 2019 but increased drastically during the COVID-19 and energy crises, under relaxed EU rules. Figure 40 shows the wide range of instruments policymakers have used to deploy state aid, including grants, tax breaks, guarantees and other instruments.

Understanding how state aid influences investment under normal conditions provides critical insight into its effectiveness as an industry policy tool. Our analysis focuses on state aid approvals from 2017 to 2018, a period during which Europe was not in crisis. It draws on the public EU registry of state aid approvals, which details recipients, objectives and instruments for aid exceeding EUR 500 000.[29]

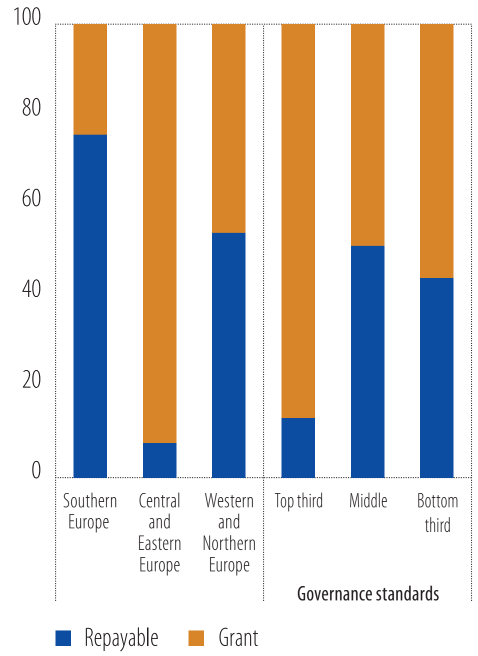
29 Since then, the threshold for reporting the receipt of state aid has been lowered.

The type of instrument used – whether loans (to be repaid) or grants (not to be repaid) – depends on the objectives pursued and the recipient's sector and location. In Figure 41, we investigate the marginal influences of the objective of state aid and the location of the recipient firm on the instrument used.[30] Holding everything else constant, grants are especially prevalent for sectoral development (agriculture, for example) in Central and Eastern Europe, while loans are more common in Southern Europe.

Firms that received state aid spent 6% more on investment than other firms for two years after receiving the aid.[31] The calculation controls for firm characteristics and changes in the macroeconomic environment that affect all firms similarly. Investment by firms receiving state aid is compared to their estimated investment without it. The counterfactual assumes that these firms' investments would have evolved like those of peers that did not receive state aid. While local authorities are required to report receiving more than EUR 500 000 in state aid, they may not always do this. In this case, the true impact of state aid would exceed this estimate.

Figure 41

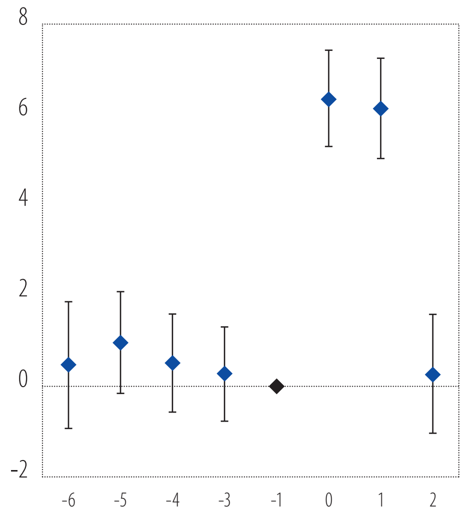
Use of loans vs. grants for state aid (% change in investment)



Source: *EIB staff calculations.*
Note: *The figure shows the marginal influence of the objectives and locations of state aid on the instrument used to provide that aid. Calculated for state aid above EUR 500 000 provided during 2017-2018.*

Figure 42

Impact of state aid on the growth of firms' investment (investment rate, winsorised), **by years before and after receiving the aid**



Source: *EIB staff calculations.*
Note: *The figure shows the estimates and the confidence intervals of the impact of state aid received in 2017-2018 on the growth of investment in fixed assets.*

30 The marginal influence reported is the estimated change in the probability of using a type of instrument, conditioned on the factors shown and further characteristics of state aid and of the recipients.

31 The investment growth rate is calculated as net fixed asset growth using balance sheet statements from Bureau van Dijk's Orbis database. The treatment effect of the approval of aid is estimated using a generalised difference-in-differences approach. The control group contains all firms in the Orbis database for which no information about the receipt of state aid could be found. Results appear robust when weighting the control group to increase its similarity to the treated (propensity score matching, 1:1 nearest neighbour) before treatment.

The impact is significantly positive in the year in which state aid is approved and the following year (Figure 42). As the difference in investment rates is not significant for years preceding the receipt of state aid (labelled -4 to -1), the results shown in Figure 42 provide some confidence that state aid not only coincided with, but actually caused, higher investment. These results are in line with part of the academic literature (for example, Canzian et al. (2024)).

The positive effects of receiving state aid need to be balanced against the cost of such aid, and the potential negative effect it can have on competitors. For example, we find that state aid awarded to publicly listed firms has a negligible impact on their investment. This confirms recent evidence by Marques and Toprak (2024). Moreover, the authors suggest that state aid awarded to large, publicly listed firms affected their competitors negatively. Taken together, these findings imply that while state aid can effectively promote investment by credit-constrained firms, its overall efficacy depends on the context and must be balanced against potential distortions of competition.

State aid should be coordinated across EU members and be part of an overall EU policy framework. As most state aid comes directly from EU countries, it carries a high risk of distorting the single market, which is a core EU asset. Draghi (2024) notes that the small, fragmented EU budget (just over 1% of GDP that is distributed across nearly 50 programmes) limits investment in large pan-European projects – compared to EU member government budgets of nearly 50% of GDP. For public research and innovation, for example, EU governments spend a similar share of GDP to the United States, but only one-tenth of this occurs at the EU level, which contrasts with the high level of federal spending in the United States. Hodge et al. (2024) highlight the need for coordinated EU state aid, noting that properly targeted industrial policy in the European Union and internationally can correct market failures, enhance efficiency and prevent production distortions, while increasing gains from specialisation and mitigating adverse trade effects. Altomonte and Presidente (2024) also note significant efficiency costs when state aid and subsidies are not coordinated on the EU level.

Box C

Quantifying the impact of uncoordinated subsidies on the allocation of resources and productivity in the European Union

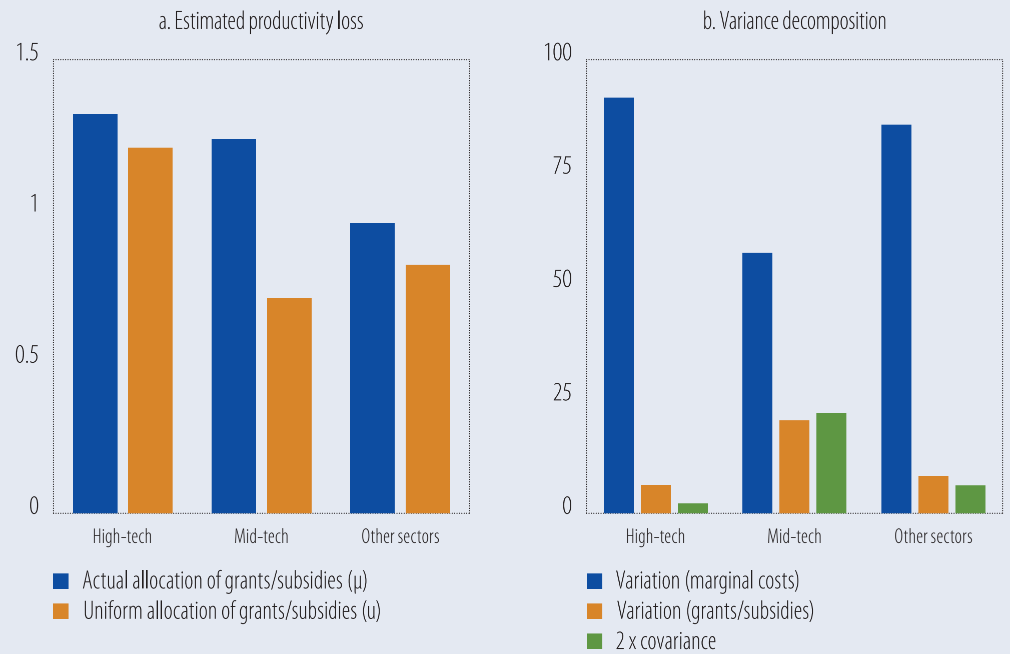
Grants and subsidies are known to address market failures, but they can also create wide differences in producers' marginal costs, reinforcing resource misallocation and therefore reducing productivity (see Restuccia and Rogerson (2008), and Hsieh and Klenow (2009)). Policy design must therefore ensure that market failures are addressed while minimising costs to productivity.

EU countries provide an interesting case for evaluating subsidy policies. Market failures that cause societal or environmental harm, such as investments in carbon-intensive projects, affect the entire European Union, but investment subsidies are typically set by national governments through state aid policies. The EU treaties require national state aid to be authorised by the European Commission (Article 107(3)(b) of the TFEU), ensuring they are appropriate, necessary and proportionate, in that they remedy a "serious economic disturbance." In practice, however, these evaluations are often case-specific, leading to significant variation in subsidy amounts and scope across EU countries. This raises the important question of how these differences contribute to resource misallocation across the European Union.

Altomonte and Presidente (2024) examine green subsidies in the electricity sector before the pandemic. This box replicates their analysis to measure the misallocation of grants and subsidies in sectors C to J from 2021 to 2023 using EIBIS data – which includes firm-level information on the amount of grants and subsidies received.[32] That period covers the EU State Aid Temporary Framework implemented after the COVID-19 outbreak. All EU members had rolled out some kind of state aid, accounting for almost 1 000 national measures that provided a total of EUR 3.2 trillion in subsidies.

The key finding is that varying levels of subsidies significantly contributed to a misallocation of resources in certain EU industries. The remaining misallocation is driven by differences in producers' marginal costs (especially in wages) compared to a uniform single market benchmark. There is substantial variation across sectors. In manufacturing, where the goods produced are mostly tradable, firms' marginal costs tend to be more homogeneous across countries. Manufacturing, which tends to receive more subsidies, would benefit the most from coordinated EU policy action.

Figure C.1
Approximation of misallocation due to uncoordinated grants and subsidies



Source: *Authors' calculations based on EU KLEMS data and EIBIS 2021-2023.*
Note: *This figure presents the estimated productivity loss due to misallocation at the EU level (left panel) and the contribution to misallocation of dispersion in marginal costs, subsidy rates and their covariance (right panel). Calculations are based on the model in Hsieh and Klenow (2009) following the approach of Altomonte and Presidente (2024). The key assumptions are a common and constant interest rate equal to 5% and a cross-country elasticity of substitution equal to 3, as in Hsieh and Klenow (2009). The capital elasticity is the simple average of the sector-specific elasticities in various EIBIS sectors – manufacturing (NACE C), services (NACE G/I), construction (NACE F) and other (NACE D/E/H/J) – which are estimated based on a Cobb-Douglas production function using EU KLEMS data. Country-sector nominal wages and investment subsidy data are taken from EIBIS 2021-2023.*

Figure C.1 presents the analysis based on the industry classification of Fuest et al. (2024). The left panel shows the estimated productivity loss in high-tech, mid-tech and other industries. The blue bars depict the estimated productivity loss that accrues with the current situation of different costs and subsidies, relative to a benchmark scenario of an ideal single market with fully equalised

32 Sectors C to J account for approximately 47% of the real value added to the total EU economy from 2011 to 2020, according to data from EU KLEMS, a growth and productivity research project that looks at various industries. We use sector C-J to align with the EIBIS sample, which is based on a representative sample of non-financial corporations across sectors C to J. All results are weighted by value-added.

marginal costs and no subsidies. The orange bars represent the estimated loss that would have occurred with varying costs, but a uniform subsidy rate across EU countries, with respect to the same ideal benchmark.

In high-tech and mid-tech industries, misallocation is responsible for around 1.2% of productivity losses across the European Union. Lost productivity stemming from the actual allocation of subsidies vs. a possible uniform allocation is similar in high-tech industries and other industries, including services (the orange and blue bars are close). However, in mid-tech industries, subsidy dispersion accounts for almost half of the productivity loss. Thus, policy coordination would result in the largest productivity gains in the most important EU industries (Fuest et al., 2024).

The right panel explains the different behaviour, by decomposing these effects further. It presents how differences in marginal costs contribute to misallocation (blue bar), subsidy rates (orange bar) and their covariance across countries (green bar). The figure confirms the negligible contribution of varying subsidy rates in the high-tech and other industries, where marginal costs (national differences in technology and wages) account for the majority of misallocation. In mid-tech, however, the lack of a coordinated subsidy policy accounts for a whopping 20% of sectoral misallocation. The figure also shows that the positive covariance between marginal costs and subsidy rates contributes an extra 20% to sectoral misallocation in mid-tech. This is because, on average, producers with high marginal costs receive more subsidies, exacerbating dispersion.

Financial support is more effective when it is targeted

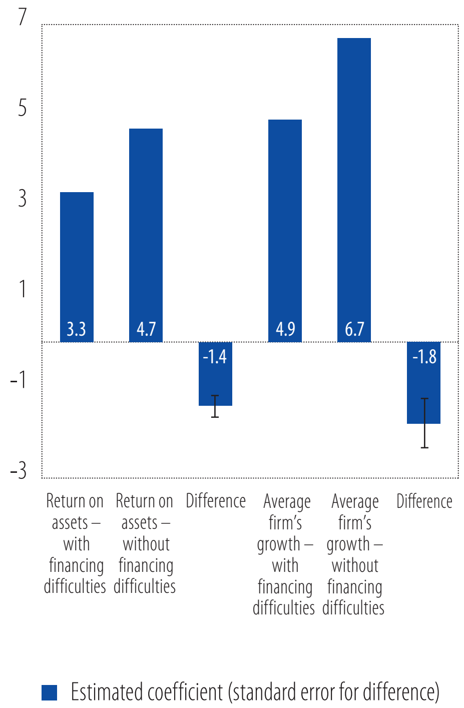
Throughout the pandemic and energy crisis, policy support has been widely used to encourage investment and avoid long-term damage. However, as the economic situation stabilises, this support must become much more targeted. Market failures – such as information asymmetries, imperfect competition, and challenges facing green and innovative sectors – can prevent projects from obtaining funding. For example, projects that do not necessarily generate returns but help societies in one way or another, such as innovative but weakly profitable projects for firms that generate and diffuse knowledge, are underfunded from private sources despite being beneficial from a social perspective. Moreover, firms with high-intangible investments, like R&D-intensive companies, often lack the collateral or track record needed to secure loans, especially if they are not yet profitable or are relatively young. Public financial support can help address market failures and ease the financial constraints for these firms. However, if such support is not carefully designed and targeted, it distorts markets, crowds out private investment, encourages inefficient risk-taking, or primarily benefits incumbent firms rather than disruptive ones.[33] Financial products offered by the EIB are designed to address market failures and improve social welfare. Their effectiveness is analysed in Box D.

We examine the impact of funding difficulties on firms' performance, measured by various indicators, during normal periods and periods of external shocks. We combine structural barriers to external financing and the cyclical deterioration of that financing in times of trouble, while controlling for other major investment barriers. Figure 43 shows that it is significantly harder for firms that have previously struggled to secure external finance to generate cash internally in order to fund investments in the subsequent two years (captured by a profitability ratio, the return on assets). These businesses record an average annual growth rate that is 1.8 percentage points lower than firms that have not struggled. More in-depth research reveals that the losses are even higher when those firms have signalled investment gaps in the past (Ferrando and Pál, 2024).[34]

33 For a review of literature on the effectiveness of public policies on firms' access to finance, see De Haas and González-Uribe (2024).

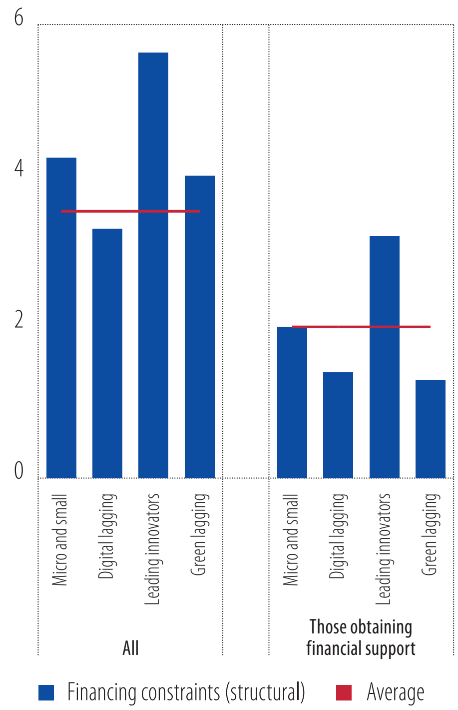
34 To ensure that financing difficulties are not related to a firm's financial viability, we exclude firms that report losses or zero profit for three consecutive years.

Figure 43
The impact financing difficulties have on firm profitability and growth (in %)



Source: *EIBIS-Orbis 2016-2023, based on Ferrando and Pál (2024).*
Note: *Results from propensity score matching.[35] Return on assets and growth in firms' total assets are averaged over two years after facing the financing difficulties. The treated and control group are matched based on country; sectors; a year dummy for the COVID-19 crisis; firm characteristics (size, age, cash flow, equity share, financial leverage, cash holdings and innovativeness) and major investment barriers (uncertainty, skilled labour, demand and digital infrastructure).*

Figure 44
External funding difficulties (% of firms), **by firm type**



Source: *EIBIS-Orbis 2016-2024, based on Ferrando and Pál (2024).*
Note: *The sample includes firms using any form of external finance for their investments. Digital lagging firms are those that have not implemented any digital technology, green lagging firms are those that have not invested and do not plan to invest in green projects. Leading innovators are firms with R&D and new products in the country or globally. Micro and small firms are those with 5 to 50 employees. Financial support includes grants and loans with favourable conditions.*

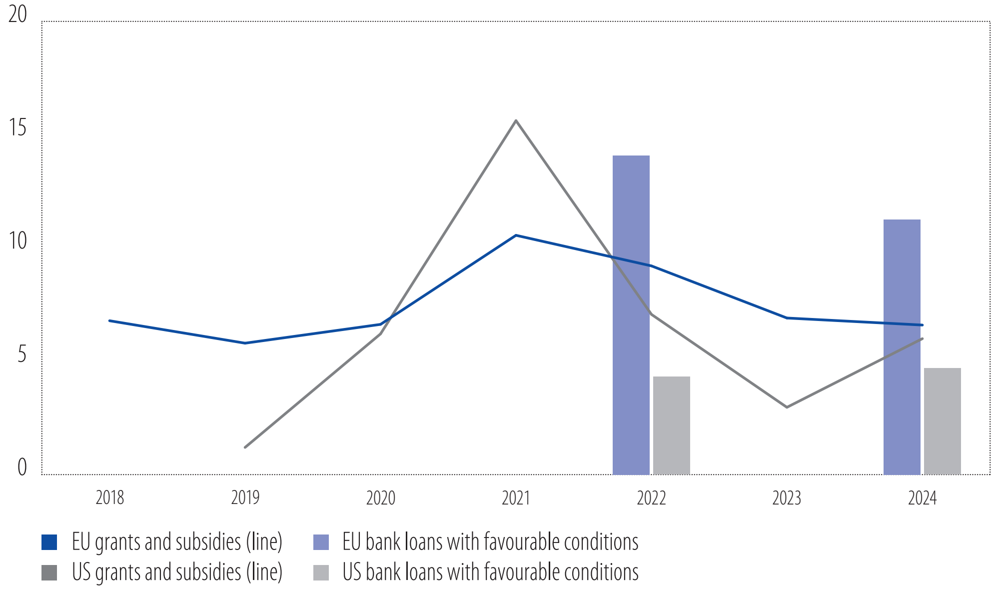
Policy support in the form of grants or loans with favourable conditions makes financing easier, indirectly improving firms' performance. Empirical evidence shows that micro and small firms, as well as leading innovators, are particularly vulnerable to deteriorating funding conditions. Moreover, firms that lag in digitalisation and green investment, even if financially viable, face a structural (rather than cyclical) financing hurdle (Ferrando and Pál, 2024).[36] Figure 44 reveals that financial support can effectively reduce funding difficulties for firms in these particular categories and enable them to transform. These results indicate that targeted financial support directed at structurally constrained firms and those that are having difficulty transforming their business can effectively promote investment and improve performance. However, such targeted support must be directly connected to a specific outcome, and certain financial health requirements should be met, to avoid supporting unviable firms and misallocating resources.

35 The treated and control group are matched based on country; sectors; a year dummy for the COVID-19 crisis; firm characteristics (size, age, cash flow, equity share, financial leverage, cash holdings and innovativeness) and major investment barriers (uncertainty, skilled labour, demand and digital infrastructure). The k-nearest neighbour matching algorithm is applied and identifies k=3 matched (control) observations from the sample of firms that did not report external funding difficulties (untreated firms) for each treatment observation.

36 Structural barriers to firms' access to finance are captured by supply-side aspects of the financing. We focus on viable firms that need loans, but were discouraged or rejected (fully constrained), or received less than they needed (quantity-constrained), or found the loan too expensive (price-constrained). To ensure that access to external finance is not due to the financial health of the firm, we exclude firms that report losses or zero profit for three consecutive years.

In the European Union, the share of firms receiving financial support has declined from its peak in 2021, during the pandemic. Using EIBIS data, Figure 45 shows that in 2024 an average of 6.6% of EU firms reported receiving grants or subsidies – marginally down from the 6.9% recorded in 2023, and well below the peak of 10.6% in 2021. A similar pattern is observed in the United States, where 6% of firms received grants or subsidies in 2024, down from 15.6% in 2021. The share of EU firms receiving loans with favourable conditions also decreased to 11.3% in 2024, compared with 14.1% in 2022, but remains higher than the 4-5% in the United States. Government efforts to stave off long-term economic damage drove up financial support during the pandemic, and the post-crisis decline reflects the normalisation of economic conditions. As fiscal space is narrowing, future support must be more targeted.

Figure 45
Share of firms receiving financial support (in %)



Source: *EIB staff calculations based on EIBIS 2018-2024, weighted by firms' value added.*

EIBIS 2024 allows a snapshot of policy support – including grants/subsidies and finance with favourable conditions – and whether these types of support target certain objectives. Overall, 15.6% of European firms that were investing received some form of policy support. Specifically, 11.2% of firms received grants and subsidies, 6.6% received finance with favourable conditions, while a subset of around 2.2% received both. The allocation of policy support varies by region and sector. Across regions, the share of firms receiving at least some form of financial support is similar in Southern Europe and Central and Eastern Europe at approximately 20% for EIBIS 2024, while it is lower in Western and Northern Europe at 13%. Across sectors, the share of firms receiving grants or finance with favourable conditions is relatively similar. However, when we distinguish between targeted policy focus intervention and non-targeted intervention, it is clear that – particularly for grants – high-tech firms tend to receive a larger share of targeted rather than untargeted support (see Figure 46). The areas most likely to receive both types of support are innovation/digitalisation and green/climate action.

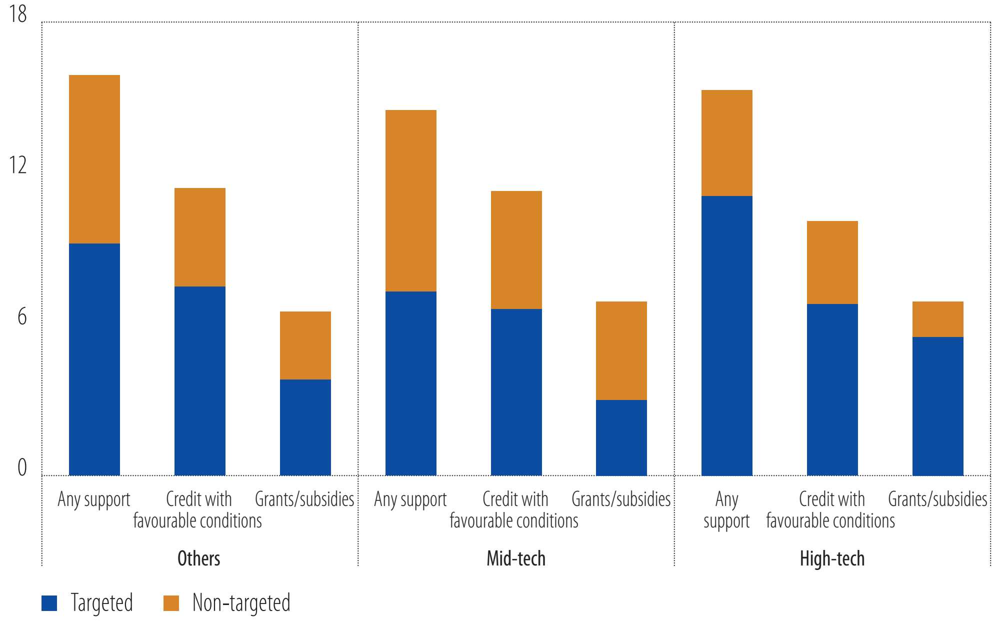
In high-tech and mid-tech sectors, startups are the most likely to obtain grants. In other sectors, larger and more mature firms are more likely to get help. A deeper analysis of the joint probability of grant allocation by tech group and age or size reveals that the most likely firms to receive grants are high-tech startups that are categorised as small and young (Figure 48).[37] Startups in high- and mid-

37 See footnote 19 for the classification of activities by tech intensity.

tech sectors have predictive margins for receiving grants that are higher, by 12.3 percentage points (high-tech) and 7.5 percentage points (mid-tech), than startups in sectors like services and construction. Conversely, in sectors other than high-tech and mid-tech, larger and more mature firms are the most likely to receive grants, with a predictive margin 2.5 percentage points higher than their smaller and younger counterparts.

Figure 46

Types of financial support and targeted areas (% of firms)



Source: EIB staff calculations based on EIBIS 2024, weighted by firms' value-added.

In sectors outside of high-tech, larger and more mature companies account for the majority of firms receiving policy support. This is no surprise, given that most firms (around 80% in the EIBIS sample, as measured by value added) operate outside the high- and mid-tech sectors. Looking at the composition of policy support recipients, Figure 47 shows that 63% of recipients of grants and subsidies and around 66% of recipients of credit with favourable conditions are older, established firms in industries outside of high-tech.

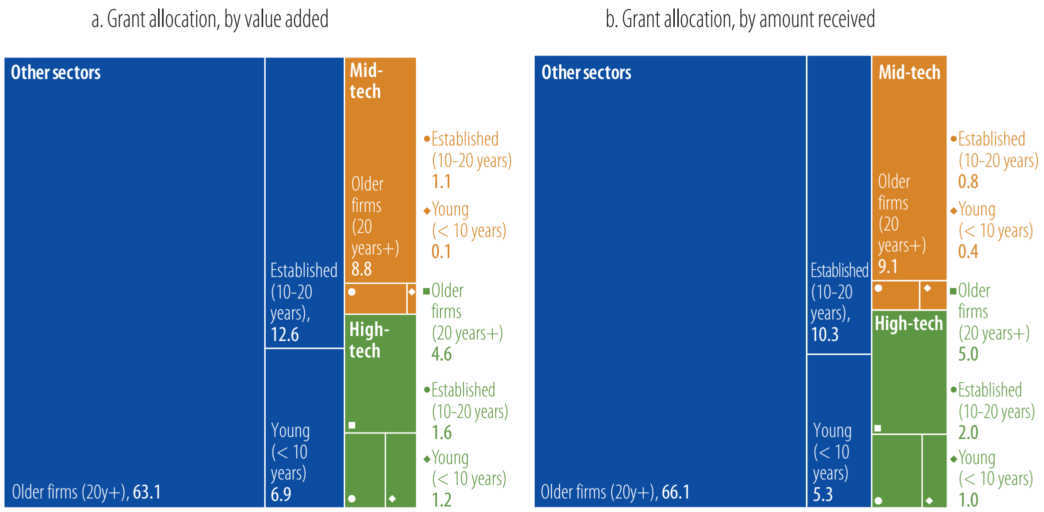
Estimates suggest that policy intervention, in the form of grants and subsidies, spur investment, with mixed results for productivity. The estimated impact of grants on productivity is debated in the literature. On the one hand, Muraközy and Telegdy (2023) find that EU-funded grants in Hungary boost labour productivity at small firms by 0.2-0.6 percentage points, but do not affect total factor productivity.[38] Alexandre et al. (2022) find that a grant significantly enhances labour productivity, especially in small firms.[39] Other studies do not find a significant impact on productivity (Cerqua and Pellegrini (2014); Criscuolo et al., (2019)). Marques and Toprak (2024) find that state aid (mainly in the form of grants) has small, temporary effects on employment and turnover, but no impact on investment or productivity in very large, listed firms.[40]

38 Some findings indicate that a second round of grants often has a greater impact. Muraközy and Telegdy (2023) also show that firms receiving multiple grants grow faster than those receiving only one, suggesting that a plan should precede the allotment of financial support.

39 The authors' rationale is that micro and small firms face tighter financial constraints, and investment grants can reduce these and help the firms make efficient investments, improve technology and grow.

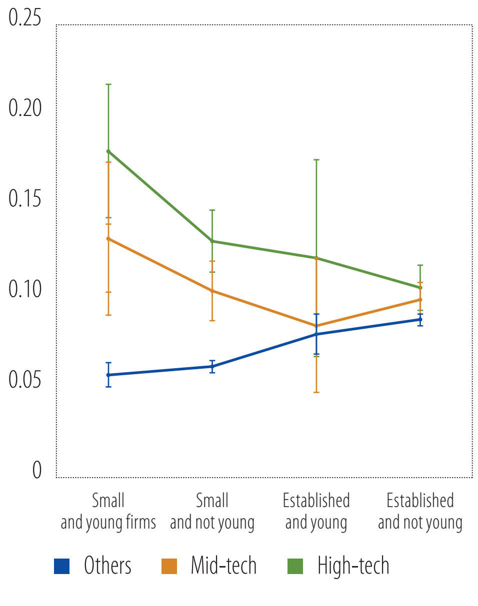
40 The authors use a sample focused on listed firms (less than 1% of all firms) with an average of 10 000 employees, which is not comparable to the EIBIS-Orbis sample. In the EIBIS-Orbis sample, large firms are those with over 250 employees.

Figure 47
Grant allocation, by sector and firm type



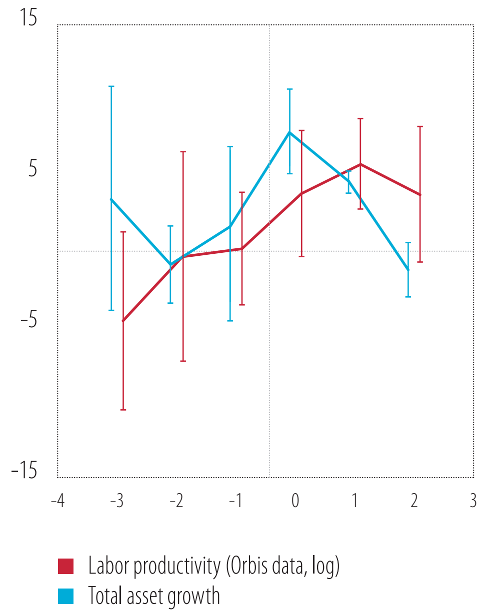
Source: *EIB staff calculations based on EIBIS-Orbis matched data for 2022-2023.*
Note: *A sample of EU firms only. Tech classification follows Fuest et al (2024): High-tech (aerospace, alternative energy, biotech, software, etc.); mid-tech (automobiles, chemicals, telecoms, etc.) and other sectors (banks, construction, media, other services, utilities, etc.). Questions about the total amount of grants received were only asked in the 2022 and 2023 surveys.*

Figure 48
Firms' likelihood of receiving grants (in percentage points)



Source: *EIB staff calculations based on EIBIS-Orbis matched data for 2016-2024.*
Note: *A sample of EU firms only. Predictive margins with black lines indicating 90% confidence intervals.*

Figure 49
Impact of obtaining grants on firm performance (in percentage points)

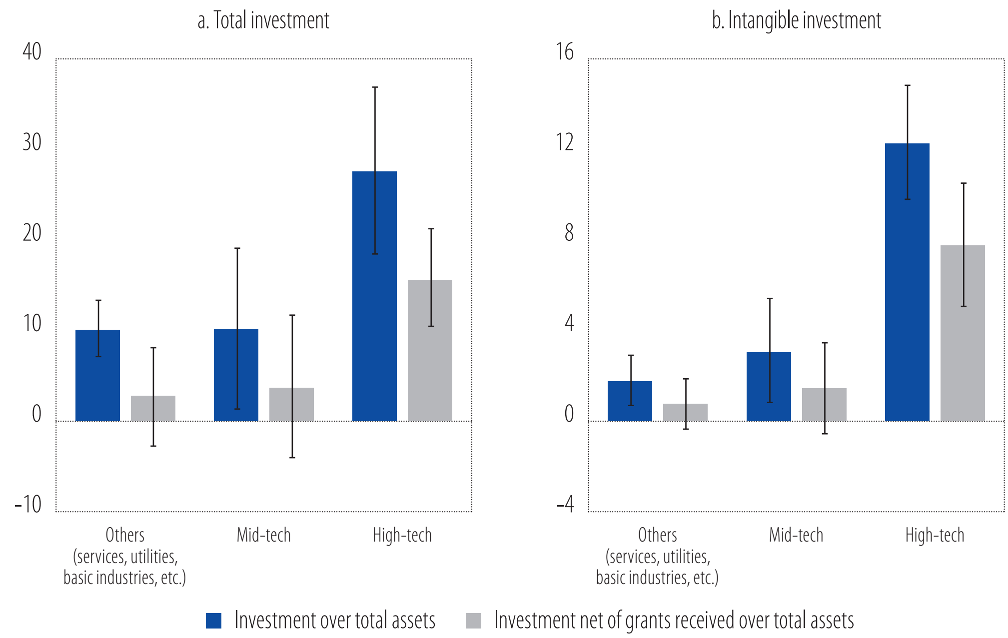


Source: *EIB staff calculations based on EIBIS-Orbis matched data for 2016-2024.*
Note: *A matched sample was constructed for the treated and control groups (three-nearest neighbours) using propensity score matching. The figure shows the estimated impact of grants on firm performance. The black lines indicate 90% confidence intervals.*

Taking data from the EIBIS and Bureau Van Dijk's Orbis database, we use propensity score matching to compare firms receiving grants with similar firms that did not. The analysis shows that total asset growth shifts up during and after the grant, and returns to its original growth path thereafter (Figure 49).[41] There is some evidence that labour productivity rises in the one- and two-year periods after the firms receive grants, compared to the control group, although part of this result might be driven by some pre-existing attributes of firms receiving grants. As a side effect, grants and subsidies might generate some resource misallocation, hampering productivity, especially in mid-tech industries (see Box C).

In high-tech sectors, policy support has a significant effect on crowding-in additional investment (+125 percentage points), more than in other sectors. Using propensity score matching to compare grant recipients with non-recipients, we find that investment over total assets is approximately 10 percentage points higher for recipients in mid-tech and other sectors, and around 27 percentage points higher for recipients in high-tech sectors, for the 2022-2023 sample (see Figure 50). When we deduct the amount of grants received to estimate additional investment, the coefficients for mid-tech and other sectors remain positive but are no longer significant at a 90% confidence interval. In contrast, high-tech firms still show a 15 percentage point increase in additional investment compared to the control sample of non-recipients. A similar trend is observed for intangible investment, where one unit of grants crowds in almost two units of additional intangible investment in high-tech firms, while the figures for mid-tech and other sectors are positive but not significant.

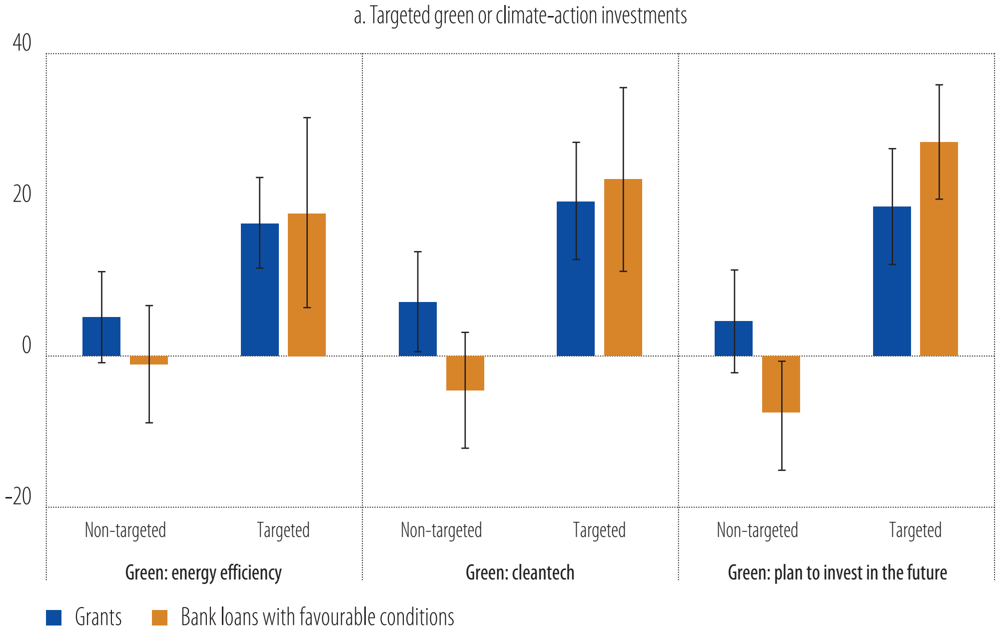
Figure 50
Firms' likelihood of crowding in additional investment (in percentage points)

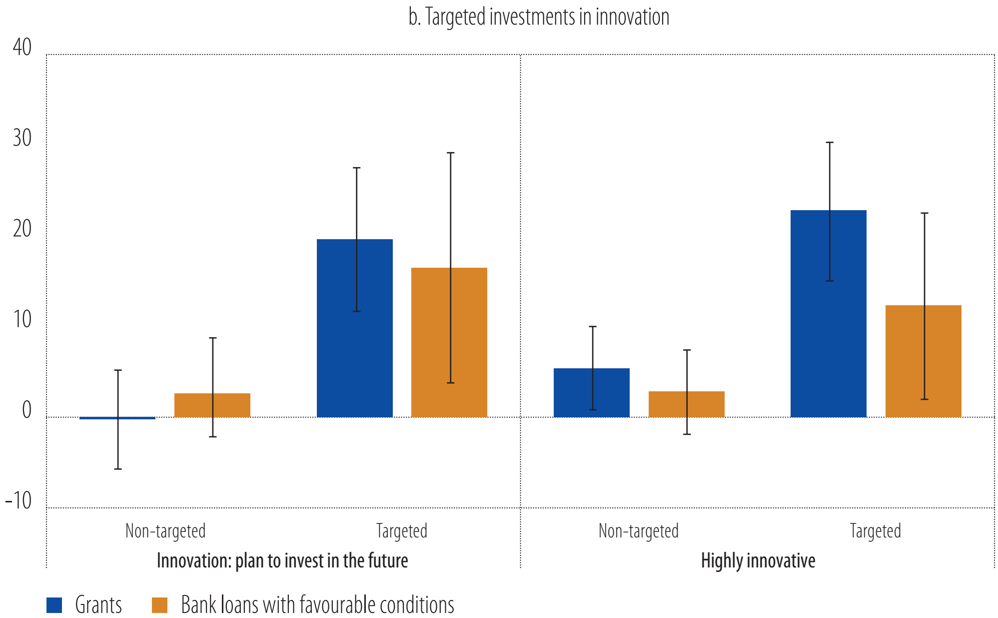


Source: *EIB staff calculations based on EIBIS-Orbis matched data for 2022-2023.*
Note: *A sample of EU firms only. A matched sample was constructed for the treated and control groups (three-nearest neighbours) using propensity score matching. The estimated impact of obtaining grants on total investment and intangible investment is net of the amount of grants received. The black lines indicated 90% confidence intervals. Tech classification follows Fuest et al (2024): High-tech (aerospace, alternative energy, biotech, software, etc.); mid-tech (automobiles, chemicals, telecoms, etc.) and other sectors (banks, construction, media, other services, utilities, etc.). Questions about the total amount of grants received as a share of total investment were only asked in the 2022 and 2023 surveys. Investment and intangible data are from the EIBIS, while total assets are from Orbis (lag of one year).*

41 Similar results are observed for the total and net investment growth rates.

Figure 51
Impact of targeted and non-targeted financial support on green and innovation investments
(in percentage points)





Source: *EIB staff calculations based on EIBIS 2024.*
Note: *A matched sample was constructed for the treated and control groups (three-nearest neighbours) using propensity score matching. Estimated impact of receiving non-targeted vs. targeted grants and bank loans with favourable conditions on the probability of investing in transformative investments and R&D intensity. The black lines indicated 90% confidence intervals.*

Targeted policy support is more effective in spurring climate action. Our analysis shows that targeted grants and loans with favourable conditions significantly influence green and innovative activities, resulting in a stronger impact than non-targeted support. Specifically, as illustrated in Figure 51(a), firms receiving grants or finance with favourable conditions targeting green investment or climate action are significantly more likely to invest in energy efficiency than firms without grants and without finance with favourable conditions. The effect for untargeted grants and finance with favourable conditions is not significant. Similarly, targeted grants and finance with favourable conditions significantly push up investments in cleantech and future climate change initiatives, while the effect of non-targeted intervention is not significant.

Targeted policy support also has a bigger impact on innovation. Firms receiving grants or finance with favourable conditions focusing on innovation or digitalisation are significantly more likely to invest in innovation over the next three years or to be innovative. By the same token, the results do not show a significant effect on the probability of firms investing in innovation when grants are not targeted (see Figure 51(b)).

Box D

Effectiveness of EIB instruments

Market failures affecting Europe's smaller businesses come at a high cost. A non-negligible share of businesses faces challenges in accessing financing, and these challenges are typically more pronounced for smaller firms. Yet small and mid-size firms are key drivers of employment and growth.

These firms account for more than half the value added by non-financial firms, and close to two-thirds of total employment in Europe. Hampering their ability to finance investment weighs on the economy, through slower job creation, innovation and productivity growth. Additionally, smaller businesses are at a particular disadvantage during downturns, when credit becomes scarce.

The EIB Group provides a wide range of instruments that address specific market failures and financing gaps. For example, it provides access to affordable credit lines and guarantee programmes that enable smaller firms to invest, expand and manage liquidity shocks, particularly during economic downturns. It issues guarantees to reduce risks to investors, encourage private-sector participation and direct investment towards projects of strategic importance for EU policies and priorities. It also undertakes equity and quasi-equity investments in young and high-risk businesses, such as startups and high-growth enterprises in need of patient capital that supports innovation.

The EIB provides significant support to businesses. It supports more than 400 000 small and medium-sized firms and mid-caps every year, providing EUR 31.1 billion in finance to businesses in 2023 alone. Almost half of that, EUR 14.9 billion, came from the European Investment Fund (EIF). Support for businesses makes up around 43% of EIB Group activity by volume, and pursues strategic EU objectives like sustainability, digitalisation and competitiveness. Different EIB Group instruments target specific market failures and firm types, including multibeneficiary intermediated loans, credit guarantee schemes, portfolio guarantees and venture investments.

EIB support has had a positive impact on beneficiaries. The EIB Group has conducted several impact studies, comparing the performance of firms that receive EIB Group support with comparable firms. These studies are based on unique firm-level datasets that link EIB Group support to external information on firms, investors and the macroeconomic setting. The effect of the financing is positive and significant, proving that EIB Group support for small and medium-sized firms, mid-caps and innovative businesses makes a real difference.

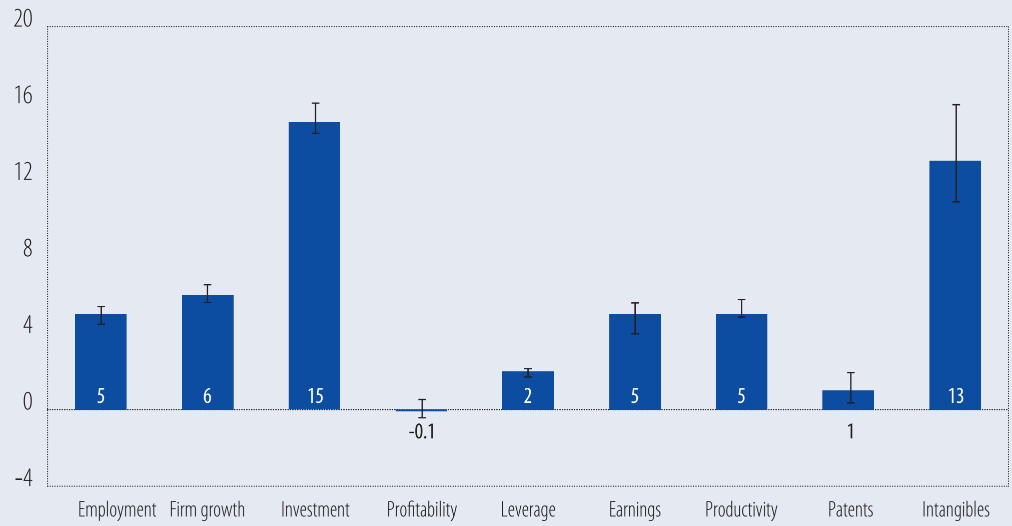
Supporting businesses through intermediated lending and guarantees positively affects firm growth and employment. For example, two EIB Group studies show the positive impact of key EIB Group instruments: intermediated lending and guarantees. By linking EIB loan-level data to firms' financial results, the first study carries out a counterfactual analysis that compared EIB beneficiaries to a control group. The analysis used a quasi-experimental design to show the positive impact on a wide range of outcome variables, including investments and employment (Figure D1).

Table D.1
How EIB Group instruments address market failures

Market failures and investment needs		Standard/established firms SMEs and mid-caps	Startups: Early/later-stage and scale-ups
Structural	• Asymmetric information • Screening costs • Discrimination	• Multibeneficiary intermediated loans (MBILs) • Guarantees (such as risk sharing, securitisation)	Venture investments: • Venture capital and private equity for mid-market firms • EIC Fund (the venture investment arm of the European Innovation Council) • Venture debt (such as first-of-a-kind, scale-up) • Co-investments (such as under the European Tech Champions Initiative)
Cyclical	• Credit rationing • Capital constraints • Flight from risk		
Strategic goals	• Innovation/digitalisation • Sustainability	• Thematic MBILs • Thematic guarantees	
Market development	• Nascent markets • Strategic industries • Establishing market scale		

Source: *Sinnott, et al. (2024).*

Figure D.1
Estimated impact of EIB intermediated loans (% increase over the counterfactual)



Source: *Sinnott, et al. (2024).*
Note: *The blue bars represent the estimated effect for EIB beneficiaries compared to a control group in the three years after the loan. The black lines indicate 95% confidence intervals.*

A second study from the EIF analysed around 360 000 guaranteed loans by the EIF to small and medium-sized firms across 19 EU countries from 2002 to 2016. It relies on similar quasi-experimental statistical methodologies to show that firms receiving EIF-guaranteed loans had lower bankruptcy rates, about one-third lower – with the rate falling to about half in some regions.

As young EU firms struggle to find the right financing for innovation, EIB and EIF support through venture capital and venture debt has also proven crucial. Analysis of EIF-supported indirect venture capital investments, comparing firms that received venture capital with similar firms exploring new technologies without such financing, shows that these interventions had a positive impact on the growth of the financed startups. Over five years, firms achieved higher capitalisation and assets, as well as significantly higher revenue and employment growth. In addition, direct EIB investments (including venture debt) help fill the financing gap faced by high-growth, innovation-focused companies that are scaling up production.

An EIB study assessing the role of EIB venture debt for innovative firms shows striking results. Not only do EIB venture debt recipients grow faster than their peers, but they also enjoy much better arrangements when they go on to find funding on the market, as receiving EIB venture capital is perceived to be a stamp of quality. These findings play a key role in the design of public policy aiming to respond to market failures and close financing gaps.

Conclusion and policy implications

The investment outlook has improved slightly but remains uncertain overall. Monetary policy is loosening, improving the financial environment for investment. Indicators from the EIBIS and the larger macroeconomy suggest that conditions will improve slightly, especially for external financing, which will benefit from falling costs and easier credit conditions. However, the expected improvement is moderate, and comes after a year of flat investment, which is bad news considering the massive spending needed to carry the digital and green transition.

Structural changes are not behind the slight expected improvement. The European Union suffers from weakness in key segments of a well-developed financial system: venture capital, private equity and scale-up finance, as well as the securitisation and public equity markets. These segments typically support the type of firms Europe needs (young, innovative and fast-growing), and the type of corporate investment it needs (intangible assets).

A more balanced and better integrated financial system would help. The European Union needs a deeper capital markets union, as emphasised in the Draghi (2024) and Letta (2024) reports. Changes in regulation would help tap a well of private long-term investment and maintain investment levels during downturns and periods of tighter monetary policy. Regulatory changes would also help unlock the expansion of specific markets.

Tighter fiscal budgets and more difficult economic conditions mean that policy support must be far more targeted than it was during the pandemic. Well-designed, targeted support can help firms, particularly young and innovative ones, to invest, and the EIB is playing a role. Public support should also focus on overcoming structural market weaknesses. However, given countries' inability to ramp up spending, public support needs to be used effectively to draw in private capital. When countries act unilaterally to support investment, the European Union does not reap the full impact of regional, country or industry spillover effects. Policy support designed at the national level can generate market distortions and create inefficiency. However, these negative effects can be mitigated with European coordination. EIB support has proven to be highly effective. Beyond pioneering green finance, the EIB has helped muster financing for EU firms that are scaling up, and it has also improved the ability of venture capital investors to exit companies. This support is crucial for a thriving and resilient venture capital system, which is needed to nurture the tech champions of tomorrow.

Investment still requires business opportunities and a conducive operating environment. The analysis on investment barriers recalls how important it is for policymakers to create a business environment that encourages investment. Reducing investment barriers and expanding the EU single market remains a priority. This would support widespread economic growth and, most importantly, would create a large and deep market for Europe's most dynamic businesses.

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PART 2

SKILLS, VALUE CHAINS AND THE GREEN TRANSITION

34% of EU firms **used big data analytics and AI in 2024** vs. **40%** of US firms.

Exports of **EU green goods rose** by **65%** from 2017 to 2023, vs. **79%** **in China** and **22%** **in the United States.**

51% of EU firms **reported a shortage of skilled workers in 2024**, up from **38%** in 2016.

The share of firms providing training **did not increase** during this time.

In countries with stricter climate commitments:

Firms are **7** percentage points more likely **to be leaders in energy efficiency**

and **21** percentage points less likely **to be laggards**.

Energy efficiency gains enable energy-intensive firms **to increase productivity by 4%** while weaker climate policies leave firms with **no incentive to transform their activities.**

Increasing female labour force participation to the highest EU level could push GDP up **4%**

1.5 million additional places in childcare **would narrow the gender employment gap** by **5%**

Chapter 4

Social inclusion as a path to well-being and competitiveness

Social inclusion and equality of opportunity are vital for Europe's future economic performance. Equality of opportunity ensures that talent and skills are not wasted and is critical for productivity and competitiveness. It is supported by inclusive economic outcomes that enhance the well-being of Europeans.

The European Union has been improving steadily in terms of social inclusion, well-being and equality of opportunity, but many barriers remain, such as those related to gender and educational background. Recently, rising housing costs have increased impediments to home ownership and relocation, with implications for labour market inclusion and labour mobility. Inflation has had a disproportionate impact on poorer households and retirees.

Education, childcare services, urbanisation and structural changes in the economy have supported rising labour force participation, particularly for women, but the green transition poses a challenge. While labour force participation has increased for all workers aged 55 and above, among those under 50 it has risen for women only, mainly driven by improvements in educational attainment and childcare services, as well as a growth in service-sector employment. However, there is a gender gap in green skills that largely reflects the gap in science, technology, engineering, and mathematics (STEM) qualifications. For firms, scarcity of skilled staff is a major obstacle to investment, a problem that was exacerbated by the COVID-19 pandemic and remains acute in many regions. Overall, growth has been concentrated in capital regions, with the poorest regions suffering a brain drain.

Greater equality of opportunity could unlock significant economic potential. Implementing policies that reduce inequality of opportunity, particularly an individual's ability to participate in the labour market, can have a positive impact on overall economic output by tapping into Europe's unrealised human capital. For example, reducing the share of young people not in education, employment or training (NEETs) or closing the gender participation gap is shown to increase gross domestic product (GDP) by several percent. Similarly, supporting employment among men and women from less advantaged backgrounds is expected to increase GDP. Simulations clearly show the economic potential of enhanced inclusion, even if significant conditions must be met to fully realise it.

Social investment in health, education and housing is critical to protecting and improving well-being and social cohesion, and also has a strong effect on EU competitiveness. Active labour market policies, inclusive education and support for parents can improve labour market outcomes for women and vulnerable groups, helping people enter the workforce and keep their jobs. When it comes to adult training, the focus should be on helping European firms to close the gap in worker training. Increasing support for EU research and development and rolling out new technologies to provide healthcare can sustain improvements in outcomes. Local administrations play a key role in social investment and regional convergence, but face capacity and funding constraints.

Making housing affordable and increasing the sustainability of housing requires a multi-pronged approach focused on reducing regulatory barriers, supporting innovation and facilitating access to finance. The decade-long rise in house prices and rents has disproportionately affected some demographic groups, like young workers, middle- and low-income families, and in general, people moving to cities for work or education. Moreover, energy-efficiency requirements, the recent surge in inflation, and pandemic-related shortages increased construction costs, further restricting access to home ownership. A lack of affordable housing in fast-growing regions deters migration, raises wages and constrains the expansion of employment in dynamic regions, with implications for EU growth. Revising regulations and land-use restrictions is necessary to facilitate an increase in the housing supply in regions where it is needed the most. Encouraging the adoption of new technologies in the construction sector will reduce costs and expand supply. New financing models to support social housing providers, finance-constrained households and businesses must be paired with policies that shore up availability of affordable housing.

Introduction

A socially inclusive economy is vital for human well-being. Moreover, inclusive economic outcomes and equality of opportunity are necessary to ensure that everyone can participate in the economy to their full potential. This is critical for productivity growth and the competitiveness and success of Europe's economy. Labour force participation, skills and labour mobility play a key role in this regard – in fact, a lack of skills is one of the main impediments to firms' investment across Europe.

Europe's social model has been a success story for inclusion and well-being. There is evidence of considerable progress across different metrics of inclusion, equality of opportunity and well-being, putting Europe at the global forefront in these areas. This has largely been sustained in recent years, despite economic shocks like the COVID-19 pandemic. However, there is more progress to be made, and gains must be protected in the face of challenges like the green transition and the growing impact of climate change, the digital transition and demographic change. It is also important to note that some economic trends are already threatening inclusion and equality of opportunity, especially the rising cost of living, and of housing in particular.

This chapter examines these issues in three parts:

The first part looks at recent trends in inclusion, well-being and equality of opportunity, with a particular focus on labour force participation, education and the effects of housing market developments.

The second part examines labour force participation as a key channel for inclusion and productivity growth. It analyses the factors that have driven changes in who participates in the labour market, particularly regarding gender, and how changing skill demands from the green transition may affect labour market inclusion. It then looks at how housing affordability affects labour market participation and mobility, how these differ from region to region and how skills and labour mobility constraints are influencing firms' investments.

The third part investigates how policies, and especially social infrastructure investment, can protect and enhance social inclusion and equality of opportunity. It covers investments in education, training and health; how to promote labour market inclusion and increase housing supply and affordability; and the importance of technical capacity at the local government level to support social investment.

The state of social inclusion in Europe

The European Union's commitment to social inclusion and well-being is a cornerstone of its economic productivity and growth. Safeguarding well-being, including equal access to quality healthcare and education, supports economic growth by ensuring a healthier and more productive workforce and the efficient allocation of skilled labour. The European Union's reputation for a high quality of life also helps attract skilled professionals from around the world. Similarly, higher social mobility is associated with faster economic growth, as better opportunities to invest in human capital improve its accumulation and allocation.[1] Thus, inclusive labour markets not only facilitate upward social convergence in the European Union (for example, by narrowing gaps in gender employment and pay), but also support economic growth.

Europe has made steady progress in social inclusion and well-being

Well-being is a complex concept of interrelated dimensions, including health, education and economic security. Measures of net national income, real household income and consumption are closely associated with material living standards. However, quality of life also depends on people's health, education, everyday activities – including the right to a decent job and housing – and the factors that shape their personal and economic security. Social inclusion can significantly enhance an individual's sense of well-being. Feeling included and valued can lead to higher self-esteem, reduced stress and better mental health overall. Equal access to resources like education, healthcare and employment reduces socioeconomic inequality and therefore barriers to well-being.

EU residents live considerably longer and healthier lives than people in many other advanced economies. Except for during the COVID-19 pandemic, life expectancy at birth in the European Union has risen consistently in recent decades (Figure 1). In 2023, life expectancy in the European Union was 81.5 years, squarely among the global leaders in this area. The lives of EU residents have also become healthier, as access to healthcare in the European Union has improved significantly over the past decade. In 2022, the number of healthy life years at birth was estimated to be 62.6 (or 77.7% of total life expectancy), up from 60.9 in 2005.

The European Union is at the global frontier in terms of inclusion and well-being. With 25 EU members in the top 50 of the UN Human Development Index, the European Union dominates the global leader board in terms of human development, scoring well across a broad range of well-being indicators (United Nations Development Programme (UNDP), 2024). EU countries have also recorded considerable progress (Figure 2a), with clear signs of convergence by countries in Southern Europe and Central and Eastern Europe. Figure 2b also illustrates the distance to the frontier (the best performing country, scaled to 1). The European Union is at the global frontier across a broad range of dimensions, recording exemplary scores in terms of life expectancy, mortality rates, inequality, gender employment and environmental outcomes.

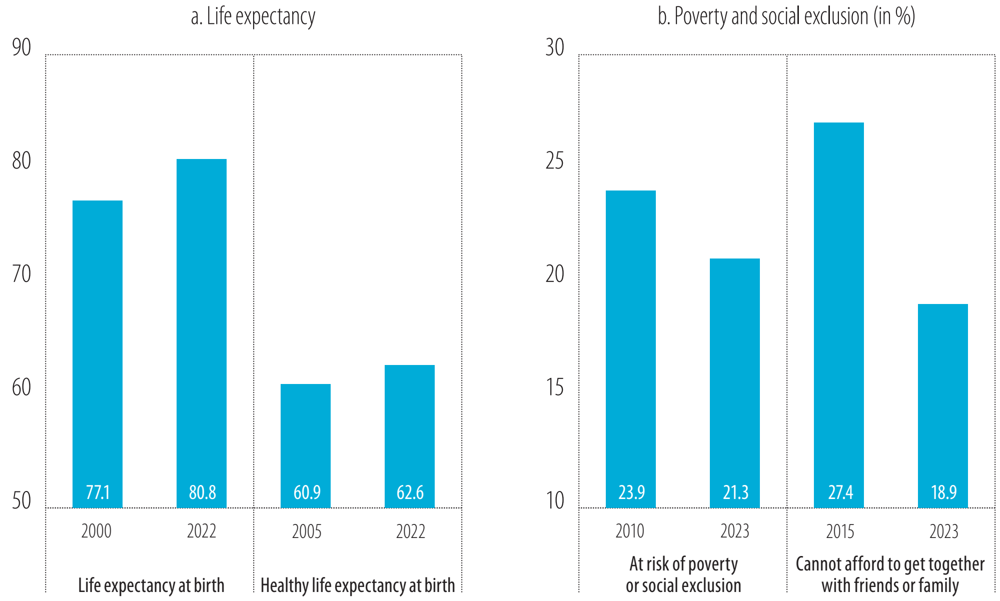
Over the past decade, income in the European Union has risen and the hours worked to obtain that income have fallen, while income inequalities have decreased. In the vast majority of EU members, median income has risen. On average, real incomes in the European Union rose by 18% in 2010-2023. National and regional variation in income growth highlights a clear catch-up in Central and Eastern Europe. For example, Romania recorded the highest growth in real income, with a 140% increase relative to 2010.[2] While real incomes rose, the weekly working hours to obtain this income gradually decreased, leaving more time for leisure. Weekly working hours for people aged 20 to 64 in their main job averaged 36.1 hours in the European Union in 2023, down from 38.2 hours in 2003. At the same time, income inequalities in the European Union shrank. In 2023, the Gini coefficient in the European Union recorded a low of 29.6.[3]

1 See, for example, Bradbury and Triest, 2016; Neidhöfer et al., 2018; Güell et al., 2018; Neidhöfer et al., 2024.

2 The exception here is Greece, where the real median income remains well below the pre-financial crisis level.

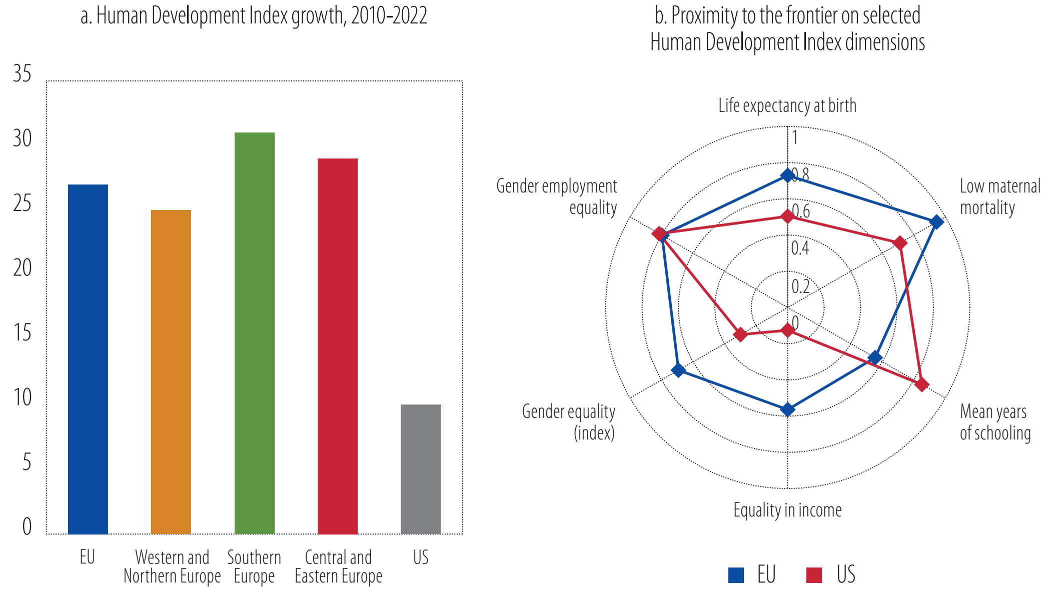
3 The Gini coefficient, also known as the Gini index, is a measure of statistical dispersion intended to measure income or wealth inequality. Alternatively, the S80/S20 ratio measures the degree of inequality as the ratio between the total equivalised net disposable income of the 20% of people with the highest income (S80) and the total equivalised net disposable income of the 20% of people with the lowest income (S20). The S80/S20 ratio dropped from 5.05 in 2013 to 4.72 in 2023.

Figure 1
Well-being trends in the European Union



Source: *EIB staff calculations based on Eurostat, Organisation for Economic Co-operation and Development (OECD) World Bank World Development Indicators.*
Note: *Population weighted averages for the EU members.*

Figure 2
Human Development Index



Source: *EIB staff calculations based on United Nations Development Programme (UNDP, 2024).*
Note: *The European Union is the population weighted average of the 27 EU members. Panel (b) plots the distance to the international frontier, with the best performing country scoring 1 and the least performing country in the Human Development Index top 25 or the European Union scaled to 0. Maternal mortality is measured as the number of deaths due to pregnancy-related causes per 100 000 live births. Mean years of schooling is measured as the average number of years of education received by people aged 25 or above. Inequality in income measures the inequality (see Atkinson index) in the distribution of incomes based on household survey data. The gender employment gap measures the difference between male and female labour force participation rates. Data refer to 2022 or the most recent year available.*

The share of people in the European Union at risk of poverty or social exclusion has been declining steadily. In 2023, 94.6 million people in the European Union, or 21.3% of the EU population, were at risk of poverty or social exclusion, a considerable decline from 104 million (23.9%) in 2010 (Figure 1b).[4] Concretely, this means that fewer people are having trouble making ends meet, coping with surprise expenses, or simply enjoying a drink or meal with friends and family. In 2023, almost one in three people in the European Union (31.2%) reported being unable to cope with unexpected financial expenses, a decrease of 5.9 percentage points since 2010. Nevertheless, rates of severe material and social deprivation vary by region. While only 6.8% of the EU population experienced severe material and social deprivation in 2023, ten regions in the European Union recorded over 20% of people experiencing such deprivation, mostly in Southern Europe and Central and Eastern Europe.

The share of workers in the European Union experiencing job insecurity is declining, promoting the distribution of Europe's prosperity. Employment rates for men and women have increased steadily over the last few decades, reaching a record high of 75.3% in 2023. The gender employment gap also continues to decrease, with the employment rate of women in 2023 surpassing 70% for the first time.[5] An increasing number of young people are employed or in education and training. Accordingly, the share of the EU population living in households with very low work intensity has decreased, helping prevent people from falling into poverty.[6] Notwithstanding this progress, significant regional disparities exist within EU countries. Several regions across Belgium, France, Germany, Italy and Spain record high rates of people living in households with very low work intensity, exceeding 18% (2023 data, Eurostat).

Rising inflation and housing costs had a major impact on households, with poorer households and retirees suffering more from the loss of purchasing power. The inflation surge following the pandemic and the energy shock induced by Russia's invasion of Ukraine reduced purchasing power and welfare for lower income households. Poorer households were affected more severely than higher income households.[7] Inflation weighs more heavily on lower income households because more of their consumption spending is devoted to necessities like food, fuel and electricity, whose prices grew comparatively faster.[8] Overall losses were especially large for retirees due to the fall in the real value of their relatively large holdings of nominal assets (like cash and deposits) (Pallotti et al., 2023). While financial distress is now lessening again after the recent inflationary pressures, it remains particularly elevated for the lowest income households.

Well-being is not a given for everyone in the European Union, as major insecurities and disparities between and within EU countries persist despite a broad upward convergence in educational and labour market outcomes. For example, significant inter-regional disparities in employment remain between and within EU members (European Commission, 2024a). Job insecurity also has an impact on the perceived quality of life of those affected. While short-term temporary contracts have become less common in the past decade, they are still relatively widespread in some countries, mostly among young people and residents who are not nationals. Accordingly, young people are less satisfied with their jobs than older cohorts. The threat of unemployment may make workers feel excluded from society (Eurofound, 2023).

4 "At risk of poverty or social exclusion" refers to people who are either at risk of poverty, or severely materially and socially deprived or living in a household with a very low work intensity. At risk of poverty refers to people with an equivalised disposable income (after taxes and transfers) below the at-risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income.

5 The gender employment gap is defined as the difference between the employment rate of women and men aged 20 to 64.

6 A household with very low work intensity is one where the working-age household members worked 20% or less of their total work-time potential during the previous year.

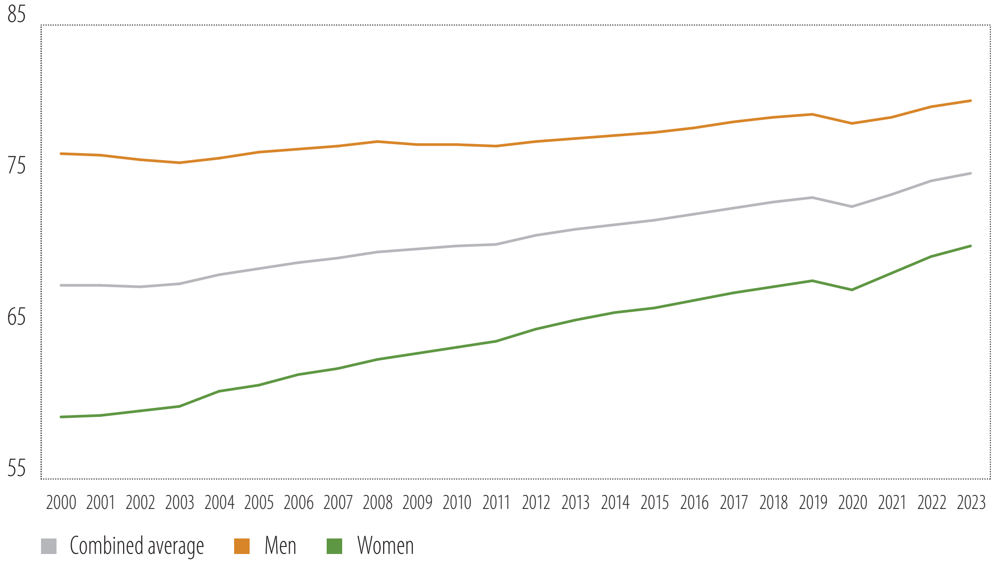
7 See, for example, Amores et al., 2023; Causa et al., 2023.

8 Fiscal measures compensated households for about a third of their welfare loss, though with significant differences between countries (Amores et al., 2023).

Labour force participation and educational trends support inclusion

Europe has experienced a strong increase in employment in the last two decades. Since the early 2000s, labour force participation has consistently increased, only briefly interrupted in the pandemic period (Figure 3). From 2004 to 2023, labour market participation increased by 9%, driven by a rise in the participation rate of women, which grew by almost twice the overall rate. While this outpaced the small rise in male participation, the rise in female participation has not been sufficient to catch up with the activity levels of men: About 80% of men participated in the workforce in 2023, compared with roughly 70% of women. So, while progress has been achieved in mobilising female workers, a significant (though declining) gender employment gap remains.

Figure 3
Trends in long-term labour force participation (in %)



Source: *EIB staff calculations based on Eurostat.*
Note: *Labour force participation by men and women aged 15 to 64.*

The overall increase in labour market activity has been driven by participation of older workers in general, and women in particular. Amid rapid demographic ageing and the baby boomer generation gradually retiring,[9] the percentage of elderly people in the workforce has risen significantly, at least partly dampening the impact of the drop in young people entering the labour market. Labour participation has increased overall, especially for people aged 55 and up, but the rise in women in this age bracket has been stronger than for men (almost 30% vs. around 22%) (Figure 4). Female participation across the entire working-age range also increased slightly following more frequent and longer periods of higher education.

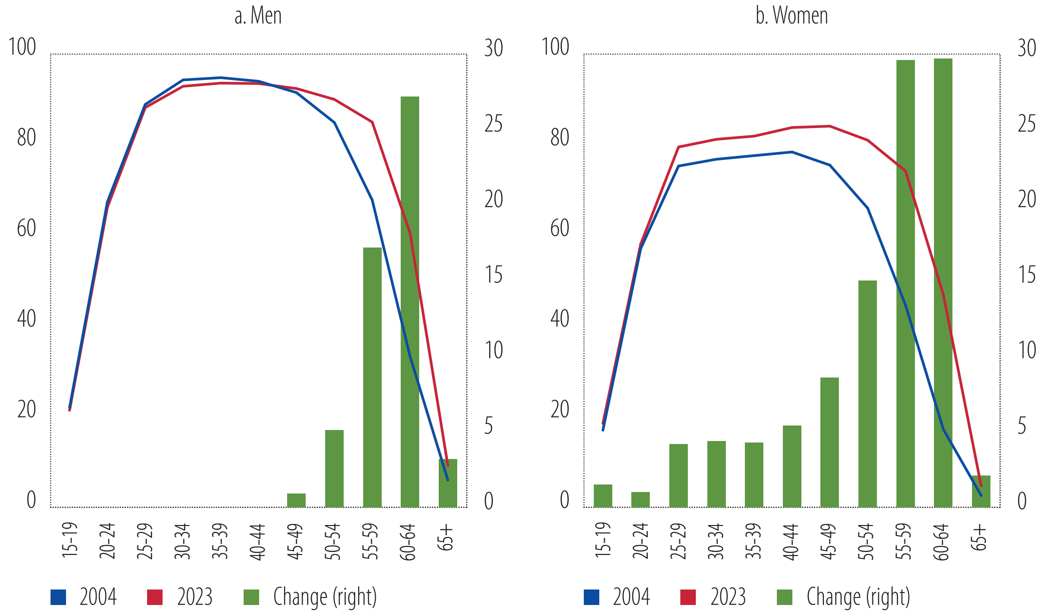
Narrowing the participation gap between women and men would lead to significant economic gains. Apart from the direct impact of a larger workforce on output, increasing female participation has been shown to raise productivity by bringing in new ideas for production and different management styles.[10] Since the early 2000s, Europe has made good progress in reducing the employment gap between men and women. The gap decreased to 10.2% in 2023, from 15.4% in 2004, despite the rising

9 According to forecasts from the European Centre for the Development of Vocational Training, baby boomer generations across Europe will have retired by 2030. Overall, Europe is expected to lose around 7% of its working-age population due to ageing by 2040 (EIB, 2024a).

10 See, for instance, Ostry et al. (2018); Cuberes and Teignier (2016).

workforce attachment of men. Further progress could bring substantial economic gains. Using a simple approximation, fully closing the gender participation gap in 2023 would result in a GDP increase of between 2% and 5% – depending on whether female participation converged towards the overall EU average, the European Union's highest benchmark rate for female full-time participation (Lithuania), or men's participation rates in individual countries (Figure 5). In GDP terms, narrowing the gap would yield an equivalent of EUR 440 billion to EUR 880 billion.[11] For that to materialise, employed women would need to work the same average number of hours as their male colleagues (assuming similar levels of labour productivity).

Figure 4
Labour market activity rates (in %)**, by sex and age**

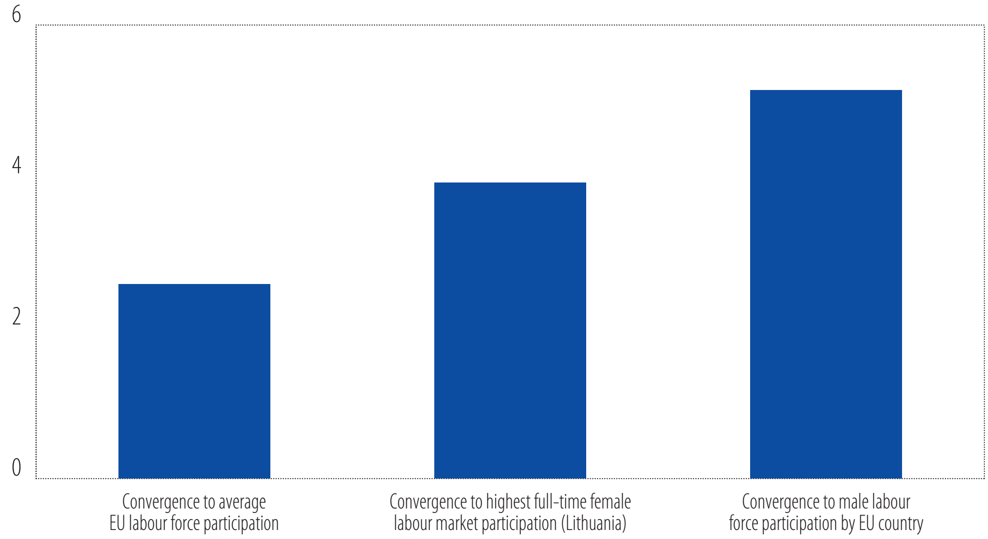


Source: EIB staff calculations based on Eurostat.

Higher education attainment and skill levels have led to better prospects for joining the labour market. The skills demanded of workers have changed and increased over time, reflecting growing complexity in the workplace and the need to learn new tasks amid the ongoing skill-intensive green and digital transition.[12] At the same time, Europe's workforce has significantly increased its level of education, in line with the demands of current and future high-quality jobs. Younger people, and particularly women, attain higher levels of education on average than older people, with the trend growing. Over the last two decades, the share of people aged 25 to 64 with tertiary education has surged, from 20.8% in 2004 to 35.1% in 2023, while the share of the population with less than lower secondary education has decreased from 32.1% to 20.2%. This growing divergence has been driven by a steady increase in the share of women graduating from university, slowly reversing the gender gap in favour of women over time. While in 2004, 29% of women (vs. 23.5% of men) in the 25-34 age group already held tertiary education, even more women than men had a degree in 2023 (48.8% vs. 37.6%).

11 The three scenarios use the respective gender employment gaps per EU country and the country's wage share (in % of GDP).
12 This is based on Eurofound's Survey on Working Conditions in Europe (various years) asking workers about changing job requirements.

Figure 5
Economic gains (% GDP) **from narrowing the gender employment gap**



Source: *EIB staff calculations based on the annual macroeconomic database (AMECO) of the European Commission's Directorate General for Economic and Financial Affairs, Eurostat and OECD.*
Note: *Calculations based on a workforce aged 20 to 64. The first column refers to the average EU labour force participation rate of men and women. Lithuania as the benchmark country in the second column ranks highly in terms of female participation and has a very low rate of women working part-time.*

Besides its societal benefits, education is a basic determinant of the quality of life of individuals. Life satisfaction, for example, is often tied to the level of income, which often reflects the level of education. Europeans are becoming increasingly educated, which offers them better job and income prospects. Higher educational attainment increases the likelihood of being employed and of engaging in lifelong learning. In the European Union, the average employment rate in 2023 was 58.3% for 20- to 64-year-olds without upper secondary education, 74.6% for those with upper secondary education, and 86.3% for those with tertiary education. Labour market participation adds to economic certainty: One in three of unemployed people aged 18 or older in the European Union were at risk of poverty or social exclusion in 2023.[13] Nevertheless, Europe has been losing ground in the quality of educational outcomes. The EU average combined PISA[14] score (for mathematics, reading and science) decreased from 2009 to 2018, and decreased further by 2022. At the EU level, about one-third of students in the PISA sample (particularly men) are considered functionally illiterate in mathematics and reading (European Commission, 2024b). Adult participation in education and training also remains well below the EU target for 2030.[15]

Despite great strides made in improving inclusiveness, not everyone is benefiting equally from the labour market expansion. There are still sizeable pockets of underused talent and underdeveloped skills, and population groups at risk of facing severe difficulty entering the labour market. Education and job-related training throughout life remain crucial in determining people's labour market outcomes at all ages. While average attainment levels have continuously improved and more young people than ever are entering the labour market with a university degree, many still cannot access education, or drop out before achieving an upper secondary qualification – or do not engage in

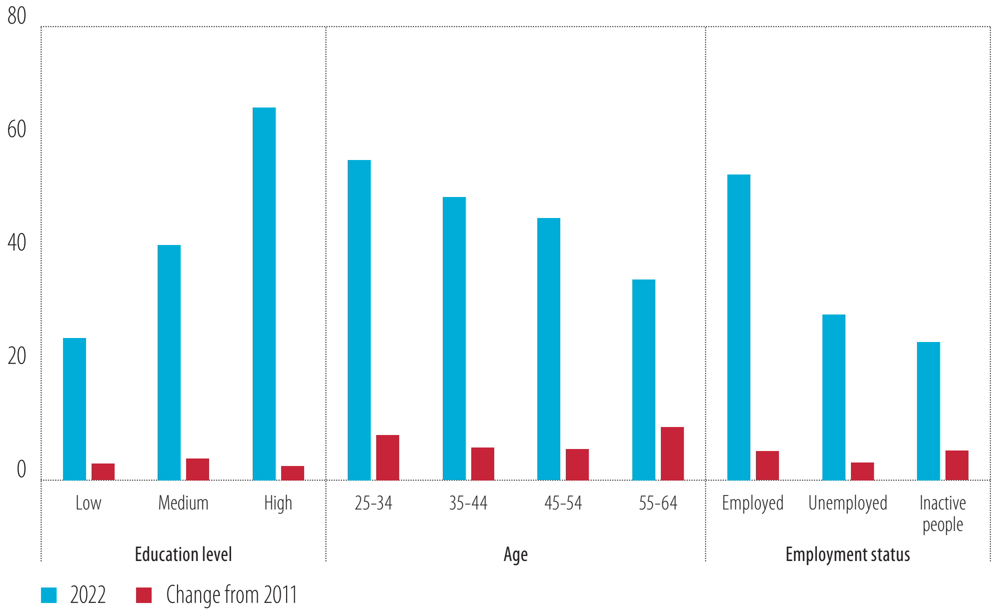
13 By comparison, just 7.1% of the EU population employed full-time were at risk of poverty in 2023.
14 PISA stands for the Programme for International Student Assessment, which is administered by the OECD.
15 In 2022, 46.6% of people aged 25 to 64 in the European Union had attended education or training during the past year (2022 Adult Education Survey). The EU target is to have at least 60% of adults participating in learning every year by 2030.

any productive activity at all. The continuing decline in quality basic education at a younger age, as evidenced by the average drop in the European Union's combined PISA test results for mathematics, reading and science between 2009 and 2022, poses a serious challenge for the next generations of workers. Also, much-needed digital skills have not shown significant improvements over time and the average level of computer and information literacy among European 14-year-olds has remained mediocre in global terms.[16]

Lower levels of education greatly increase young people's risk of not staying in employment or continuing any form of education and training. Leaving school early is linked to social exclusion, poverty and poor health. In 2023, an average of 9.5% of young people aged 18 to 24 in the European Union left education and training early. While this rate has come down over time, individual country rates vary dramatically, and currently range from 2.0% in Croatia to 16.6% in Romania. While the average rate of 18- to 29-year-olds not in employment, education or training (NEETs) fell from a peak of 19.1% in 2013 to an all-time low of 13.4% in 2023, low-skilled youth who did not complete upper-secondary schooling had an unemployment rate about 1.7 times that of tertiary graduates – despite a record number of job vacancies in recent years.[17] Young women are more likely to become NEETs, with young mothers saying that family care responsibilities were their biggest challenge. Reducing the 2023 rates of 18- to 29-year-old NEETs to the level of the best-performing country, the Netherlands, would increase EU GDP by about 0.8%, or EUR 115 billion.[18]

Figure 6

Participation in adult learning (in %)**, by education, age and employment status**



Source: EIB staff calculations based on Eurostat.

Economic transformation particularly affects older workers, since many of them do not have the necessary education or work experience. With the workforce ageing, fostering continuous learning and skill development across all ages and socioeconomic backgrounds helps to comprehensively increase labour market activity, preserve expertise and spur overall productivity. However, adult

16 See Fraillon (2024) based on results from the ICILS 2023 survey.

17 For instance, Stemmer (forthcoming) finds an increasingly tight labour market in the wake of the pandemic despite a significant rise in labour force participation.

18 This scenario assumes that the NEETs rates in Member States converge towards the lowest rate in the Netherlands (4.7%). The estimate is calculated using the observed workforce shares of young people aged 18 to 29 and the wage shares (in % GDP).

learning tends to benefit primarily those who already have better chances of labour market attachment (Figure 6). University educated, younger and already employed adults show substantially larger participation rates in adult learning programmes than less educated or unemployed people. Changes in participation rates in the last decade do not show significant progress amid a widening gap in skills between highly educated and low-educated adults. This stagnation coincides with comparatively low levels of willingness to train, based on the OECD Survey of Adult Skills (PIAAC 2012, 2015 and 2018). On average, slightly more than 50% of adults across EU countries did not or did not wish to participate in any training. Only about 12% participated in or were actively seeking further training.

The increase in labour force participation coincides with a secular decline in hours worked. While increasing flexibility in work time arrangements have benefited the attachment of women to the labour market, the bulk of new female entrants in the labour market have taken part-time arrangements. Around 80% of part-time jobs continue to be held by women. Thus, while the number of actual hours worked has been falling over the past two decades, policy reforms to increase flexible working hours might at least encourage involuntary part-timers who want to work more hours (very often women) to do so.[19]

Inclusion has enhanced equality of opportunity, but more needs to be done

Equality of opportunity ensures that talent and skills are used optimally. Equality of opportunity is traditionally understood as the absence of barriers to education and jobs based on personal characteristics like economic class, gender and race. An equal opportunity society guarantees that those who exert an equal degree of effort, regardless of their circumstances, are able to achieve equal levels of outcome.[20] When barriers based on involuntary characteristics are removed, resources flow to where they are most productive.[21] This enhances overall productivity and competitiveness. Moreover, when individuals believe they can succeed based on their abilities and efforts, they are more likely to take risks and start businesses, driving innovation and growth. Overall, lower inequality of opportunity is associated with faster growth.[22]

Involuntary circumstances affect labour participation and labour outcomes for those who work. High employment disparities exist depending on people's circumstances, including their parents' education or whether they have a disability. In 2023, people whose fathers had a low level of education had higher shares of unemployment or inactivity (17.6%) than people whose fathers had a medium or high level of education (9.8% and 11.3%, respectively).[23] Adults with highly educated parents, for example, tend to have better literacy skills than those with less educated parents, improving their chances in the labour market.[24] Similar disparities exist across other dimensions of involuntary circumstances, such as disability and parental occupation. Social ties also play an important role in finding jobs. Almost half of individuals in developed countries obtain or hear about jobs through friends and family. Importantly, these ties are significantly more important for less educated individuals and immigrants.[25] For those who work, labour earnings are significantly lower for those in more vulnerable circumstances (Figure 7).

19 Astinova et al. (2024) document the dominant structural role of the income effect over the substitution effect in determining workers' labour supply at the intensive margin, that is, preferences in reducing working hours. The decline on the intensive margin has actually been driven by men, especially men with children, who opted to reduce working hours voluntarily.

20 Inequality of opportunity represents the non-effort-based component of inequality.

21 In addition to the underutilisation of human capital, obstacles to equality of opportunity may also prevent physical capital accumulation (for example, when associated with structural unequal access to credit).

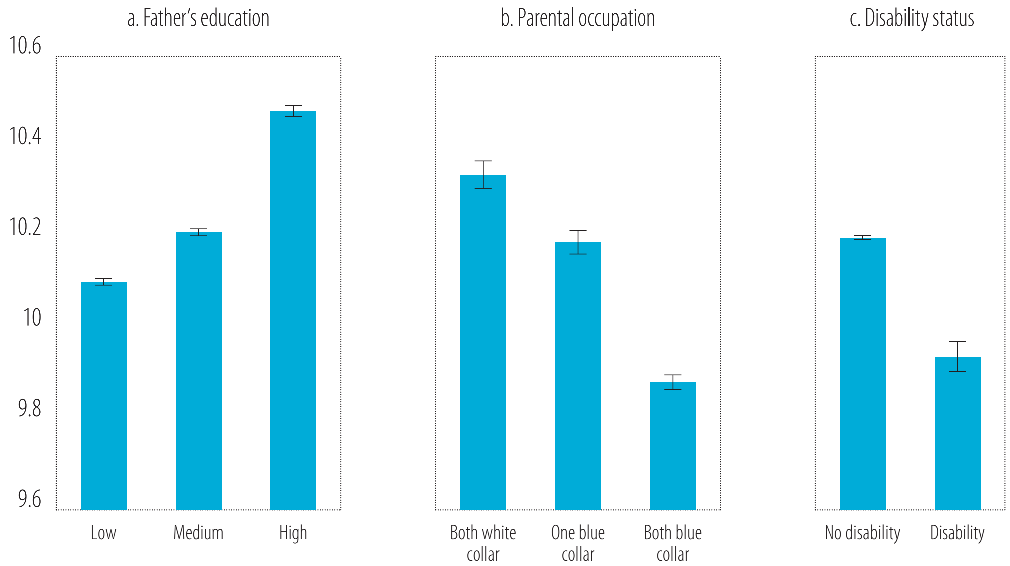
22 See, for example, Marrero and Rodriguez, 2013.

23 Following the definitions for the 2023 EU statistics on income and living conditions (EU-SILC), people with primary education or lower secondary education or below are classified as having low levels of education. Upper secondary education and post-secondary non-tertiary education are considered medium levels of education. High levels of education cover short-cycle tertiary education or a bachelor, master or doctoral level or equivalent.

24 Organisation for Economic Co-operation and Development (OECD), 2024b.

25 Kramarz and Nordström Skans, 2014; Moreno Galbis et al., 2020.

Figure 7
Average labour earnings (in logarithms)**, by personal circumstance**



Source: *EIB staff calculations based on EU statistics on income and living conditions (EU-SILC) 2023 data.*
Note: *Bars indicate 95% confidence intervals around the means. The data cover employed and self-employed heads of household aged 25 to 65 in full-time work and show the labour earnings averaged across the sample of individuals in each category.*

Inequality of opportunity in the European Union has been gradually and consistently decreasing. Analysis using detailed information on individual incomes, employment, household characteristics and the intergenerational transmission of these factors shows that the inequality of opportunity in the European Union has decreased over the past decade, improving conditions in the majority of EU countries.[26] While involuntary circumstances like gender, disability, parental education and occupation still accounted for 38.0% of the overall earning differentials in 2011, this share gradually and consistently decreased to 22.1% in 2023.[27] Inequality of opportunity across EU countries has also significantly converged over time.[28]

Gender and education remain key barriers to opportunities in European labour markets. Figure 8 illustrates the relative contribution of a variety of involuntary circumstances on the inequality of opportunities. Over the last decade, the importance of a parents' country of origin has declined. Nevertheless, parental education and gender persistently limit labour market opportunities across the European Union, accounting for around 80% of all variation explained by involuntary circumstances (Figure 8).[29] Narrowing down the findings by income quantile, sex and education are found to be of comparatively greater importance in explaining earning differentials among those with higher incomes, whereas a disability and one's geographical place of birth gain importance in explaining differentials across lower income individuals. Tackling these barriers is important because they constrain social mobility.[30]

26 The results in this section draw on the analysis of the EU-SILC detailed in van der Wielen (forthcoming). Inequality of opportunity is measured as the share of (winsorised) log labour earnings explained by involuntary circumstances. The estimations are based on EU-SILC data for employed and self-employed household heads aged 25 to 65 in full-time work.

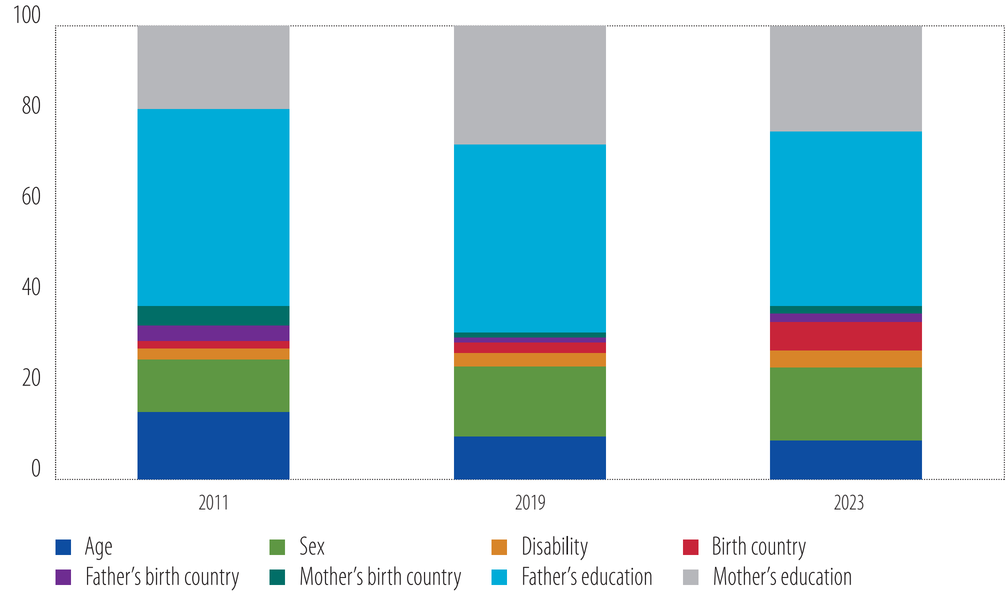
27 The results are in line with earlier findings. For the European Union, applications to earlier data vintages have also documented a decrease in the relative inequality of opportunity (Filauro et al., 2023). Earlier country-specific estimates can be found in Marrero and Rodriguez (2012), Checchi et al. (2016), Palomino et al. (2019), Suárez Álvarez and López Menéndez (2021), Brunori et al. (2023), and Filauro et al. (2023).

28 This is in line with earlier convergence tests by Suárez Álvarez and López Menéndez (2021) and Filauro et al. (2023).

29 Another important factor is parental occupation (blue collar vs. white collar). Due to data limitations, it cannot be accounted for in the 2023 data. Results for 2011 and 2019 show it is equally important as parental education. Including it would not change the above conclusions.

30 Indices of inequality of opportunity are strongly correlated with, for example, indicators of intergenerational mobility (see, for example, Brunori et al. (2013)). The importance of gender as a barrier is also in line with evidence that the intergenerational mobility of daughters is lower than that of sons (Carmichael et al., 2020).

Figure 8
Contribution of circumstances to inequality of opportunity (in %)



Source: *EIB staff calculations based on EU-SILC.*
Note: *Inequality of opportunity is measured as the share of labour earnings explained by involuntary circumstances.*

Reducing inequality of opportunity could unlock significant macroeconomic potential. Policies that reduce the inequalities affecting labour market participation and overall outcomes will affect economic output more broadly. For example, based on 2023 data, closing the gender participation gap is expected to increase GDP by up to 5% (Figure 5). Similarly, leading men and women not in work and with low-educated fathers towards employment could increase EU GDP by 2.7%.[31] Facilitating the entry of people with disabilities into the labour market could add approximately 1% to EU GDP.[32]

Public policies help promote the formation and effective employment of human capital. Public policies may offset how people's circumstances determine their opportunities. Figure 9 presents the relationship between inequality of opportunity and a range of public policies across EU countries. Education and labour market policies, for example, are key instruments to reduce the extent to which labour outcomes are related to personal background. There is a clear relationship between the inclusiveness of education and equality of opportunity (Figure 9a). Educational inequities are reflected in earnings. Systems with higher inequality of opportunity are typically characterised by higher college premiums (Figure 9b). Countries may spend the same fraction of GDP on education, but with different outcomes. If spending is directed to high-quality, accessible early childhood education and care, it is more likely to benefit those facing obstacles to opportunities (Figure 9c).[33] Higher enrolment in early childhood education and care also coincides with lower inequality of opportunity (Figure 9d). This is encouraging, as participation in early childhood education and care in the European Union has been increasing.

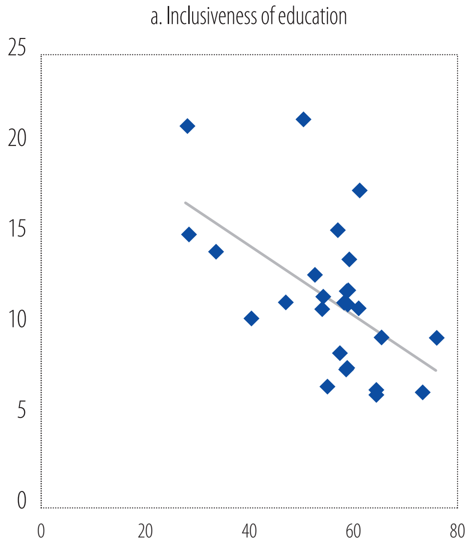
31 The GDP potential assumes that all EU members achieve the employment rate for the target group of the best-performing country (Denmark). The scenario is calculated using the observed shares of individuals with low-educated fathers in the 2023 EU-SILC and the wage shares (in % GDP) in AMECO.

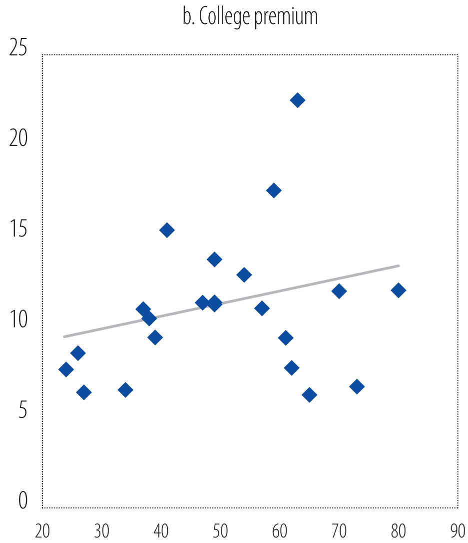
32 The economic potential is based on a scenario in which all Member States lead 68% of working-aged people with disabilities towards jobs (the share achieved by the second-place country). The scenario accounts for the fact that disabled workers work slightly fewer hours per week on average.

33 Similar trends have been documented by Checchi et al. (2016).

Figure 9

Social policies (x-axis, in %) **and inequality of opportunity** (y-axis, in %) **in the European Union**



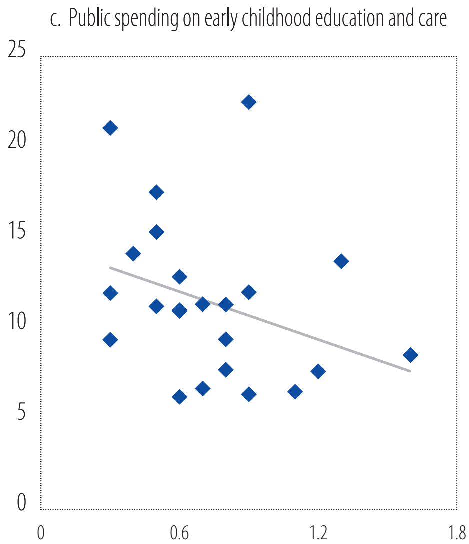


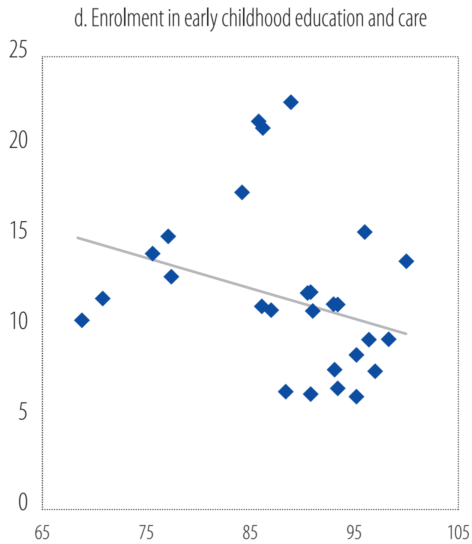
Source: *EIB staff estimations based on EU-SILC and PISA 2022 results.*

Note: *Measured by the share of 15-year-olds at or above proficiency level 2 in mathematics, reading and science. The diamonds represent EU countries for which data are available.*

Source: *EIB staff estimations based on EU-SILC and OECD Education at a Glance 2022.*

Note: *Measured as the premium in employment earnings of 25- to 64-year-olds with a tertiary education compared to peers with an upper secondary education. The diamonds represent EU countries for which data are available.*





Source: *EIB staff estimations based on EU-SILC and PISA 2022 results.*

Note: *Measured by the share of public spending on early childhood education and care relative to GDP. The diamonds represent EU countries for which data are available.*

Source: *EIB staff estimations based on EU-SILC and OECD Education at a Glance 2022.*

Note: *Measured by the share of 3- to 5-year-olds enrolled in early childhood education and care services and primary education. The diamonds represent EU countries for which data are available.*

Amid rising living costs, housing affordability is a key concern

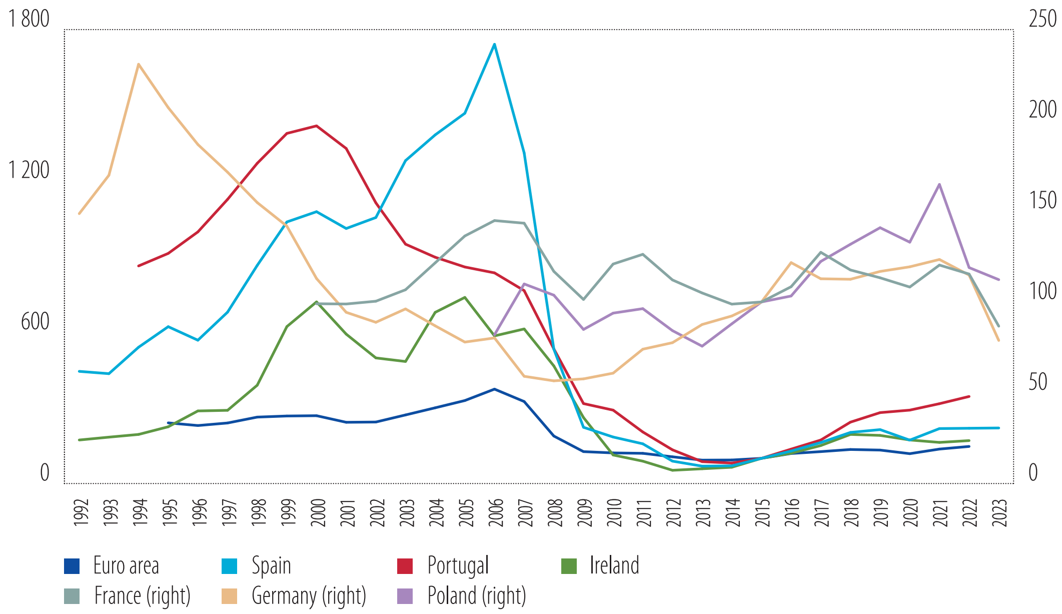
The cost of living, and particularly the cost of housing, is a major concern for Europeans. Driven by structural trends in monetary policy, demographics, and housing supply, the rising cost of housing has had a significant impact on key demographic groups and has become a serious concern. Expensive energy efficiency renovations add an additional cost.

House prices and rents have increased above income levels in recent years. The concentration of population in cities is creating regional imbalances. Regions affected by negative net migration are experiencing a drop in housing demand, while regions with positive net migration are unable to meet the higher housing needs. As a result, from 2013 to 2023, rents increased by 50% to 100% in many cities, including Lisbon, Dublin, Budapest, Berlin and Luxembourg, with many households spending more than 40% of their income on rent. In addition, high home prices and rents, especially in cities that have seen huge increases, spill over into high prices of non-tradable goods and services, like restaurants and hair salons, as high labour costs adjust (Stroebel and Vavra, 2019). This further deteriorates the purchasing power of workers.

Coastal cities and tourist destinations also experienced a rapid rise in rents and housing prices. In many regions, the high percentage of vacant houses (including holiday homes) and short-term rentals puts further pressure on the housing market. Over 20% of homes in Portugal, Spain, Malta and Estonia are vacant, according to the OECD Affordable Housing Database. The expansion of short-term rentals and second homes is especially problematic in tourist destinations, as it limits the housing available to residents and drives prices well above the average income of local workers.

Since the 2007-2008 financial crisis, new housing supply has remained sluggish in many countries, despite rising prices. In some countries, annual housing starts never recovered from the housing bubble (Figure 10), remaining below pre-2007 levels despite the buildup of housing demand since the 2010s.

Figure 10
Housing permits for selected EU countries (an index, 2015=100)

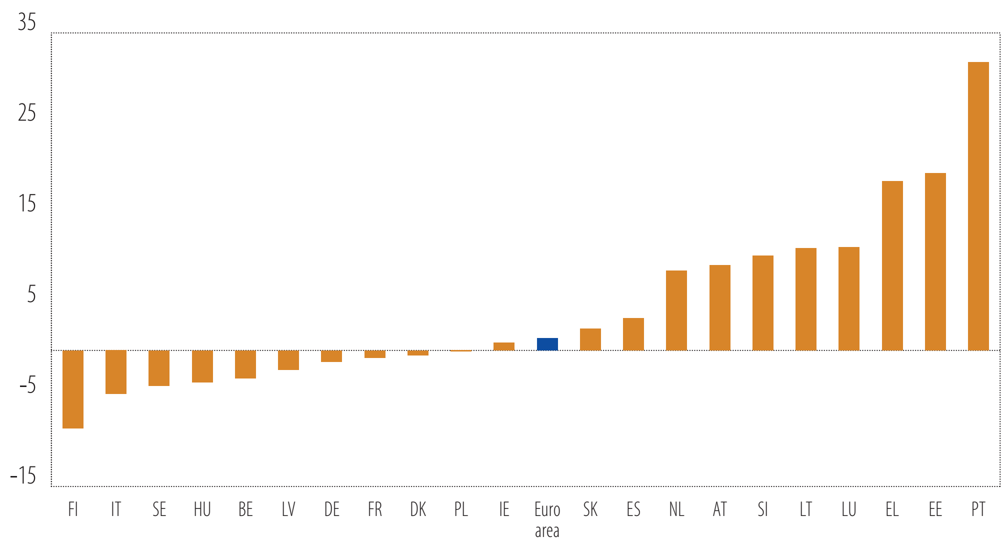


Source: *EIB staff calculations based on Datastream and Federal Reserve Economic Data (FRED).*

Limited land availability, high construction costs and regulatory constraints are among the key drivers of high housing prices. The availability of land is constrained by natural limitations (geographical barriers like bodies of water, mountains and other types of non-developable terrain) as well as large populations and high population density, which are among the main factors limiting the elasticity of housing supply in many European regions (OECD, 2019c). However, other factors, including regulation and land-use restrictions, can play an important role in limiting the availability of land for housing development, and consequently increase land prices. For new construction, the high cost of decontaminating former industrial sites also contributes to high housing prices. Increasing the housing supply also creates costs for local municipalities, as they must expand the supply of public facilities like roads and schools to prevent overcrowding. And while more stringent energy requirements decrease energy bills for households, they push up construction costs. In addition, European regions with a high presence of institutional investors active in the European housing market, particularly investment funds, also display larger deviations in prices than from underlying macroeconomic fundamentals (European Central Bank (ECB), 2023).

Housing prices peaked during the pandemic, when supply-side shortages prevented the market from responding to increased demand that was supported by macroeconomic policies. In the pandemic years house prices soared, pushed by supply-side constraints, including labour and material shortages. At the same time, expansionary monetary and fiscal policies were keeping housing demand high. House prices have partially readjusted since then, while wages began to catch up with inflation, mortgage rates responded to monetary policy and fiscal stimulus was largely withdrawn. Still, house price to income ratios remain significantly higher than the pre-pandemic levels in many countries (Figure 11).

Figure 11
Difference in house price to income ratios (in %)**, 2023 vs. 2019**

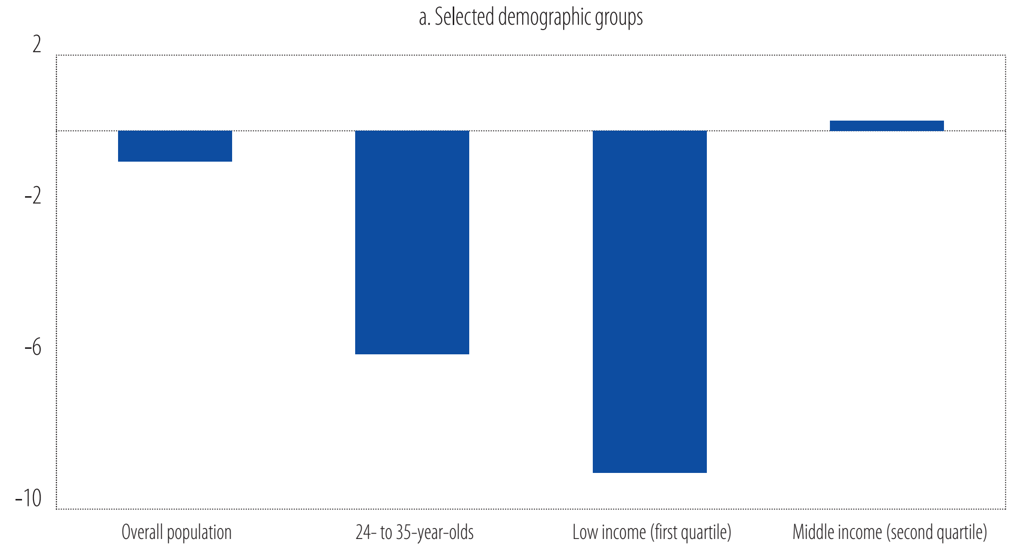


Source: OECD.

Housing price increases greatly benefited homeowners. Housing is the largest component of households' wealth. Therefore, as residential property experienced larger capital gains than other investments, households that held a large share of their wealth in real estate saw that wealth rise by more than those that did not own property or invested in other assets. Reflecting this development, the share of EU households overburdened by housing costs (those spending more than 40% of the household budget on housing costs) has steadily decreased in the last 20 years because interest rates on mortgages have remained low and growth in household income has been robust, notably in Central and Eastern European countries.

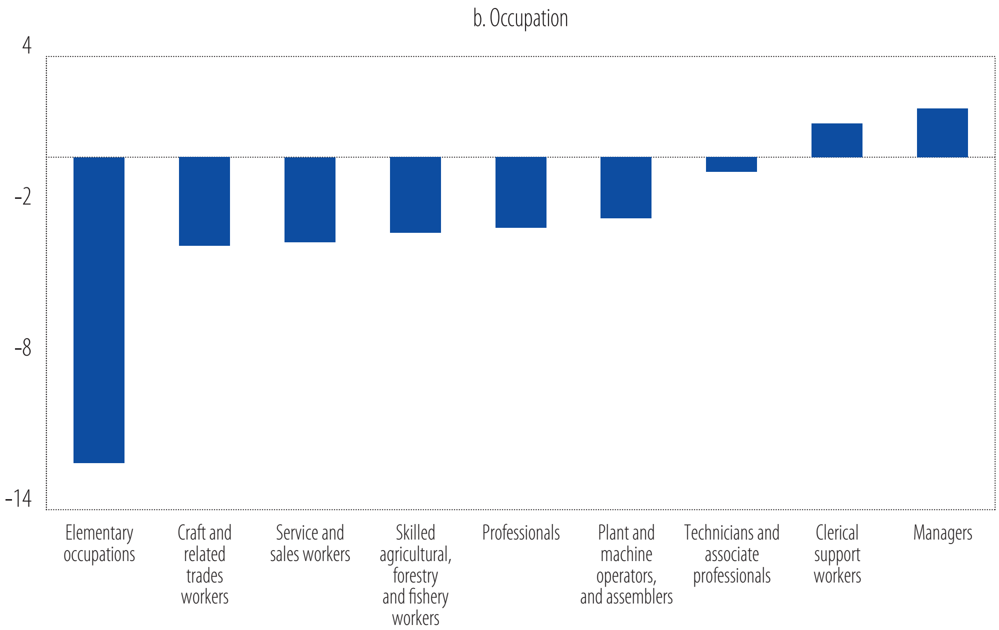
However, rising housing prices also reduced access to home ownership, particularly for younger generations and low- and middle-income households. As house prices increased, access to housing became more difficult for some demographic groups, including renters, those that did not own a house before the price surge, or those that had to relocate to the most expensive cities. The home ownership rate for 24- to 35-year-olds decreased by 5.9 percentage points from 2005 to 2023, compared with 0.8 for the overall population (Figure 12a).[34] The largest drops in youth home ownership rates were recorded in Spain, Cyprus and Estonia. Among other strongly affected demographic groups, low-income households experienced a larger deterioration in home ownership than richer households. Ownership rates fell to 62% in 2023 from 71% in 2005 for poorer households (first income quartile), compared with a 2.5 percentage point increase for households in the fourth quartile of the income distribution. Access to home ownership worsened across most types of occupation, but the brunt of the impact was felt by workers in elementary occupations (Figure 12b). On the opposite end, managers and clerical support workers have increased home ownership rates over the last 20 years.

Figure 12
Change in home ownership rates (EU average, in percentage points)**, 2023 vs. 2005**



Source: EIB staff calculations based on EU-SILC.
Note: The following countries are included: Austria, Cyprus, Czechia, Estonia, Greece, Spain, Finland, France, Hungary, Italy, Lithuania, Luxembourg, Netherlands, Portugal, Sweden, Slovenia and Slovakia.

34 When including only the population in the labour force (and therefore excluding people who are retired, studying or staying at home), the drop in home ownership rate between 2005 and 2023 is 3% for the overall population and 7% for 24- to 35-year-olds.



Source: *EIB staff calculations based on EU-SILC.*
Note: *The following countries are included: Austria, Cyprus, Czechia, Estonia, Greece, Spain, Finland, France, Hungary, Italy, Lithuania, Luxembourg, Netherlands, Portugal, Sweden, Slovenia and Slovakia.*

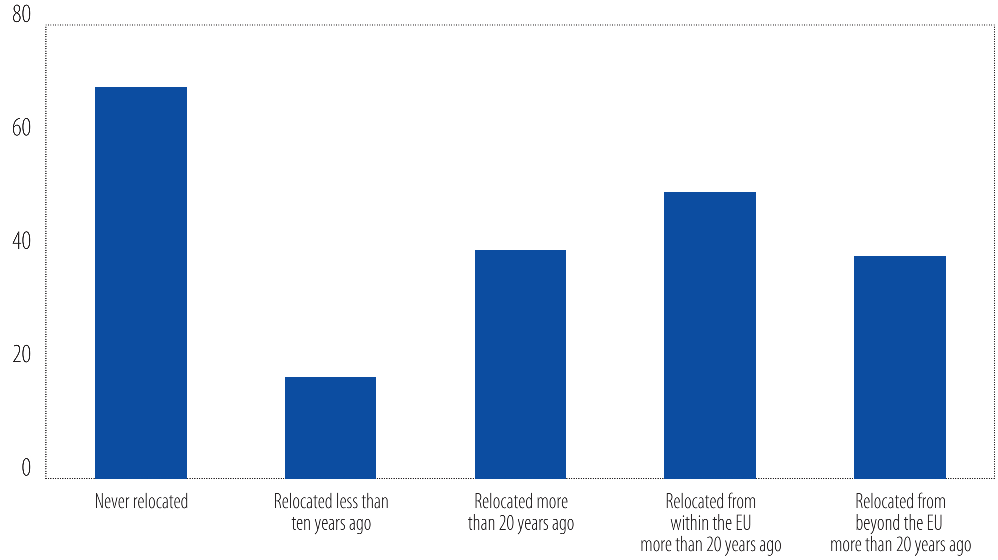
People relocating within the European Union experience lower home ownership rates, even decades after they move. People relocating to a new country have lower home ownership rates than people born in that country. Among people who relocated to an EU country less than ten years earlier, 18% own their home, compared to 69% of people who were born in that country (Figure 13). However, the gap in home ownership is present even when relocation lies far in the past. More than two decades after relocation, 40% of non-native residents own their home, well below the home ownership rates for locals. Relocating decreases the odds of owning a home even among people relocating within the European Union, for whom the rate of home ownership is 51%.[35]

The heavy costs of renovation and energy efficiency retrofitting will limit the use of the current housing stock and contribute to high housing costs. Half of the current housing stock in the European Union was built before 1980. In addition, about half of the EU housing stock has an energy rating of D or worse and requires renovation to be brought up to modern housing standards (European Commission, EU Building Stock database). Residential housing accounts for about 20% of greenhouse gas emissions, and heating remains a significant component of household electricity consumption. Despite significant improvements over the last decade, in 2023, 10.6% of EU residents were unable to keep their homes adequately warm – 3.7 percentage points higher than the historical low of 6.9% in 2021, as the energy crisis has increased the cost of heating. Raising the energy efficiency of current buildings could halve the emission intensity of residential buildings and reduce the financial burden of heating on households. However, the financial viability of such renovations has been compromised by rising material and construction costs, coupled with higher interest rates, which have collectively reduced the return on investment for these necessary upgrades (European Mortgage Federation, 2023). It takes more than 12 years to reap the financial benefits of energy efficiency renovations, with longer times to return on investment in many countries, including France, the Netherlands, Bulgaria and Germany (European Mortgage Federation, 2023). In addition, although retrofitting and energy

35 The findings may also reflect a compositional effect linked to the relocation of workers from high-home ownership countries in Southern Europe and in Central and Eastern Europe to low-home ownership countries in Western and Northern Europe.

efficient building techniques reduce energy spending later in the life of a building, they entail upfront costs that may be difficult for households to bear, particularly vulnerable groups.

Figure 13
Home ownership rates across different groups (in %)**, 2021-2023**



Source: *EIB staff calculations based on EU-SILC.*
Note: *The following countries are included: Austria, Belgium, Cyprus, Czechia, Germany, Denmark, Greece, Spain, Finland, France, Italy, Lithuania, Netherlands and Portugal.*

Labour market participation as a driver for inclusion and productivity growth

Access to the labour market and to quality jobs is key for social inclusion. However, not everyone who wishes to participate is equally equipped to contribute to the workforce. The ability of workers to adapt to fast-changing work environments is critical amid the green, digital and demographic transition. But work-related adaptability and resilience are set up early in life by high-quality education, which also determines future participation in lifelong learning and skill transformation. The level and quality of education, together with factors like age, gender, mobility, access to affordable and high-quality housing, and public policies targeting better labour market access, influence the link between personal circumstances and individual achievements, and thus labour market outcomes.

Education, childcare and urbanisation improve labour force participation

European labour markets show long-term trends of increasing labour force participation, and economic downturns have barely slowed the process. This development is broadly based on a change in the composition of the labour force, with the rising share of highly skilled workers driven by increasing educational attainment and workforce attachment, supported by a growing service-oriented economy. Higher educational attainment and quality throughout life, gradual improvements in the availability of childcare and flexible working time arrangements, as well as widespread changes in retirement rules, have led to stronger workforce attachment of women and older workers. Moreover, pandemic-induced changes to working life like the spread of teleworking, helped by a massive rollout of digitalisation, have had a positive impact on flexibility and social inclusion.[36]

The ongoing increase in workforce participation and significant shift in its makeup can be attributed to several key enabling factors. On average, obtaining higher levels of education, the availability of childcare, agglomeration effects around urban areas with more job opportunities – and, to some extent, structural changes like increasing service employment and openness to trade – have strongly supported overall labour force attachment (Figure 14).[37] Women aged 25 to 54 in particular seem to have profited from higher educational attainment, better access to childcare and greater flexibility in work arrangements, which has influenced their willingness to participate in the labour force. Taken together, these factors have accounted on average for about 50% of the increase in working-age female labour participation across EU countries since the mid-2000s. Apart from childcare, these factors also contributed to the rising labour force activity of working-age men, albeit less dramatically. Moreover, urban areas provide a wide range of employment opportunities and tend to foster employment by attracting a highly skilled workforce, which is associated with high levels of productivity. However, while concentration effects of employers and knowledge externalities of jobs in cities have an undeniable impact on economic dynamism, the related constant inflow of potential workers may also put strain on already tight housing markets, which can impair the efficient allocation of labour.[38] Common components across countries over time, as captured by year effects, like increasing life expectancy or changes to early retirement rules, have drawn men and women across all age groups into the labour force.[39]

Workforce attachment has also shown to be responsive to tax and benefit systems and labour market institutions. Social security systems and pension schemes provide essential insurance against illness and unemployment or support a decent lifestyle in older age, and are thus inextricably linked to the well-being of workers and retirees. However, higher labour tax wedges[40] and social benefits, like substantial long-term support for the unemployed or more generous pension benefits, tend to be associated with lower labour force attachment – particularly for men at a working age, but also beyond.[41] Conversely, active labour market policies that facilitate the job-matching process[42] and support wage-setting institutions, like better coordinated wage bargaining through unions,[43] are important tools for including older workers in the labour force.

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36 Growing evidence shows that work-from-home schemes provide some relief from the burden of care time at home for women and foster the inclusion of people with disabilities. Touré (2023), for instance, shows that since the pandemic, amid an overall increase, more women than men have teleworked in OECD countries, which may have helped to increase women's bargaining power and improve gendered work-life balance. Ameri et al. (2022) find that pandemic-related telework was higher among disabled women than men, with the likelihood decreasing with age.

37 Based on a panel regression framework, the underlying specifications also account for cyclical factors, year effects common across countries, and control for serial and spatial dependencies through the Driscoll-Kraay estimator.

38 Davis and Dingel (2019), for instance, view cities as the primary location for highly skilled workers to learn and exchange ideas, which increasingly draws educated labour to urban areas, driving up housing prices.

39 The same specification has also been estimated for male and female workers aged 54 to 64. These results confirm the main findings.

40 A tax wedge measures the difference between the total labour cost of employing a person and the worker's net earnings.

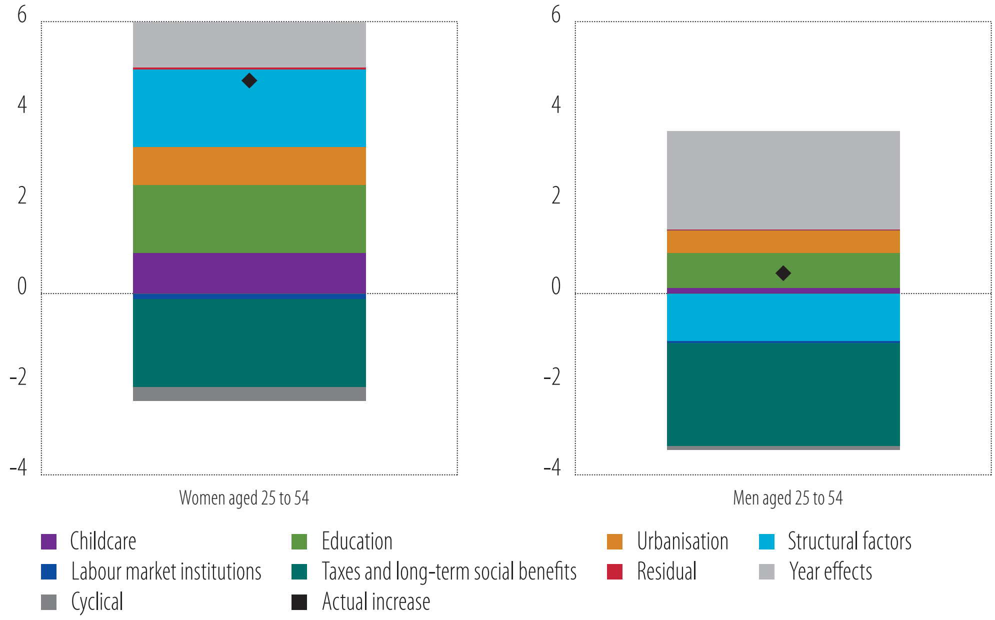
41 See, for instance, Gal and Theising (2015) for the literature on the relationship between social benefits and labour force activity.

42 Renewed evidence for the supportive role of active labour market policies and of tighter social benefits in engaging in the labour market, for example for Germany, comes from Weber (2024).

43 More coordinated wage setting tends to allow for a greater role of unions in accommodating the economy's position in the business cycle in the wage bargaining process (Bassanini and Duval, 2009).

Figure 14

Factors contributing to changes in labour force participation (EU average, in percentage points)**, 2007–2019**



Source: *EIB staff calculations based on Eurostat, OECD.*
Note: *Estimations are based on a sample of 20 EU countries for the period of 2007-2019. Childcare refers to public spending on child daycare as a percentage of GDP. Education includes tertiary and below secondary education. Structural factors include the relative share of industry to services employment, trade openness, and gross domestic expenditure on R&D. Labour market institutions combine the contributions of expenditure on active labour market policies, long-term unemployment benefits, and the degree of wage setting coordination. Taxes and long-term social benefits include the labour tax wedge and the generosity of pension benefits. Cyclical factors such as the lagged output gap or the unemployment rate control for business cycle effects. Actual increase refers to the achieved average increase in the labour force participation rate for men and women across the 20 sample EU countries.*

Childcare is an important factor in female labour force participation

The European Union aims to decrease the gender employment gap to 5.6 percentage points by 2030, down from an average of 10.2 percentage points in 2023. For instance, around 22% of NUTS 2 regions[44] had already achieved this target in 2023, while the rest still faced significant challenges and entry barriers for women, including unpaid care responsibilities, inadequate childcare, hiring discrimination, underrepresentation of women in leadership, tax disincentives and occupational segregation into activities characterised by lower wages or lower opportunities for career development.[45]

Women who lack care facilities are less likely to work than their peers.[46] In 2022, 28% of EU households contained children up to five years of age, and 59% had children under 15. Among women with children under the age of six, 65% were employed, compared to 70% of women without young children and 90% of men with children under the age of six. A shortage of care facilities is a key factor constraining labour

44 NUTS refers to the Nomenclature of Territorial Units for Statistics, or La nomenclature des unités territoriales statistiques in French. It is used to reference the administrative divisions of countries for statistical purposes.

45 Using data from the Spanish Labour Force Survey (LFS), Cervini-Plá and Silva (2024) found that parents without childcare constraints experience a much lower gender gap in labour outcomes, with career breaks longer than two years having the most detrimental impact on labour supply. Recent research also shows that information constraints regarding the financial consequences of reduced hours affect mothers' labour supply decisions (Costa-Ramón et al., 2024).

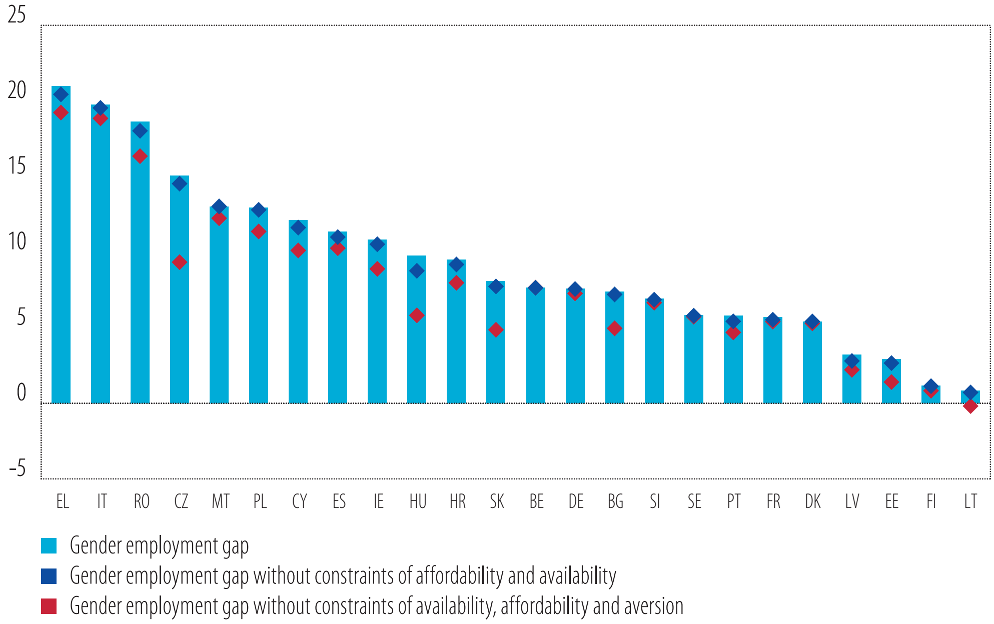
46 Results are based on the analysis of EU LFS microdata using the latest available year, 2022.

supply, to the extent that there are women who would like to work but cannot do so right away because they have to care for their children. Out of the women aged 20 to 64 with small children who would be available to work if they were offered care facilities, 9% report a lack of childcare facilities, 8% complain about affordability, 69% prefer to care for their children themselves (arguably including cases in which they are not happy with the quality of such facilities), and 13% cite other factors.

A policy simulation suggests that addressing these barriers could significantly narrow the gender employment gap (Figure 15). For instance, improving the availability and affordability of childcare in the Baltic states could reduce the gender employment gap by over 12% on average, and in Hungary by more than 10%. With broader reforms targeting the quality of childcare (and assuming that cultural norms do not stand in the way of sending children to childcare facilities), an additional three EU members (Portugal, Slovakia and Bulgaria) could reach the 2030 gender employment gap target of 5.6 percentage points. Remarkably, the gender employment gap could turn negative in Lithuania, and almost disappear in Finland, with reductions exceeding 30% in six other countries, including Estonia, Hungary and Czechia.

Figure 15

Reducing the gender employment gap (in percentage points)**, by eliminating care facility constraints**



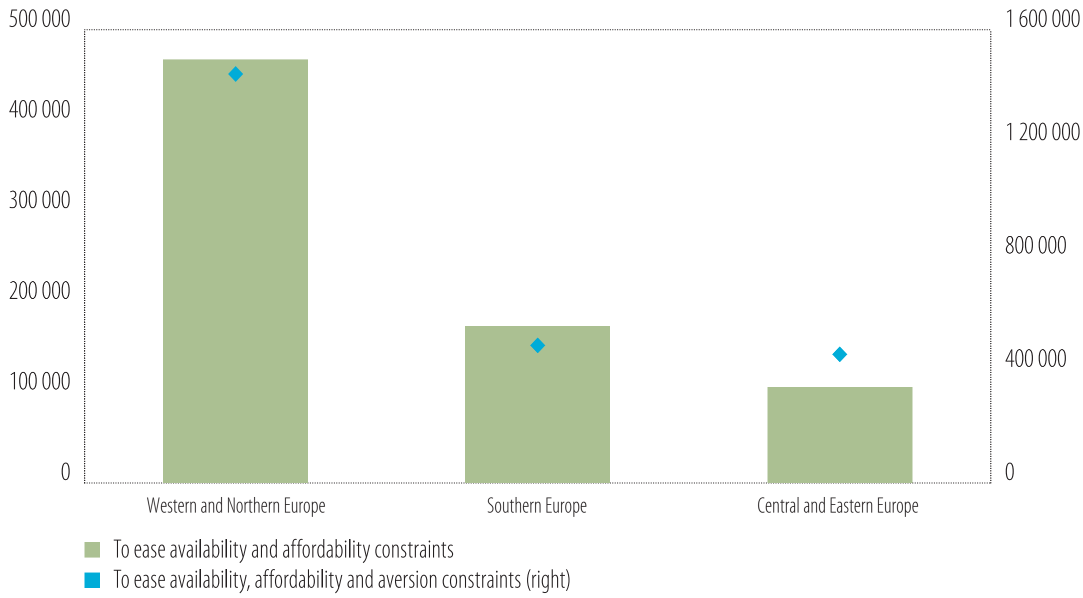
Source: *EIB staff calculations based on 2022 EU Labour Force Survey (LFS) data.*
Note: *The gender employment gap without affordability and availability constraints is calculated considering the potential growth in female employment if women were able to rely on care facilities that are currently unavailable or unaffordable to them. The gender employment gap without constraints of availability, affordability and aversion is calculated considering the potential growth in female employment if women were able to rely on care facilities that are currently unavailable or unaffordable, or which they currently prefer not to use.*

A significant share of women with young children who are employed part-time express a desire to work more hours but face constraints. In countries in Western and Northern Europe and in Central and Eastern Europe, 34% of women working part-time report such constraints, compared to 13% in Southern Europe. Care responsibilities remain the primary barrier, affecting 61% of these women. Of those constrained, 20% point to the availability or affordability of childcare, while 68% indicate a preference to provide care themselves.

In any employment situation, women are affected by personal, household and institutional circumstances, including the role of childcare. Econometric analysis confirms the main determinants of working status (not working, working part-time or working full-time): childcare constraints, the number of small children and the presence of elderly people in the household, the level of education, general health and immigrant status. Average, bad or very bad health increases the probability of not working by 14%, 35% and 45%, respectively, and decreases the probability of working full-time by 16%, 34% and 39%, respectively. Removing childcare constraints like availability and affordability would decrease the probability of women not working or working part-time by 20% and 35%, respectively, while increasing the likelihood of full-time employment by 55%. In addition, taking measures to help women overcome an aversion to childcare would yield comparable results.

Eliminating childcare barriers would require between 745 000 and 2.3 million additional places in childcare across the European Union. Childcare constraints are particularly acute in rural areas, in households with small children, and for women with immigrant backgrounds. These groups report higher incidences of constraints related to availability, affordability, or aversion to childcare. Another policy simulation exercise considers women constrained by childcare facilities regardless of their employment status and quantifies the number of missing places in childcare facilities, based on the number of children under six in their households. Moving beyond the 745 000 additional childcare places associated with the availability and affordability constraints, that number would rise to 2.3 million if aversion to childcare was also addressed and cultural barriers to using childcare facilities for young children no longer played a role. Around 63% of these missing places would be required in Western and Northern Europe, followed by Southern Europe (23%) and Central and Eastern Europe (14%).

Figure 16
Number of childcare places missing to address existing childcare constraints



Source: EIB staff calculations based on 2022 LFS data.

Tackling childcare constraints could yield substantial economic benefits, including enabling women to enter the labour market and harness the potential of highly skilled women. For instance, Bach et al. (2020), using German data and microsimulations, demonstrated that investments in childcare facilities could potentially be self-financing through increased income tax revenue and reduced benefit payments. This holds even without accounting for long-term gains such as higher female wages and shorter career breaks. The cost-effectiveness of investments in childcare or care facilities depends largely on country-specific factors, including childcare benefits or tax incentives, warranting a country-by-country approach.

Closing skill and gender gaps is vital for an inclusive green transition

The green transition will have far-reaching effects on labour markets in general, and skill requirements in particular. With the European Union and national governments increasing their commitments to tackling climate change and making economies and societies more resilient, there is a growing need to seize opportunities, but also to identify the risks to workers associated with the emergence of new jobs and the transformation of old ones. Placing skills at the centre of the green transition is thus essential for addressing already widespread labour shortages, supporting workforce development, and promoting social inclusion amid the gradual emergence of a green economy.

Green jobs are on the rise and benefit workers who have them. From 2018 to 2024, jobs related to the greening of the economy grew steadily, at around 5% per year on average across EU countries, according to recent data from LinkedIn. At the same time, these jobs expanded at nearly twice the rate as the number of workers with the skills to occupy them, and the pace is growing.[47] These jobs have multiple benefits for workers. Beyond the positive skill premium[48] – when workers with specific skills are rewarded with a premium on the market – green jobs improve workforce attachment, as they are predominantly full-time positions with a permanent contract. They have also proven to resist times of economic uncertainty (Barslund et al., 2024).

The green transition tends to favour higher skilled workers who can cope in ever more complex jobs. While the economy's shift towards a stronger service orientation with knowledge-intensive jobs already favours well-educated workers – as evidenced by the changing composition of the labour force – the ongoing green transformation is having an even more profound impact on workers' skill requirements and knowledge base. Information processing skills for acquiring new knowledge and cross-functional skills, such as complex problem solving and decision-making, have become increasingly important in a greening economy characterised by rapid technological advancement (OECD, 2024a). These skills are inherent in most high-skill jobs, and especially in STEM-related jobs, with only small differences in the skills required. For low-skilled workers, new green jobs will demand much higher levels in all skills than other job categories.

Younger, more educated workers currently gain the most from demand for green skills. The average growth in green skills is highest among workers of the younger generations and decreases with age (Figure 17).[49] Millennials born from 1981 to 1996 have seen the strongest increase in the share of green talent, which has been growing by an average of about 13% per year since 2015. People aged 44 to 59 have also exhibited significant growth of necessary green skills, at a rate of 10% per year. The baby boomer generation currently in the process of retiring shows the least expansion in green talent.

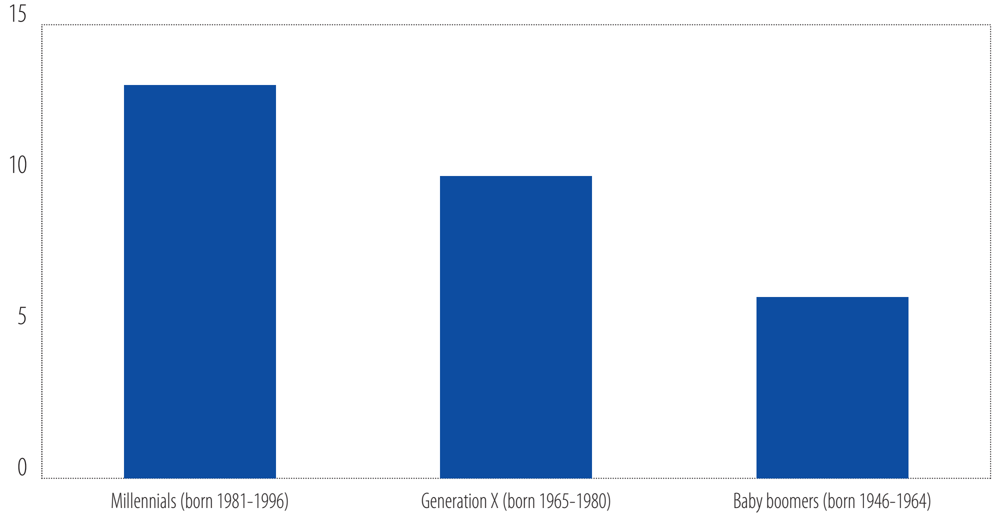
This age inequality appears to be related to the rising trend of higher education among younger generations. From 2015 to 2021, the average annual EU-wide growth rate of workers with green skills and at least an undergraduate university degree was only slightly higher than that of workers with only upper secondary education (11% vs. 9%). However, within countries, differences in favour of tertiary education are more pronounced and show higher growth rates (Figure 18). Romania and France, for

47 Based on LinkedIn (2024), in 2023 and 2024, demand for green skills grew by around 12% while the number of workers with green skills rose by 8%.
48 See, for example, Bluedorn et al. (2023). Recent evidence even shows a higher premium for women than for men, unlike for non-green jobs (Alexander et al., 2024).
49 LinkedIn has coined the term "green talent" for workers who have either added green skills to their LinkedIn profile or who work in an occupation requiring a relatively high intensity of green skills.

instance, have an average growth rate of 13% for green talent with university education, while the rate is only 6% in Romania and 8% in France for green talent with an upper secondary education level. At the same time, in certain countries, many workers can also access quality, well-developed vocational education that may help them access these jobs, which could explain some of the high growth rates of talent below the level of tertiary education.[50]

Figure 17

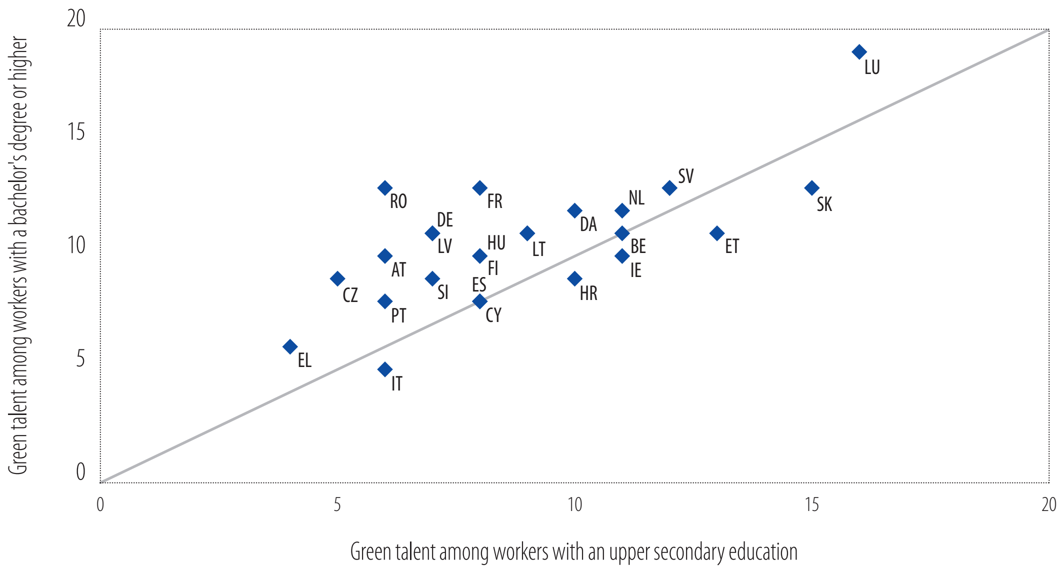
Annual average growth in share of global green talent (in %)**, 2015-2021**



Source: EIB staff calculations adapted from LinkedIn.

Figure 18

Annual growth in the share of workers with green skills (in %)**, by education level 2015-2021**



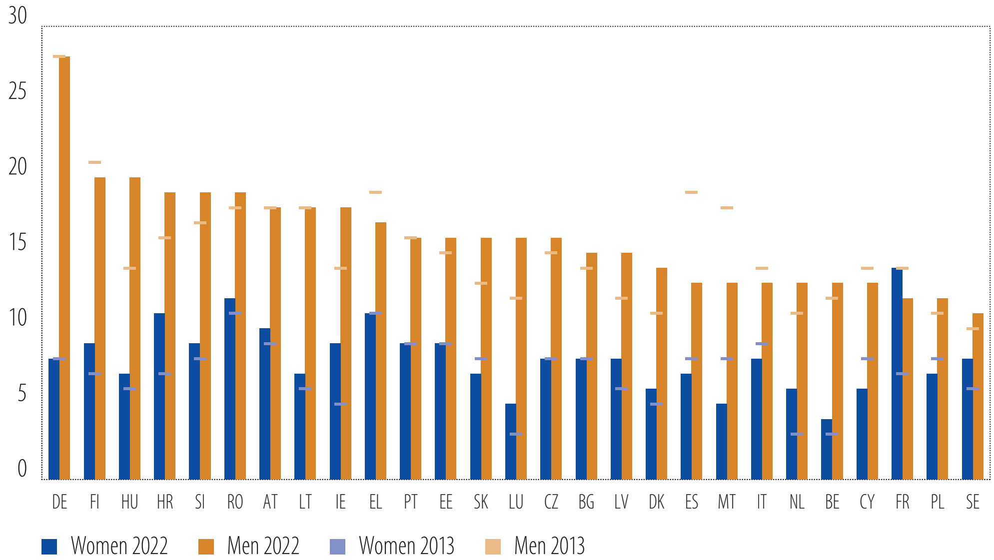
Source: EIB staff calculations adapted from LinkedIn.

50 In Belgium, for instance, more than half of the workers in green shortage jobs have a secondary education level (Barslund et al., 2024).

Closing skill and gender gaps is essential for making the green transition more inclusive. The emergence of green jobs and the related demand for green skills highlights a discrepancy, which is that women tend to achieve higher educational outcomes than men[51] but are less likely throughout the European Union to hold green jobs. According to LinkedIn, and notwithstanding an increase in female green talent,[52] the current gender gap of 67 women for every 100 men who are considered green talent has remained roughly unchanged since 2015. Moreover, despite requiring a relatively broad set of skills, about 60% of green jobs tend to require some form of technical or STEM skills, which are essential for successfully transitioning into a green economy. Therefore, the gender gap likely reflects the gender disparity in STEM education. As Figure 19 shows, the graduation gap in STEM fields between men and women has not only persisted but in many cases widened over time. While across most EU countries fewer women graduated with STEM degrees (relative to all other disciplines) in 2022 than in 2013, the number of male graduates predominantly increased.

Figure 19

STEM graduates across EU countries, by gender



Source: EIB staff calculations based on 2022 LFS data.

Promoting housing affordability is vital to preventing the misallocation of labour

The trend of rising home prices could also affect individual labour market outcomes and labour mobility. Housing difficulties and unemployment are closely intertwined. Spells of unemployment could result in housing difficulties, but the reverse is also true. The lack of a stable, healthy home environment has a negative impact on labour market outcomes, even many years after the fact. A lack of affordable housing also creates barriers and disincentives for labour mobility, exacerbating skill shortages for firms and reducing overall labour market efficiency.

51 Delaney and Devereux (2021) and references therein.

52 Some countries in Europe have, however, made progress in closing the gender gap, including Ireland, the Netherlands, Denmark and Malta (LinkedIn, 2023).

There is some evidence that housing shortages increase labour misallocation and have a negative impact on growth and productivity. In several EU countries, and in particular in European cities, there are substantial rigidities in the housing supply.[53] In general, housing supply rigidities deter migration, raise wages and constrain the expansion of employment in dynamic regions.[54] For instance, in the United States, relaxing housing constraints in just three highly constrained housing markets (New York, San Francisco and San Jose) would increase aggregate GDP by 9% with perfect mobility and 3.7% with imperfect mobility (Hsieh and Moretti, 2019).[55] More research is needed to establish how these results would apply to the European Union. It is still unclear whether the GDP implications from housing restrictions would be larger or smaller for the European Union than they are in the United States. On the one hand, housing restrictions are higher (including due to higher population density and lower land availability). Relaxing them might therefore lead to greater gains. On the other hand, differences in productivity between regions and workers' willingness to relocate are lower in the European Union, which would suggest lower gains from relaxing housing constraints. Relocation could also reduce wage inequality between poorer regions and the richest ones.[56]

Fast-rising rents dilute workers' incentives to participate in productive labour markets and could therefore dampen aggregate output. When rents increase faster than wages, income gains accrue disproportionately to landlords and homeowners, to the detriment of renters and first-time buyers. This increases income inequality (net of housing costs) and reduces the incentives and ability for workers to relocate. From 2005 to 2022, the fastest growing regions in the European Union experienced average annual real productivity growth well above the EU average: about 2% for regions in the upper quartile, compared with an EU average of 0.5%.[57] Larger productivity gains were concentrated in regions in Central and Eastern Europe (Bulgaria, Poland, Romania, etc.) and large cities (Warsaw, Bucharest, Dublin, Sofia and Riga). Productivity gains benefited workers living in those regions. In 2005-2023, an average annual labour productivity growth that was one percentage point higher than the EU average was associated with an annual disposable income growth that was 0.2 percentage points higher. However, during the same period, rents increased disproportionately in many of these regions. In particular, outside of the euro area, workers in fast-growing regions (the upper quartile by labour productivity growth) paid on average 19% of their income in rents in 2023 – 6 percentage points more than in 2005 (up to 10 percentage points more in some regions). As a larger part of the benefits of high productivity growth are absorbed by higher rents and house prices, incentives for workers to relocate to the most productive regions are diluted.

For people who experienced homelessness, poorer labour market outcomes can persist for many years. In the European Union, more than 13 million people have experienced housing difficulties in the last five years. Those people were also more likely to be unemployed (17%, compared with 8% among the rest of the population in 2023, see Figure 20). Higher unemployment rates were also observed among people who experienced housing difficulties more than five years ago (16%). Of course, unemployment may itself be a cause of housing difficulties. When restricting the sample to people who experienced housing difficulties more than five years ago for reasons unrelated to financial circumstances, the unemployment rate is just as high (16%). Even among those who experienced housing difficulties in the past due to relationship or family problems, the unemployment rate is 14%.

53 Cavalleri et al., 2019; Bétin and Ziemann, 2019; Combes, Duranton and Gobillon, 2019.

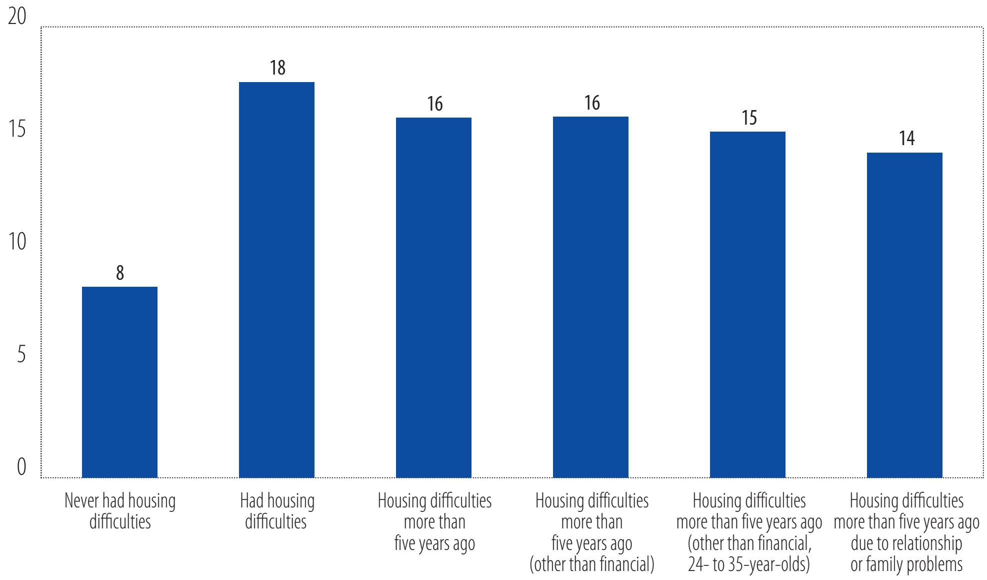
54 Ganong and Shoag, 2017; Saks, 2008; Eliasson et al., 2024; Glaeser and Gyourko, 2018.

55 See also Duranton and Puga, 2019, who reach similar conclusions using a different model.

56 This is true in the absence of agglomeration externalities. Gaubert (2018) estimates that half of the productivity differential between large and small cities in France is due to firm sorting, while the rest comes from agglomeration externalities.

57 Real productivity estimated as productivity per employed person, based on the ARDECO dataset.

Figure 20
Unemployment rates (in %) **among people experiencing housing difficulties, EU average 2023**



Source: EIB staff calculations based on EU-SILC.

Tackling labour market imperfections eases skill shortages for firms

Among the investment obstacles cited by firms, the availability of skilled staff is of particular importance. In every round of the EIB Investment Survey (EIBIS), respondents are asked whether nine factors constitute a major or minor barrier to investment. Since 2016, availability of staff with the right skills has been among the two most frequently cited obstacles to investment. But it is not just that many firms face skill shortages. The European Investment Bank (2024b) has shown that skill shortages affect firms that have good investment opportunities and that are more productive than the average. The analysis suggests that economy-wide productivity would increase if these skill shortages were remedied. This section explores in more detail the geographic correlates of skill shortages, as well as the role of wages.

European firms continue to suffer from a shortage of skilled staff, but rarely provide training accordingly. Over time, the share of European firms reporting the availability of skilled workers as a major long-term barrier to investment has increased to 51% in 2024, from about 38% in 2016, peaking at 62% in 2022 in the wake of the pandemic.[58] However, the share of firms that provided training, but also the average amounts invested, remained relatively constant over time. This includes the recovery period following the pandemic trough, which brought the frequency of training back to pre-pandemic levels, or below them in some cases. Only firms in select, highly innovative sectors have increased training in response to staff shortages. Reporting a significant shortage of skilled staff led to only a marginally higher share of firms providing training, compared to firms that did not declare skills to be a major investment barrier.

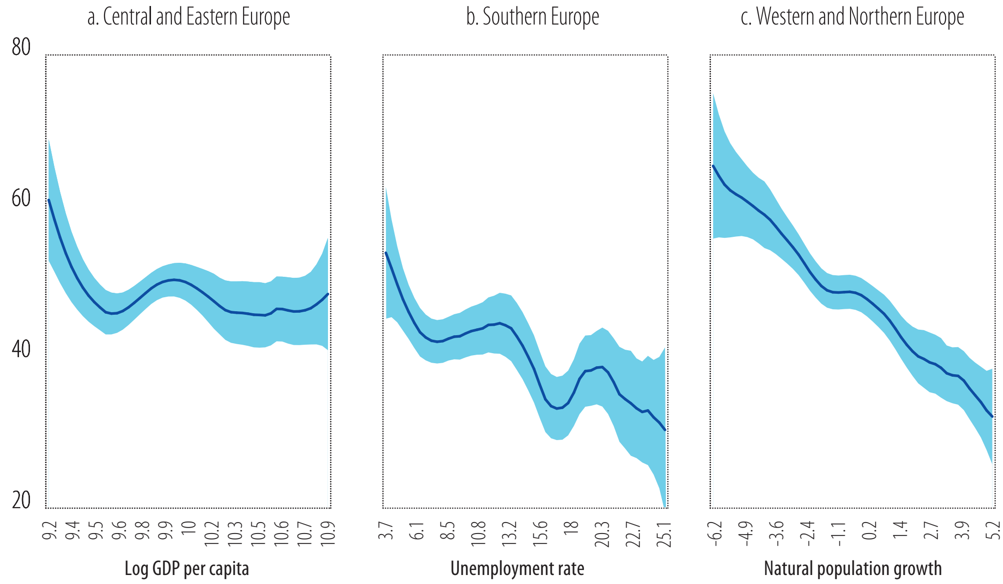
The most salient drivers of skill shortages differ by region. The European Union is economically diverse, so that the effects of the various mechanisms documented in Figure 17 tend to cancel out at the EU level. Specifically, Figure 21 presents the results of local linear regressions of the skill obstacle

58 Figures are based on EIBIS waves from 2016 to 2024.

aggregated at the NUTS 2 level on log GDP per capita, the unemployment rate and the natural population growth rate.

GDP per capita is a strong predictor of skill shortages in Central and Eastern Europe. As the left most panel of Figure 21 shows, the average level of skill shortages is elevated. European labour markets are still imperfectly integrated, with language being a major barrier. However, Figure 21 suggests that when wage differences are large, people do move towards opportunity. The regions with the lowest GDP per capita are particularly affected – a pattern consistent with brain drain. Strong wage growth and improving quality of life in Central and Eastern Europe have the potential to bring back a large pool of highly qualified expats. It is essential, however, that the region continue to converge to the technological forefront, offering incentives for innovation and highly skilled jobs.

Figure 21
Drivers of skill shortages across Europe (% of firms)



Source: *EIB staff calculations based on EIBIS 2024 and Eurostat.*
Note: *Results from local linear regressions. The dependent variables are given by the percentage of firms at the NUTS 2 level that consider the availability of staff with the right skills to be a major obstacle to investment.*

In Southern Europe, the association between skill shortages and unemployment is particularly striking. On average, in regions with substantial labour market slack – as reflected in a high unemployment rate – fewer firms complain of a lack of staff with the right skills. This appears to be a legacy of the European sovereign debt crisis. Conversely, regions with tight labour markets are characterised by a large share of firms citing skill shortages as a barrier to investment.

In Western and Northern Europe, demography is strongly associated with the availability of skills. The natural rate of population growth is calculated from the difference between the birth rate and the death rate. The majority of NUTS 2 regions in Western and Northern Europe have natural growth rates between -5 and 5 per 1 000 individuals. The right panel of Figure 21 documents a steep negative gradient between natural population growth and the availability of skills. It is important to note that the natural population growth rate is itself an economic outcome as individuals move towards opportunity.

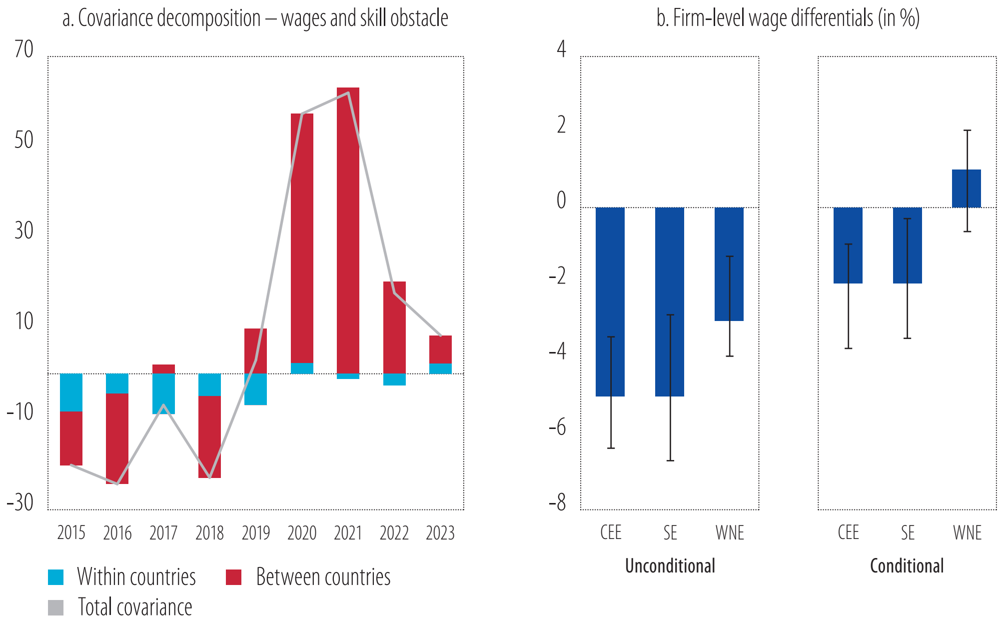
Firms experiencing skill shortages could offer higher wages to find the employees they need. As argued by Fuest and Jäger (2023), higher wages will encourage employees to move towards highly productive firms. Firms that cannot pay higher wages, however, will eventually exit the market. Some tasks with a marginal product lower than the going wage rate will be automated. Higher wages would also tend to increase the labour supply, as some individuals may decide to enter the labour market or increase their working hours.

The wage-driven reallocation of skills between and within borders in the European Union has been distorted by the pandemic. We decompose the relationship between regional wages and reported skill-related obstacles to investment into two parts: differences between countries and differences within countries (Figure 22).

Between countries and regions, wage differentials matter for mobility. Post-pandemic, these differentials have narrowed. Before the pandemic, countries and regions with higher wages tended to face fewer skill-related obstacles to investment, suggesting that higher wages were effective in moving talent between and within countries. Wages thus helped to allocate labour and skills more efficiently. Since the pandemic, however, this relationship has been impaired. Cross-border mobility restrictions and lockdowns impeded labour mobility to the extent that higher compensation, at least where feasible, was not enough to attract the right skills. While in the aftermath of the pandemic the free movement of resources was restored, and nominal wages in countries in Central, Eastern and Southern Europe substantially increased, wages have not yet reached the levels necessary to reallocate the skills between and within countries, to the extent this used to occur.

Figure 22

Relationship between regional wages and skill-related obstacles to investment



Source: *EIB staff calculations based on EIBIS and Eurostat.*

Source: *EIB staff calculations based on EIBIS and Bureau van Dijk ORBIS.*

Note: *Coefficient estimates and 95% confidence intervals from regressions of the average wage on the availability of skills as a major obstacle to investment. The unit of observation is the firm. Separate regressions are estimated for each country group. CEE is Central and Eastern Europe; SE is Southern Europe; and WNE is Western and Northern Europe.*

The EIBIS offers an empirical perspective on the relationship between skill shortages and wages. Figure 22 shows predictions from a regression of the average wage on whether a firm experiences skill shortages. The unit of observation is the firm. The regression is estimated separately for each country group. The specifications referred to as "unconditional" have no firm-level covariates and exploit variation between firms that operate in the same country, at the same time, in the same industry. These specifications can be interpreted as capturing the perspective of the employee, as they inform the decision to work for a particular company. The specifications labelled "conditional" control for the structure of production and the financial health of the company.[59] They capture the average wage that the firm can be expected to pay.

The results indicate that firms experiencing skill shortages pay lower wages on average. In Central and Eastern Europe and in Southern Europe the difference exceeds 4% and is thus non-negligible. In Western and Northern Europe, the wage difference is smaller but still statistically significant. It is therefore not surprising that these firms find it difficult to attract workers. Moreover, in Central, Eastern and Southern Europe, firms experiencing skill shortages pay lower wages even after controlling for their economic and financial structure. This raises the question of why these firms do not simply pay higher wages to attract the employees they need.

Labour market imperfections may limit the ability of wages to address skill shortages. Taxes and social security contributions drive a wedge between the wage firms pay and the wage workers earn. Empirically, however, the wage difference between firms with and without skill shortages does not vary significantly with taxes and social security contributions. Large employers may benefit from local monopsony power, which may enable them to push wages down (Manning, 2003 and 2021). This possibility cannot be investigated with EIBIS data. However, monopsonists could share their rents with employees to address skill shortages. A methodological caveat is that the specifications underlying the results in Figure 22 do not control for employee characteristics. Hence, individual workers may receive a wage commensurate with their skills even though the average wage in the firm is low.

Green, digital and demographic challenges call for better inclusion across regions

Increasing differences across regions has become a visible feature of the economic convergence process. The rapid process of catching up in many European regions has been disrupted by a series of shocks (pandemic, energy crisis) in recent years. Although per capita income and employment across the European Union have risen, the ongoing convergence process of many regions has not brought the same benefits to all. The gap between capital and non-capital regions within individual countries, which emerged after the global financial crisis, has persisted, and has become more entrenched in some EU members (Figure 23a).[60] The different intra- and inter-regional economic performances are the result of a variation in the factors that drive structural competitiveness, and aspects like economic structure or overall education levels, which influence development differently from region to region. At the same time, accompanying social inequalities (for example, diverging levels of well-being or social and workforce inclusion) have materialised as well, and have led to different realities of social inclusion and labour market opportunities.[61]

Recent socioeconomic shocks have had uneven regional consequences and have contributed to multiple challenges for capital and non-capital regions. A widespread slow-down in labour productivity and lower innovation, especially in the digital sphere, are two examples of specific trends

59 Specifically, the regressions control for labour productivity, the capital labour ratio, return on assets, leverage, fixed asset growth over the last three years, firm size and age.

60 The NUTS 2 GDP level of some capital regions may be overestimated due to daily commuting in by workers who live in other regions. However, there is no simple method of adjusting the underlying regional data.

61 For example, see an analysis of developments of a traditionally industrial region in Belgium in Bisciari (2024) or the heterogenous effects of EU cohesion policy across regions in Di Caro and Fratesi (2022). Consequences of regional developments and their implications for the political process are analysed in Rodríguez-Pose et al. (2024).

that have affected regions in the aftermath of the global financial crisis.[62] These trends, in combination with more rigid labour market structures and less forward-looking institutions, have negatively affected competitiveness and depressed economic development. Additionally, the necessary structural adjustments stemming from the ongoing green and digital transformation pose the next challenge for many regions across Europe,[63] resulting in the emergence of development traps[64] and talent gaps. The lack of adequate physical and digital infrastructure, gaps in the availability of important public services, and insufficient funding of local authorities can also be added to the list of obstacles. Unsurprisingly, the deepening divide between capital and non-capital regions – noticeable, for instance, in indicators measuring (industrial) production, output and real wages – has been discernible in population movements for quite some time (Figure 23b).[65] Particularly in poorer parts of Central and Eastern Europe, where slack economic performance, deteriorating socioeconomic factors and spatial barriers (such as remoteness, or limited access to services due to low population density) have prompted internal migration and emigration to other EU members.

Figure 23

Developments in EU capital and non-capital regions (cumulative growth in %)

Source: *EIB staff calculations based on Eurostat.*
Note: *Only countries with capital and non-capital regions available are included. Real GDP = real gross value added (GVA) at basic prices. Simple average over gross value added growth in NUTS 2 regions of selected countries, accumulated since 2004. The grey line represents the 45-degree line.*

Source: *EIB staff calculations based on data from the European Commission Directorate-General for Regional and Urban Policy (DG REGIO) and Eurostat.*
Note: *Only countries with capital and non-capital regions available are included. Some NUTS 2 population developments are estimates. See the original source. Simple averages over population growth in NUTS 2 regions of selected countries, accumulated since 2004. The grey line represents the 45-degree line.*

62 Innovation measured in terms of international patent applications. See, for example, Fuest et al. (2024). See also International Monetary Fund (IMF, 2024) for the analysis of EU enlargement effects, structural reforms and global value chain links.

63 Such as traditionally industrial regions which, due to the green transition, are currently in need of substantial modernisation or facing a possible exit; or agricultural or climate-specific regions that are now more exposed to extreme weather events.

64 Diemer et al. (2022) provide the notion of regional development trap as a situation in which regions face significant structural challenges in recovering past dynamism or improving prosperity for their residents. Rodriguez-Pose et al. (2024) illustrate some implications of development traps.

65 This view does not explicitly control for immigration and emigration. Stemmer and Zdarek (forthcoming) provide a more detailed analysis of the dynamics behind the diverging regional trends.

Social investment as a tool for improving well-being and competitiveness

Policy interventions to protect and increase social inclusion will make a vital contribution to Europe's productivity growth, cohesion and competitiveness. Going forward, labour market and social outcomes will be challenged by subdued growth, persistent labour shortages and demographic change. Strengthening the labour force and the development of skills will be key to tackling the challenges of an ageing society and making the climate transition and digital transformation a success. Ultimately, effective investments in social cohesion and well-being that help remedy the remaining inequality of opportunity will lay the foundation for a thriving and inclusive economy.

Unlocking potential through social investment

Social investments can have a positive long-term impact on labour market outcomes and economic growth by increasing employment, competitiveness and productivity. Regional investments in skill development, for example, can lead to significant gains in employment and economic activity in the long run (see Box A). Similarly, social investments supporting inclusion have important long-term economic effects. Equal access to education, training, healthcare and affordable and sustainable housing leads to a more skilled and productive workforce.

Social factors are critical catalysts in ensuring everyone benefits from Europe's prosperity. Effective social investment contributes to upward socioeconomic convergence.[66] Investments in early childhood education and care, for instance, tend to promote upward economic convergence through their positive impact on the employment of mothers – and of their children, later in life.[67] Better schooling, higher social capital, less inequality and more inclusion tend to coincide with better social mobility.[68] Social inclusion also increases trust in both national and EU institutions.[69]

By maintaining robust economic growth, the European Union can uphold its commitment to social cohesion and well-being, reinforcing its strength in these areas. Overall, EU members tend to offer relatively strong protection of the most vulnerable through their social safety nets, including redistributive tax and benefit systems. At the same time, continued economic growth is key to sustaining the social policies that underly the European Union's global leadership in well-being. Economic growth generates the necessary resources to fund comprehensive social programmes, such as healthcare, education and social security, which are critical for maintaining high standards of living and social inclusion. A growing economy also creates jobs, reducing economic and non-economic risks to people's well-being.[70] Furthermore, sustained economic growth fosters innovation and competitiveness, ensuring that the European Union can continue to invest in and improve its social infrastructure.[71]

66 See European Commission (2024a) for evidence across a range of economic and social indicators.

67 Elango et al., 2015; Nieuwenhuis et al., 2019; Olivetti and Petrongolo, 2017; Nieuwenhuis, 2022; Narazani et al., 2023.

68 Chetty et al., 2014; Acciari et al., 2022 ; van der Weide et al. (2024).

69 There is a strong link between people's financial constraints and employment status and their trust in institutions (Eurofound, 2022a). Labour force participation and perceptions of unfairness may therefore shape voter priorities and turnout.

70 Among other things, income growth and inequality affect the level of social mobility, see Berman (2022), for example.

71 Aghion et al. (2019) show that innovation is positively associated with social mobility.

Investing in quality, inclusive education

The conditions for lifelong learning and labour market participation are set early in life. That is why promoting improved performance in primary and secondary education is critical for setting people up to deal with rapidly changing workforce needs, and for longer working lives. Confronting the poor educational performance of disadvantaged students and schools is not just critical from a social inclusion perspective. Given the shrinking number of younger workers, it becomes increasingly important not to waste untapped potential by leaving groups of young people unequipped to participate in the workforce, in an increasingly demanding workplace for skills.

A priority for social investment is ensuring high-quality primary and secondary school outcomes. Here, policy should focus on improving the quality of teacher training and school curricula – including ensuring a sound basis for STEM and digital skills – and tackling disparities in education by making resource allocation more effective and better targeting allocations to underprivileged students and schools. Providing quality schooling would further broaden access to tertiary education.

In a fast-changing labour market, further action should be taken to help higher education respond to labour market needs. Education and training are essential for individuals to navigate the changing work environment and the skills demanded.[72] On the supply side, governments must align the incentives for higher education institutions to link their offerings to labour market demand. Collaboration between employers and tertiary institutions on course offerings and curricula can prepare students for the available jobs. Demand-side policies, in turn, can better link education with the workplace, for example, by expanding career counselling services in schools and tertiary education establishments. Generally, increasing employer involvement and workplace learning across the tertiary education system will better prepare students for jobs.

72 See OECD (2019a) for further discussion.

Box A

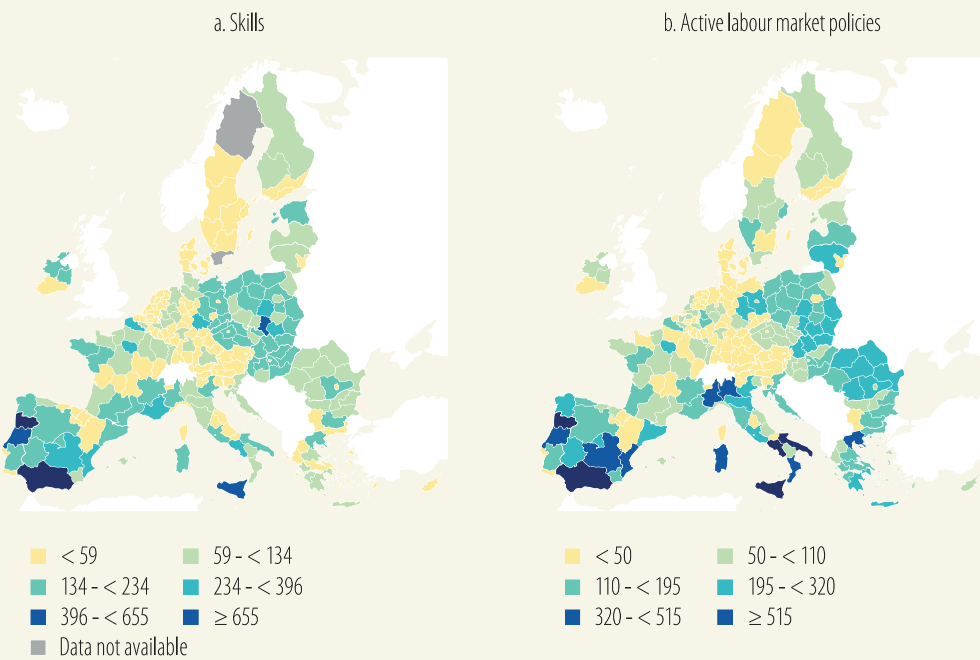
The macroeconomic impact of investing in skills and active labour market policies

Investment in skills development and active labour market policies has been shown to boost employment, competitiveness and productivity. By equipping workers with relevant skills, facilitating job transitions and promoting the participation of underrepresented groups, such investments can drive economic growth and reduce labour market imbalances. Moreover, the current green and digital transformations make it even more important for individuals to acquire new skills, enhance their employability and address skill shortages. Doing so can lead to better labour market outcomes, stimulate economic growth and contribute to greater economic convergence within the European Union.

To assess the potential macroeconomic impact of investment in skills and active labour market policies, this box zooms in on the long-term effects of European Social Fund Plus (ESF+) spending on skills and active labour market policies during 2021-2027 (Figure A.1). The analysis[73] employs the RHOMOLO model, a dynamic spatial general equilibrium model calibrated using data from 235 EU NUTS 2 regions. The standard version of the model distinguishes between five labour income groups and is extended to allow endogenous labour market participation.[74] ESF+ funds targeting skills are assumed to increase labour productivity, while active labour market policy interventions increase labour supply. In both cases, on the demand side, the funds are modelled as increases in government current expenditure and a lump-sum tax is levied on regional income. Both effects are assumed to decline over time at a rate of 5% per year.

Figure A.1

Total amount of regional allocation of investment (EUR million)**, by region**



Source: *Christou et al. (2024) using the RHOMOLO model.*

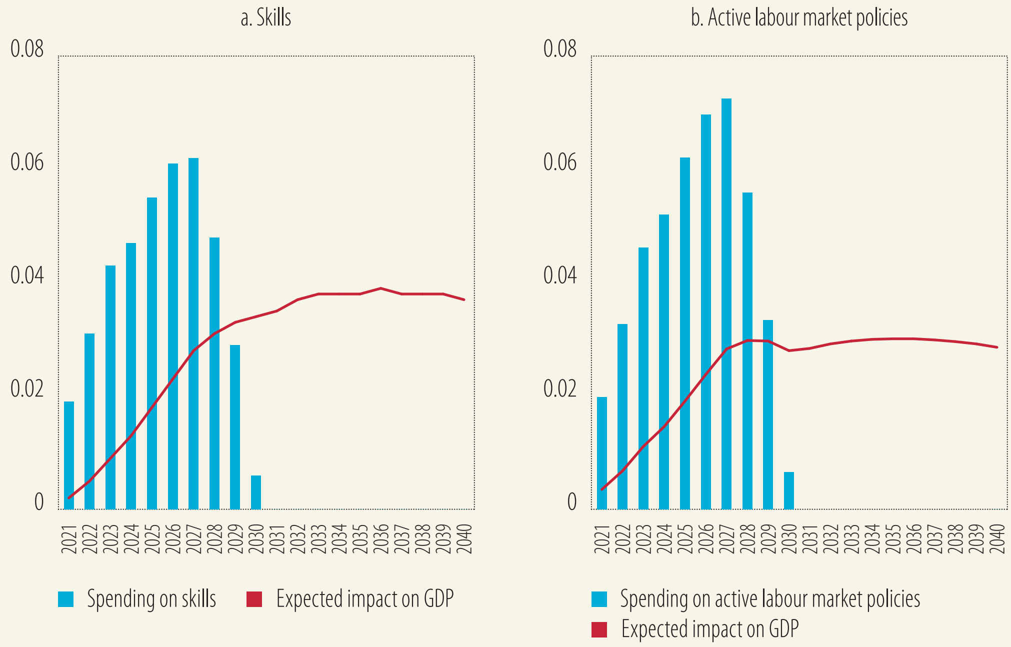
73 Described in detail in European Commission (2024a).

74 As in Christensen and Persyn (2022). In the standard version of the model, the only possible adjustment in the labour market is through changes in the unemployment rate. The modification introduced here allows for an additional transmission mechanism through the change in hours worked and the choice to participate in the labour market.

The investments targeting skills planned under the ESF+ are expected to increase EU GDP by up to 0.039% at its peak in 2036 relative to baseline GDP (Figure A.2). The impact remains positive and above its baseline after spending on the programme ends as the structural effects of increased labour productivity and corresponding adjustments by firms and households materialise, providing gains that are significantly larger than the original investment. Investments in active labour market policies are also projected to expand economic activity in the long term, increasing EU GDP by approximately 0.029% per year even 20 years after the start of the programme.

Figure A.2

Spending on skills and active labour market policies (% EU GDP) **and expected impact on GDP** (% deviation from baseline GDP)



Source: *Christou et al. (2024) using the RHOMOLO model.*

Targeted investments in skills can lead to employment gains throughout the funding period and in the long term. At their peak in 2026, EU-level employment gains from investments in skills are projected to be +0.024% compared to the baseline, with the largest employment gains expected for the lowest income quintiles. Investments in active labour market policies also have a positive impact on employment-related earnings and social outcomes, as they are shown to improve employment outcomes in the decades following the original investment, with a peak of +0.11% expected in 2027.

Stepping up adult learning and training

Participation in lifelong learning in Europe is low, and it is critical for the private and public sectors to step up the availability and quality of this type of training. Expanding lifelong learning matters even more for individuals and the economy in light of the shrinking and ageing workforces in many countries, and of the major ongoing economic shifts. This includes training workers in current roles and retraining those in declining sectors, or retraining people to switch to new technical professions and preparing them to adapt to new demands for green and digital skills. The rapid economic transition requires firms in Europe to invest more in training and skills, an area in which they are not doing enough.

Time, resources and perceptions are barriers to formal training in firms. New case study evidence shows that certified training tends to be available for health, safety and security, and to be job-related practical or technical training (OECD, 2021). Soft skills or IT skills are less likely to be offered. A lack of time is a major barrier for employees and management in undergoing or providing training (European Commission, 2024a). Financial constraints put an additional squeeze on what is possible, and a negative view of training is a further impediment. Although online training accelerated during the pandemic, it was more easily provided by large and/or multinational enterprises, while smaller firms faced more challenges. Much training takes place informally in the workplace. This type of learning is hard to measure but offers important opportunities for workers through initiatives like job rotations, mentoring and peer learning, and learning events like trade fairs and knowledge-sharing events on new technologies.

Adult training can positively influence economic mobility. For instance, studies have found large wage impacts for sectoral employment programmes and occupational programmes in high-demand areas.[75] Public provision should be tailored to equip workers with certified, transferable, in-demand skills. Assessing training outcomes is important internally in firms and, crucially, also for public programmes and external training providers. Here, the government can play a role in certification to ensure quality and assess outcomes, including the impact on earnings and employment rates.

Policymakers have many tools at their disposal to support the acceleration of training for adults in the workforce. Possible instruments include support through information and technical content and guidance for companies; building management capacity to plan training and use career development frameworks; and financial incentives for providing targeted training, for example by embedding skills development and training into public support programmes (such as the apprenticeship and quality job requirements put in place under the US Inflation Reduction Act). The private and public sectors face the challenge of continuously upgrading technological infrastructure to enable high-quality technical training and effective support for people navigating career changes.

Developing skills for the green and digital transition

Well-targeted policies can help to tackle the green and digital skills challenge. Education and training targeted to current shortcomings can play a big role in bringing green and digital skills to existing professions and supplying companies with workers ready to take on new specialist roles (OECD, 2024a). Several European countries, for example, have increased the attractiveness of STEM degrees for young people with targeted policies, ranging from STEM-related university scholarships to a broad set of tailored measures in education in close collaboration with local firms (OECD, 2018). Expanding vocational education and apprenticeships can also ensure that specialisations are targeted to labour market needs.

The needs of the green economy should be reflected not just in resources for younger people and people entering the labour market, but also in adult learning and career guidance. Training plays a key role in enabling individuals and businesses to benefit from the green economy and is best served through active engagement by all stakeholders. Fostering strong collaboration between companies, private sector training providers and public education may help to build curricula that are tailored to job- and sector-specific needs and equip students with high-quality skills needed to find a job.[76]

75 See Katz et al., 2022.
76 See, for example, OECD (2019b) for an example on building teaching capacity.

To end the underrepresentation of women in green and digital roles, skill development needs to happen equitably. Policies should strengthen incentives for women to pursue STEM education. This includes exposure to math and sciences from an early age to counteract potential biases. STEM subjects should be taught across all levels of education, through gender-conscious curricula with specialised training for educators. The private sector should also contribute, for instance through mentorships and partnerships with firms.

Reducing structural barriers to labour market participation

Increasing opportunities for women to participate in the labour market involves providing access to childcare and parental leave and overcoming barriers inherent in the design of tax and benefit systems. Policies should ensure the neutral treatment of second earners by the tax system.[77] Incentives could also include targeted support for childcare expenses, especially for those for whom these expenses prevent them from pursuing education or taking a job; ensuring adequate parental leave for both parents; and increasing the availability and accessibility of childcare, given the lack of availability and disproportionately high costs in some countries.[78]

Active labour market policies can help people enter the workforce and keep their jobs. Publicly supported programmes that focus on at-risk groups ensure the best use of resources. This includes measures supporting employment for young people and women, and measures that help people transition to new jobs following job loss, thereby preventing the risk of detachment from the labour market.[79] Box A, for example, illustrated the positive impact of spending on active labour market policies as part of the European Social Fund Plus. Targeted, resource-intensive public policies have proven effective: for example, taking a case management approach that is tailored to unemployed individuals, with curated services like one-to-one interviews and development plans, and job matching systems.

Sustaining improvements in health outcomes

Europe's relatively strong performance in health outcomes can be further strengthened with strategic investments. Helping people stay healthy while ageing calls for continuous investment in integrated care systems. Investment should focus on disease prevention and on using the latest technologies – particularly to build on the successes in the area of non-communicable diseases and to make further progress, for example in the fight against cancer. European scientists and firms producing innovative technologies can make further gains in life expectancy and reduced morbidity possible. Policies can help them continue the already strong research and development and the scaling of new health technologies, such as cancer vaccines, gene therapy, and digital diagnostic tools incorporating artificial intelligence. Investments towards upgrading health infrastructure will need to continue and grow. Pressure on social and long-term care provision systems is mounting as the oldest segment of the population grows, and smart infrastructure to support active lifestyles and care for elderly people will continue to grow as an investment priority. To support these developments, the chronic health workforce shortage faced by many countries and regions will need to be addressed through policies that attract, retain and continue to train health and care sector workers.

77 See, for instance, Bick and Fuchs-Schündeln (2018).

78 Andresen and Havnes (2019) find a significant impact of childcare on the increase of labour supply by cohabiting mothers both on the intensive and the extensive margin.

79 See European Commission (2024a).

Increasing the supply, affordability and sustainability of housing

Public support could target innovation in construction and improve the availability of affordable and sustainable housing. This chapter highlights the distributional cost of high home prices and reduced access to affordable and sustainable housing. As prices have increased over the last two decades, the housing supply has remained sluggish and has not responded promptly to rising demand. This is a localised issue that has disproportionately affected certain cities, regions and demographic groups. Box B provides an overview of the annual additional housing demand in each country in 2025 and compares it with the additional housing supply, to highlight the the housing gap in the European Union, where unmet housing needs are expected to exacerbate an existing shortage.

Addressing the innovation gap in construction is critical. The construction sector has low productivity growth. A small share of construction companies invests in innovation: 75% of construction companies do not innovate, and do not even adopt practices that are new to the firm – compared with 67% for firms in other sectors (EIB, 2024b). Construction firms are also less likely to use digital technologies: 55% of construction companies use advanced digital technologies, compared to 76% of firms in other sectors (EIB, 2024b). At the same time, there are labour and skill shortages in the construction sector. A shrinking workforce will make it difficult for this sector to increase supply and keep construction costs low. More widespread adoption of key innovations in construction (including digitalisation, off-site methods like modular construction, mass customisation and robotics, and innovation in building materials) would make construction faster, increase the housing supply elasticity and improve safety. Any specific financial support for the sector should therefore target research, development and innovation (including fostering innovation clusters), with the goal of increasing productivity, facilitating the adoption of new technologies and digitalisation, improving manufacturing and construction practices, and running pilot projects to spur innovation. Public procurement can be used to provide predictable, stable demand for disruptive technologies like modular construction.

The housing supply cannot be expanded without removing regulatory barriers. Housing construction is subject to regulations at the EU, national, regional and local levels, resulting in a high degree of complexity and fragmentation of the market. Obtaining building permits is also slow and time-consuming. Enhancing European standards for construction products and moving away from recipe-based standards and towards performance-based standards would foster innovation. Making vacant land available for urban development and reducing obstacles to densification – while considering ecological conservation objectives and the availability of sufficient public facilities – would increase the supply and facilitate large-scale housing projects, which are typically cheaper than other options.

To provide enough affordable housing, new financing models must be paired with policies to facilitate supply. Institutional investors, particularly investment funds, have recently markedly increased the available financing in the residential real estate market (ECB, 2023). However, this additional investment has often translated into the construction of high-end luxury housing units. At the same time, the affordable housing segment has remained underserved. In many countries, the low number of affordable and social housing providers – which often have only limited capital – has constrained the growth of the stock of affordable housing units. Soaring costs related to regulatory barriers, increased input costs and limited innovation in the construction sector have exacerbated this situation. The current context of increased construction, financing and renovation costs is causing many social housing projects to be postponed or dropped altogether (Housing Europe, 2023).

In the medium term, fostering the development of the securitisation market in a manner consistent with financial stability could expand access to mortgages for lower income households and reduce funding costs in underserved markets. In the short term, public investment could support models to increase affordable housing supply, particularly if accompanied by planning and tax reforms to reduce building costs and encourage the more efficient use of scarce development land. Scaling up innovative practices also plays a role in improving quality and reducing costs and labour needed in the sector, in a context of labour shortages. Government funding and public policies must be made more effective and targeted, moving away from inefficient approaches such as rent controls and demand subsidies, towards targeted supply-side incentives (see Chapter 2 for an overview of current housing policies).

Raising energy standards for new and existing buildings requires deep financial resources. For new buildings, clear and transparent regulation on energy standards would help construction and related industries respond optimally to new requirements. Fostering innovation in the sector could partly offset the resulting higher construction costs. Energy efficiency requirements add to the upfront cost of purchasing a house, at a time when house prices are already high. Renovation costs are a barrier to improving the energy efficiency of existing buildings, particularly for financially vulnerable households, as the upfront investments are large and the benefits are uncertain and slow to materialise. Policy can support households in the green transition by continuing to provide public funding for energy efficiency investments, limiting the financial burden on the most vulnerable households and fostering green finance for real estate, including green mortgage-backed securities (MBS). To enable a wave of energy efficiency renovations, policy must address the different causes of high renovation costs, including supply chain shortages, demanding procedures and building permit requirements, and the need for extensive technical expertise. For buildings that are energy efficient, better data transparency would make it easier to provide evidence of the lower maintenance and running costs, allowing home buyers and banks to incorporate these extra savings into their investment decisions.

Box B

Estimating housing investment needs in the European Union

In the context of growing concerns about housing affordability and the effect of housing costs on inclusion and labour mobility, it is useful to get a sense of whether housing investment in the European Union is sufficient to meet demand. This requires estimating both housing supply and housing demand. This box provides an estimate of the additional annual housing demand in the European Union in 2025 and compares it with the expected additional supply of housing to see how large the mismatch is in 2025. This analysis therefore does not take into account the pent-up demand built up in previous years.

Estimating the growth of supply is relatively straightforward. It can be estimated by the number of completed dwellings or, looking ahead, the number of construction permits for dwellings or housing starts (two years ahead[80]). In this analysis, we use data on building permits for new dwellings. Supply of dwellings could also be increased through measures to unlock access to vacant properties or subdivide larger dwellings, but such effects are not included here.

Estimating housing demand is no simple task. This box provides details of the methodology used to estimate the European Union's housing needs, specifically, the number of dwellings that need to be created each year to meet the additional demand in each country. The analysis is based on existing studies and estimates of housing needs from national sources.

Formally, annual additional housing demand (housing needs) depends on the following components:

Annual additional housing demand =
Household formation + Obsolescence of housing stock +
Change in demand for second homes + Change in demand from non-residents

80 See Banco de España (2024); Chapter 4 assumes that housing starts in 2022-2023 can proxy housing completions two years later (2024-2025).

Household formation is the number of new households created in a year. It is calculated as the difference in the projected number of households between two consecutive years, which includes the effect of migration. Household formation projections are generally produced by national statistical offices on the basis of expected population dynamics and household size trends (with household size typically declining in developed economies).

The obsolescence of the existing housing stock represents the share of dwellings that have become suitable for demolition and depends on the age and condition of the housing stock. The existence of second homes increases the demand for housing over and above the number of households. Finally, housing demand by non-residents is related to the purchase of houses in coastal or tourist areas by people from outside the country.

After reviewing the literature and sources at country level, we identified studies and estimates of housing needs carried out by reliable national sources (statistical offices, central banks, ministries, research institutes, etc.) for the following ten countries: Ireland, Spain, Germany, Italy, France, the Netherlands, Belgium, Czechia, Slovakia and Austria. These ten countries represent 71.2% of the EU population. We collected and revised the latest data for these countries on household projections, household size, population, housing stock, vacant dwellings and occupied dwellings.

On the basis of the information collected and according to the national sources, the annual additional housing demand in all countries, with the exception of Ireland, is proxied by household formation.[81] In the case of Ireland, the study also takes into account the rate of obsolescence of the housing stock. Housing needs estimates vary from year to year as household formation projections are not constant (they depend on population dynamics and the evolution of household size in each country).

An initial calculation of annual additional housing demand in 2025 for these ten countries comes to some 900 000 units, or 1.3 million if we extrapolate to the remaining 29% of the EU population. However, this initial estimate has limitations. Household projections are annual for Belgium, Spain, France and the Netherlands but they are not revised at the same frequency. In the other countries, projections were more approximate or were only produced or revised from time to time. We therefore compared data on building permits for new dwellings with estimates of annual additional housing demand by country and cross-checked the data against annual government housing targets, double checking sources where there was a large discrepancy.[82]

In the case of Germany, estimates of supply based on dwelling permits were well below government housing targets. Although the methodology used for setting the national policy target is unclear, it seemed preferable to take the government target as a benchmark in view of recent population inflows. Government targets in France and Italy also suggest higher additional housing needs than household formation projections. Initial calculations were therefore revised upwards where government targets were higher.

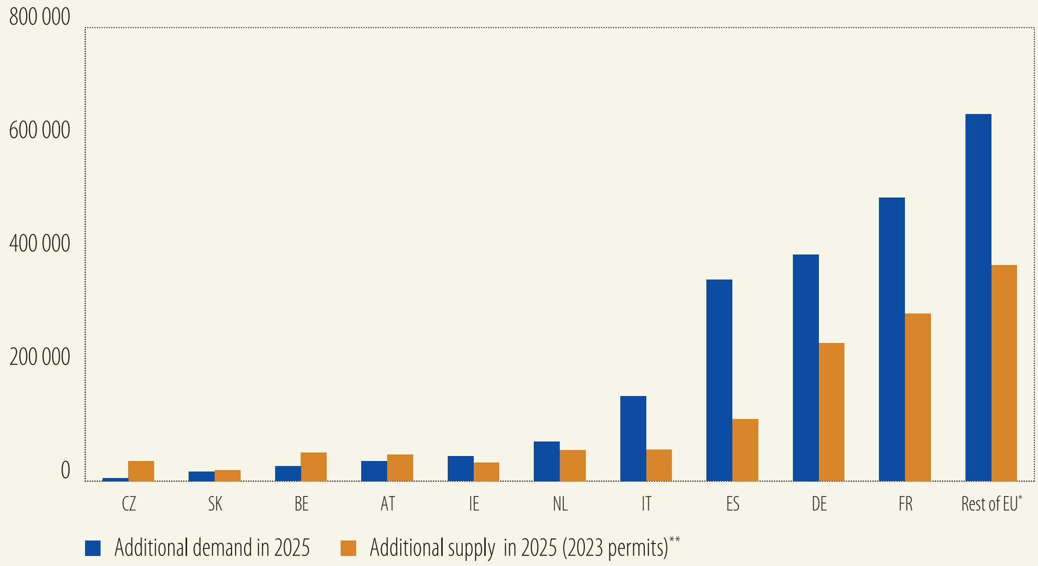
The additional housing demand in the European Union for 2025 is estimated to be 2.25 million units. Given that the average period of housing construction is 24 months, we can assume that the maximum number of new dwellings completed in 2025 (that is, the additional housing supply) will be equal to the number of dwelling permits in 2023. Taking the 2023 permits for the ten countries and extrapolating them to all EU members, as we did with the demand, we expect 1.32 million units

81 The national sources for household formation (housing demand) are: Austria: Statistik Austria, Household projections, 2024; Belgium: Federal Planning Bureau, Household projections 2024-2070, June 2024; Czechia: Český Statistický Úřad (CSU), 2005; France: Institut National de la Statistique et des Études Économiques (INSEE), 2024; Germany: Statistisches Budesamt (DESTATIS), 2020; Ireland: Bergin and Egan, 2024; Italy: Instituto Nazionale di Statistica (ISTAT), 2024; The Netherlands: Statistics Netherlands (CBS), households in the future, June 2024; Slovakia: Inštitút informatiky a štatistiky (INFOSTAT), 2014; Spain: Instituto Nacional de Estadística (INE), Household Projections years 2024-2039, June 2024.

82 The sources of annual government housing targets are as follows: Italy: Cavestri (2024); France: Lefebvre (2021); Germany: Federal Government of Germany (2022)

to be completed in 2025, indicating a gap of 925 000 units. This suggests that the 2023 construction rate of new dwellings should have been 70% higher to meet the additional demand in 2025.

Figure B.1
Annual additional housing demand and supply (units)**, by country in 2025**



Source: *EIB staff calculations based on national sources.*
Note: **Rest of the European Union is calculated as the difference between the total EU estimation and the data for the ten countries listed here. **Dwelling permits in 2023 for all the countries except for Ireland, for which we use data on housing starts.*

These estimates of housing demand may be considered conservative. First, this analysis does not account for pent-up demand built up in previous years (as it was done only for one year), which appears high in countries like Spain and France. Second, internal migration may also increase housing demand in certain regions while reducing it in others, so housing pressures may be more acute in faster growing areas than aggregate household formation suggests. Third, the analysis does not consider demand for second homes by residents and non-residents and the ageing of the housing stock (except for the Ireland estimates), which would further increase housing needs.

On the supply side, this analysis has only considered the construction of new dwellings. To close the gap in the provision of housing, it is also vital to consider the role of renovation and policy in achieving a fuller utilisation of the existing housing stock. Policies could seek to incentivise the use and renovation of vacant housing, the subdivision of underused large dwellings (given rising demand from one- and two-person households) and the redirection of short-term rentals to long-term ones or occupancy by property owners.

Increasing local government capacity for social investment

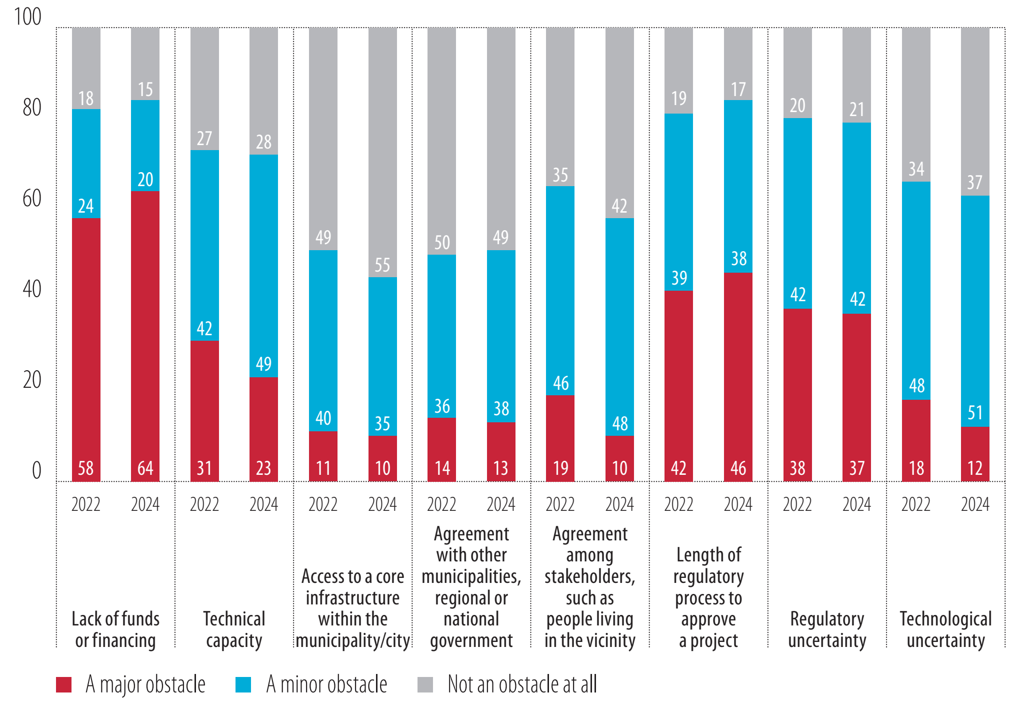
Improving social infrastructure requires local, regional and national governments to possess the capacity and competencies needed to invest effectively. Governments below the national level have a substantial economic and social impact and are helping to finance the ongoing twin (or triple[83]) transition. In 2021, these governments in OECD countries were responsible for over one-third

83 Some authors highlight a separate need to address structural features of the long-term demographic challenges alongside the green and digital transition; see for example European Committee of Regions (2024).

of total public spending (education and health in particular), and over half of total public investment on average (OECD, 2022b and 2024b).[84] Local and regional governments are often among the largest employers in a country, with wages representing a substantial share of expenditures. Local governments must function properly to create an environment conducive to local economic and social activity, attractive to the private and public sectors.[85] Institutional quality[86] also has an impact on the effectiveness of resource allocation (including public investments; see Álvarez et al., 2023 and Zavarská et al., 2024). Effective resource allocation is one of the key factors supporting further economic integration and facilitating exchange and cooperation between regions and beyond. This is especially true for the service sector, which is typically relatively mobile and less dependent on complex supply chains.[87] A further problem seems to be a shortage of information and analysis that could be used to select the most suitable projects. Only around one-third of municipalities perform independent assessments of infrastructure projects regularly (on more than half of projects).[88]

Figure 24

Obstacles to the implementation of investment activities (% of survey respondents)



Source: *EIB Municipalities Survey, EIB staff calculations.*
Note: *All municipalities (excluding don't know/no answer). The number of responses varies according to the subcategory.*
Question: *To what extent is each of the following an obstacle to the implementation of your infrastructure investment activities?*

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84 Between 2004 and 2022, the share of EU regions and cities in total government investment ranged between 54% and 58%; see European Committee of Regions (2024). A larger share of investment in budgets can be observed at lower levels of subnational government (municipalities) than at higher ones (regions or states); see Council of European Municipalities and Regions (CEMR) (2023). However, the share of actual spending on investment in total public spending remains very low by international standards; see for example Giordano et al. (2024) or Chapter 2 of this report.

85 Recently adopted fiscal rules on economic governance in force since the end of April 2024 (see Council of the European Union, 2024) may have implications for financing flows between central (federal) and regional governments. They will also impact the negotiations of the EU multiannual financial framework for the period 2028-2034. For many municipalities, transfers are a major component of the annual investment budget, including allocations for infrastructure investments.

86 There are substantial differences at the NUTS 2 level across the European Union. Capital regions do not necessarily enjoy the highest quality government in a country, as documented by the Quality of Government (QoG) Index; see Charron et al. (2024).

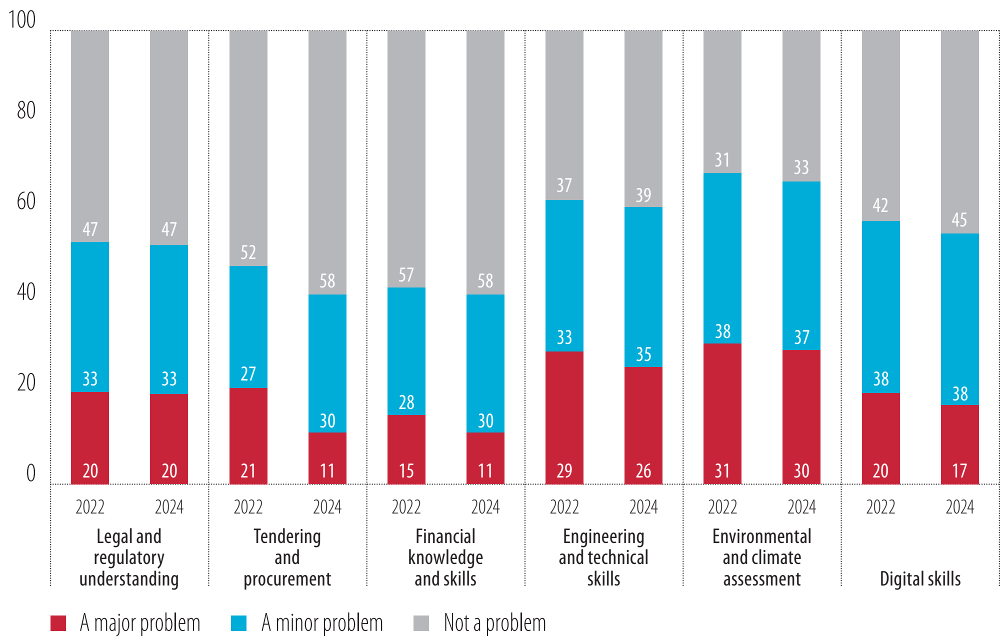
87 However, service sector firms tend to localise and depend on the availability of skilled workers, and can create polarisation effects that increase inter-regional inequalities. For example, see Springford et al. (2024).

88 This is despite the fact that many infrastructure projects require impact assessments to be eligible for public funding, among others. The size and location of a municipality do not significantly impact the likelihood of projects there being evaluated.

Removing barriers to regional development in a timely and targeted manner will require structural adjustments and investments. According to the EIB Municipalities Survey 2024 (EIB, forthcoming), one of the biggest challenges municipalities face is a large funding gap, followed by demanding regulatory procedures (Figure 24). The funding gap is likely to persist unless additional resources are brought in, especially in a time of more constrained fiscal policy (reduced fiscal space and increasing debt-to-GDP levels), which is the case across EU members. Overcoming regulatory difficulties would require a review and streamlining of administrative procedures, especially given the increased administrative burden from the twin transition.[89] Recent international survey evidence that includes a number of EU members shows relatively supportive environments for business, compared with the total sample of 50 countries worldwide (mostly low- and middle-income).[90] However, EU countries' performance could be improved in terms of regulation and efficiency, which could create better business conditions to help firms prosper.[91] The survey also shows room for improvement in digital public services and environmental issues (for example, approval procedures).

Figure 25

Access to experts as a problem for municipalities (% of survey respondents)



Source: EIB Municipalities Survey, EIB staff calculations.
Note: All municipalities (excluding don't know/no response). The number of responses varies according to the subcategory.
Question: For each of the following areas, to what extent is access to experts a problem for the delivery of your municipality investment programme?

Apart from well-known problems, such as a lack of funding or the administrative burden, many local governments have difficulty finding skilled labour to implement investment projects. A lack of experts with the necessary technical skills is a major obstacle that ultimately complicates the implementation of municipal investments (Figure 25). In the EIB Municipalities Survey, about 60% of municipalities reported

89 A recent survey of members of the Council of European Municipalities and Regions (CEMR), which represents local and regional governments and local government associations across 41 EU members, shows that the main barriers to implementing climate-related legislation are: (a) lack of funding, (b) lack of staff and (c) lack of experts/complexity of funding (see CEMR, 2024).

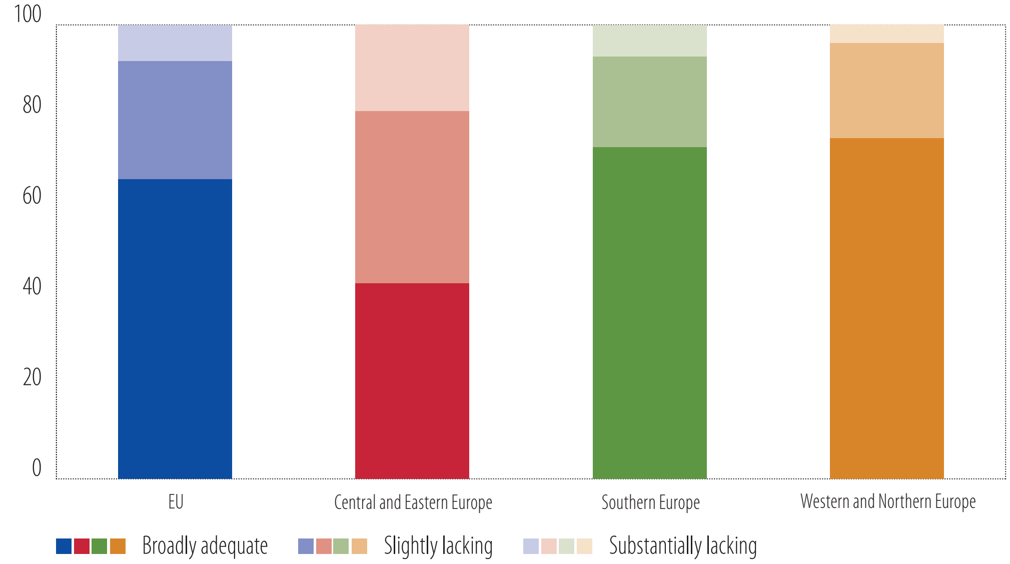
90 From 2024 onwards, the World Bank's Business Ready (B-READY) project replaces its Doing Business series. It takes a new approach to assessing the business and investment climate across countries and covers three areas (in order of importance): (a) regulation, (b) public services and (c) operational efficiency. It also aims to analyse topics at both the national and the local level (as opposed to the city level, as was done under Doing Business). The 2024 B-READY Report includes data on 12 Member States and EU candidate countries, but only in the regions Central and Eastern Europe and Southern Europe, and the Balkans (see World Bank, 2024).

91 See also Giordano et al. (2024), which identifies the main obstacles to higher levels of investment in Europe.

major or minor problems finding experts with technical engineering, environmental, climate-related or digital skills,[92] as opposed to other types of skills associated with more common or more administrative roles like finance or procurement.[93] This problem is difficult to overcome, as the persistence of these barriers across different survey years shows (for 2022 data see EIB, 2023).

Local governments report high needs in the areas of social investment and climate change mitigation. The EIB Municipalities Survey lends insight into investment activities and needs across municipalities. The survey finds that around one-third of municipalities perceive their social infrastructure investments in the past three years to be inadequate (Figure 26), which is almost unchanged from the previous survey (2022). Perceived adequacy is even lower for climate change mitigation and adaptation investments, but only mitigation is viewed as a slightly more pressing priority than social infrastructure investment for the next five years.[94] Note that around two-thirds of climate change spending, representing over 1.1% of GDP, takes place at the local level (data from 25 EU and eight OECD countries in 2019; see OECD, 2022a). A decomposition by macroeconomic region reveals substantial differences: 57% of municipalities in Central and Eastern Europe view their past investments as "insufficient" vs. only around one in four municipalities in the other two regions. But it is social infrastructure investments – in better skills and education, affordable housing, robust networks and access to services – that can help bridge the current divide between regions across all EU countries. These investments improve well-being for everyone and support sustainable growth during an economic and social transition by equipping local institutions to face the challenge.

Figure 26
Social investment (in %)



Source: *EIB Municipalities Survey, EIB staff calculations.*
Note: *All municipalities (excluding don't know/no response). Only one out of six subcategories asked in the question is shown. The number of responses varies according to the subcategory.*
Question: *In the last three years, would you say that within your municipality the level of investment in infrastructure projects was broadly adequate, slightly or substantially lacking?*

92 According to the responses, the lack of experts with engineering and technical skills represents a slightly more severe problem for municipalities in Western and Northern Europe than in the other two regions (65% vs. 59% for the other two). For environmental and climate-related skills the problem is worse in Western and Northern Europe and in Central and Eastern Europe than it is in Southern Europe (68% for the first two vs. 63%).

93 The variation across cohesion or macro-regions is relatively small, showing that this is a general problem any municipality across the European Union might face.

94 However, response shares for all three categories of investment (climate change mitigation, social infrastructure and climate change adaptation) only differ by a few percentage points. For further details, see EIB (forthcoming).

Conclusions and policy recommendations

The European Union has been improving steadily in terms of social inclusion and well-being. This includes better health outcomes than in other regions and reductions in income inequality and job insecurity. However, many disparities remain, between and within EU members.

Recent decades have seen improvements in equality of opportunity, although gender and educational background remain key barriers. Involuntary circumstances like gender, parental occupation and disability have less of an impact than a decade ago, but still account for around 18% of earning differentials.

Rising housing costs have increased barriers to home ownership and relocation, with implications for labour mobility, while inflation has had a disproportionate impact on poorer households and retirees. Rising house prices and rents have benefited existing homeowners but have hurt renters and reduced access to home ownership, particularly for the young. This may have lasting effects. Individuals who have experienced housing difficulties persistently show higher unemployment rates, while high housing costs are also a barrier to mobility (particularly in cities), affecting equality of opportunity and labour market efficiency. The rising cost of necessities has affected poorer households in particular, while retirees have suffered from falling real value of cash and deposits.

Education, childcare services, urbanisation and structural changes in the economy have supported rising labour force participation, particularly for women. Notably, while labour force participation has increased for all workers aged 55 and over, among those under 50 it has risen for women only, mainly driven by improvements in educational attainment and childcare access, and the growth of service sector employment. High labour tax burdens and generous long-term social benefits have been associated with negative labour force attachment.

The green transition will increase demand for technical skills, which may have a negative impact on female labour force participation. Green transition-related jobs are less likely to be held by women in the European Union. The gender gap in green skills largely reflects that in STEM qualifications.

For firms, scarcity of skilled staff is a top obstacle to investment, a problem that was exacerbated by the pandemic and remains acute in many regions. In Central and Eastern Europe, growth has been driven by capital regions, with the poorest regions suffering a brain drain. Across the European Union, pandemic-related barriers to internal EU migration strongly impaired firms' ability to attract skilled workers by offering higher wages.

Social investment in health, education and housing, as well as broader social policies, are critical to protect and improve well-being and social cohesion and have a strong effect on the competitiveness of the European economy. In the face of long-term challenges like demographic change and the green and digital transition, attention to these areas will be essential to maintaining a thriving and inclusive economy.

More and better investment in education and health will have long-term societal benefits. Ensuring high-quality and inclusive education outcomes will be critical for continuing to increase equality of opportunity. In the area of adult training, the focus should be on helping EU firms provide more training. Further supporting research and development and scaling advances in health technology in Europe can sustain the improvements in health outcomes that have already been achieved.

Active labour market policies, support for parents, and inclusive education can improve labour market outcomes for women and vulnerable groups, helping people enter the workforce and keep their jobs. A focus on targeting resources well and reaching at-risk groups can reduce the risk of detachment from the labour market. Policies to ensure that the tax system does not penalise second earners, to increase access to childcare and to give both parents adequate parental leave would further boost equality in labour force participation. Investment in skills acquisition is needed to mitigate gender disparities in employment related to the green and digital transition. An analysis of survey data provides further evidence of the supportive effect of childcare services on female labour force participation.

Housing policy should address the issue of housing affordability, including for energy renovations, and the need for innovation in construction. Adopting innovative construction technologies and practices is critical to bringing construction costs down. To increase housing supply, regulatory barriers must be reduced, and public support should focus on shortcomings in affordable housing and on making energy efficiency renovations affordable for low-income households.

Local governments play a key role in social investment and regional convergence, but face capacity and funding constraints. According to the EIB Municipalities Survey 2024, the funding gap constitutes the main challenge for municipalities, followed by the complexity of regulatory procedures. Financial support and administrative reform are needed, along with technical support and training to fill gaps in expertise that hinder investment.

For future social investment, more and better prioritisation, greater efficiency and higher quality of spending by the European Union and its members will be vital. Significant amounts have already been spent (see Chapter 2). National government expenditure on health and education, for instance, amounts to 12% of GDP on average across the European Union, with spending per person ranking among the highest in OECD member countries. However, countries are feeling budget pressures. Going forward, transforming spending into productive growth hinges on targeted and efficient efforts that ensure quality outcomes.

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Chapter 5

Innovation in a shifting global landscape

The global innovation landscape is changing rapidly. To enhance the competitiveness of European firms, Europe must invest more in cutting-edge innovation, improve the diffusion of innovation, increase the resilience of supply chains and reduce strategic dependencies in critical sectors. Against a global backdrop of persistent disruptions and heightened systemic uncertainty, the ability of the European economy to adjust and transform will be dependent on a supportive operating environment.

The European Union is at the forefront of clean technology, but lags behind the United States and China in digital innovation. This creates major dependencies on digital platforms and other technologies (such as artificial intelligence) developed by non-EU providers. Relatively high energy costs and the fragmentation of the internal market are also putting the competitiveness of EU businesses under pressure. A successful green transition will require sustained efforts in innovation and the widespread uptake of green and digital technologies, as they are key drivers of Europe's competitiveness and its ability to withstand economic disruption and climate change.

The European Union is committed to a model of economic security that focuses on diversification and innovation while also retaining the benefits of trade. To increase its resilience, Europe needs to reduce the risks of dependencies in critical raw materials and key strategic inputs imported by EU firms. This will help encourage investment in diversification and possibly the timely build-up of domestic production capacities for high-tech products in which EU businesses have a comparative advantage, making it easier to position the EU manufacturing sector in an intensely competitive global landscape. Certain industries have the potential to create value and jobs in Europe and contribute decisively to its competitiveness, but this will require policy measures to make the economic environment more efficient, bring down regulatory barriers and strengthen the internal market, ensuring there is an equal playing field across the European Union.

Introduction

Global competitive dynamics are changing fast. Trade remains strong, but the last few years have seen a substantial anti-globalisation backlash, with some countries increasingly implementing inward-looking industrial policies and strong pressure for economic security. The United States has embraced a strategy that supports domestic production via widespread stimulus for re-industrialisation paired with higher tariffs, and the new US administration has left the door open to a new wave of tariffs and levies, which may further alter global trade flows. Over the past two decades, China has positioned itself as a leading global player in key advanced technologies with a strategy that substantially increases its comparative advantage in mid-tech and high-tech sectors, thereby challenging other established players.

The European Union has maintained a more open approach to global trade, and this has proved effective in supporting its economy in the past. In the short term, Europe is still benefiting from its participation in global value chains, the integration of the Central and Eastern European region into international production networks, and a large market. But serious challenges may emerge in the medium term.

This chapter looks at the challenges facing Europe and analyses its global competitive position. It is organised into four sections. The first section assesses the position of the European Union in global research and development investment. The second highlights current trends in the development of new technologies, explores the performance of EU firms that hold patents in green technologies, and discusses the position of the European Union in global technological collaboration networks. The third section discusses investment in resilience to supply chain risks and dependencies in imports, exports and the production of green technologies. The last section presents the policies needed to support innovation in the European Union.

Europe’s global research and development position is challenged

Investment in innovation is a key driver of productivity, long-term prosperity and economic growth for advanced economies. It fosters competitiveness, resilience and structural transformation. It is needed to address pressing policy and social challenges including an ageing population, climate change and numerous health and environmental issues (see Chapter 1). This section assesses the position of the European Union in global research and development (R&D).

Innovation is a broad term that covers several components, all of which require major investment. Innovation activity includes R&D spending, patenting and the development of new products, processes and services, among other aspects. Investment in innovation creates growth opportunities for firms, together with new skill needs and job opportunities for workers. It differs from capacity replacement (investment in existing buildings, machinery, equipment or information technology) and capacity expansion (investment in new buildings, machinery, etc.) as the returns from investing in innovation are less cyclical, more uncertain and typically have a longer time horizon.

Europe’s high number of R&D researchers is evidence of its role as a strong engine for global technological progress, on a par with the United States and China. In 2022, R&D expenditure per capita in the European Union was less than a third of that in the United States but remained higher than in China (Table 1). At the same time, the number of R&D researchers per capita in the European Union was close to the US level, despite only 34% of 25- to 64-year-olds in the European Union having a tertiary education (compared with 50% in the United States).

Table 1
Selected indicators on research output in 2022

	EU	US	China
R&D expenditure (EUR billion)	357.4	876.8	434.9
Population (million)	445.8	333.3	1 425.9
R&D expenditure per inhabitant (EUR)	801.6	2 630.7	305.0
R&D researchers per million inhabitants	4 691.7	4 918.4	1 849.5
Tertiary education (% of 25- to 64-year-olds)	34.2	50.0	18.5
Nature Index (number of publications)	37 991	30 754	24 735
PCT[1] patent applications	53 773	66 785	71 943

Source: *EIB staff calculations based on Eurostat, Organisation for Economic Co-operation and Development (OECD), Nature Index and Patent Cooperation Treaty (PCT) patents (PATSTAT).*
Note: *The Nature Index is based on the number of research papers published in 2022 in 145 natural science and health science journals. Data on R&D researchers in the United States are from 2021. Data on tertiary educational attainment in China are from 2020. Data on PCT patent applications (in collaboration with the Expertise Centre for Research and Development Monitoring (ECOOM) at KU Leuven University) are from 2021.*

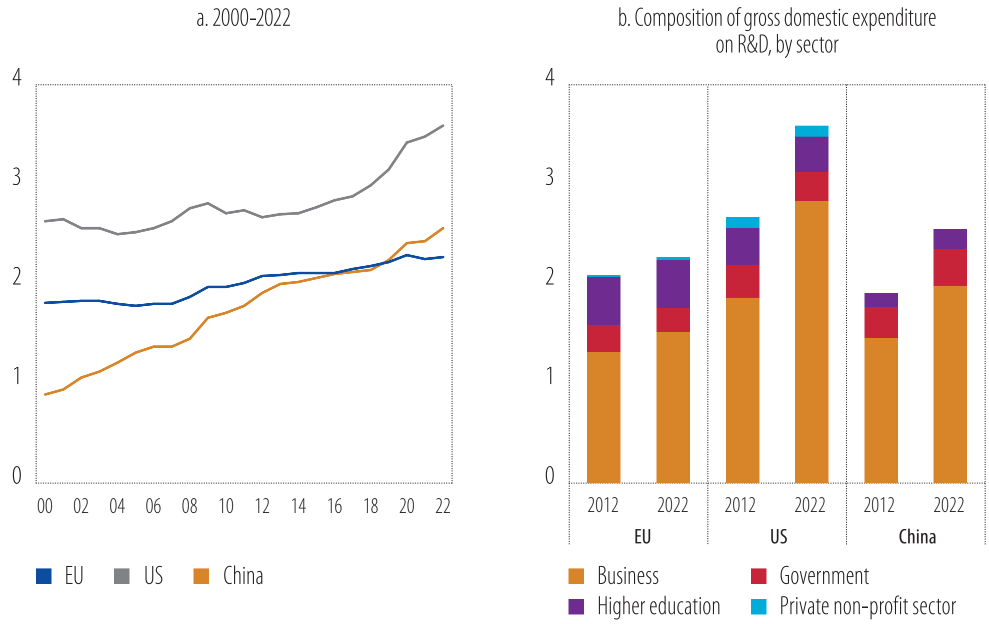
There are more leading natural science and health science publications in the European Union than in the United States and China. However, despite Europe's excellence in scientific research, patent applications under the Patent Cooperation Treaty and total R&D expenditure are lower in the European Union than in the United States and China, showing that the high level of scientific output does not translate sufficiently into innovation and investment in fast-growing key markets, such as pharmaceutical and biotech or digital services.

The European Union sets public and private sector R&D investment goals. The European Commission has acknowledged the crucial role of creating and improving the dissemination of knowledge and technologies. A key policy goal is for the European Union to invest 3% of its gross domestic product (GDP) in R&D, 2% of which is expected to come from business and 1% from the government, higher education and private non-profit organisations.

Global R&D expenditure has increased rapidly over the past two decades, but Europe is investing less in R&D than the United States or China. The R&D intensity of the European Union was 2.3% of GDP in 2022, compared with 3.6% in the United States and 2.6% in China (Figure 1a). Ten years ago, the R&D intensity was higher in the European Union than in China. The private sector has been driving the rapid increase in gross expenditure on R&D (GERD) in China and the United States over this period (Figure 1b). The failure to meet the 3% target for R&D expenditure is one of the main reasons why the European Union is lagging behind the United States in the development of new technologies (Draghi, 2024). If policy measures are not taken to support R&D, some highly innovative EU firms may lose their competitive advantage over firms based in other countries.

1 The Patent Cooperation Treaty (PCT) is an international treaty signed by more than 150 countries. It makes it possible to seek patent protection for an invention in many countries simultaneously by filing a single international patent application instead of several separate national or regional patent applications. The granting of patents remains under the control of the national or regional patent offices.

Figure 1
Gross domestic expenditure on R&D (% GDP)



Source: EIB staff calculations based on Eurostat and OECD.
Note: Gross domestic expenditure on R&D (GERD) as a share of GDP. Data on the private non-profit sector are not available for China.

Public funding for R&D in the United States focuses more on defence than in the European Union

While the business enterprise sector remains the main source of R&D funds in the European Union (1.3% of GDP in 2021), government funding is significant and amounts to 0.68% of GDP. GERD can be broken down not only by sector of performance (Figure 1b), but also by the source of funds (Organisation for Economic Co-operation and Development (OECD), 2015). A non-negligible share of R&D spending is financed by the government in the European Union (0.68% of GDP) and the United States (0.65% of GDP), while this stands at 0.46% of GDP in China.

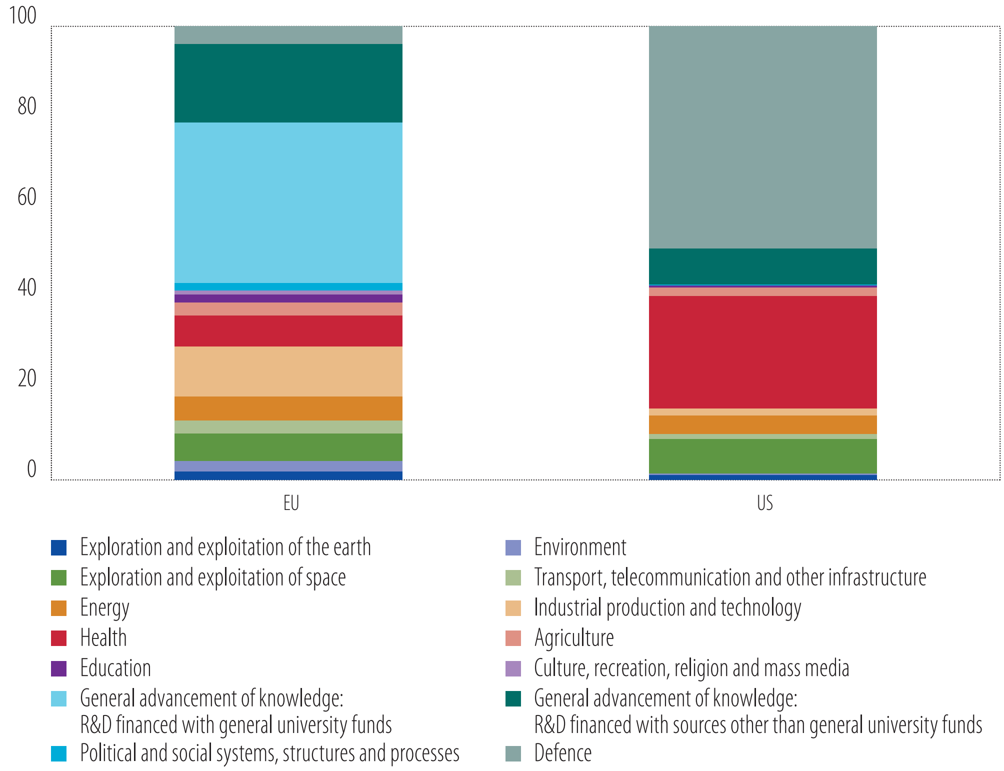
The European Union and the United States have similar levels of government budgets allocated for R&D, but the United States prioritises defence R&D much more. In the European Union, more than 40% of government budget allocations for R&D (GBARD) goes towards the general advancement of knowledge, industrial production and technology and health (Figure 2).[2] Unlike in the European Union, defence accounts for about half of GBARD in the United States.[3] The European Union's lack of focus on areas related to economic security – including dual-use technologies for civil and defence applications – may be driven by national governments, which account for most government R&D spending. This calls for better coordination of public support for research and innovation among EU countries (Draghi, 2024). The United States also appears to place more of an emphasis on public R&D support for health than the European Union, but this is partially due to differences between the United States and the European Union in the classification of socioeconomic objectives. GBARD for general advancement of knowledge includes R&D related to natural, engineering, medical, agricultural or social sciences as well as humanities – a breakdown not provided at the European level.

2 GBARD can be classified into socioeconomic objectives according to the nomenclature for the analysis and comparison of scientific programmes and budgets (NABS) 2007 classification.

3 A comparison with government funding for R&D in defence in China is difficult due to the lack of reliable data, but various sources suggest that it is high and has increased over time (Nouwens and Béraud-Sudreau, 2020; Tian and Su, 2021; Centrone and Fernandes, 2024).

Figure 2

Socioeconomic objectives of government budget allocations for R&D (in %)**, in 2023**



Source: *EIB staff calculations based on Eurostat and OECD.*
Note: *The numbers are based on government budget allocations for R&D (GBARD) in 2023.*

Top European firms are losing ground to other leading global innovators

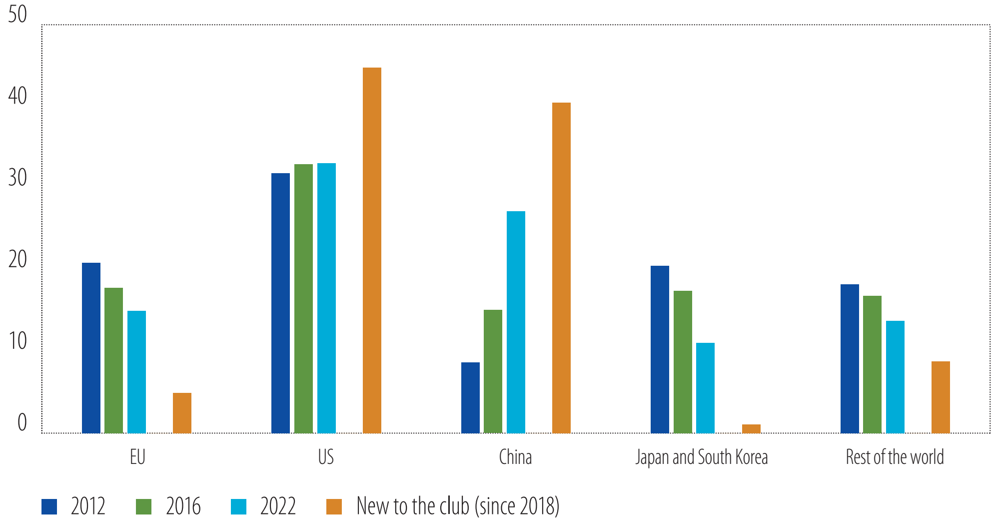
R&D investment and patenting activities are highly concentrated among a small number of companies, sectors and countries. The world's top 2 500 R&D investors account for close to 80% of global business R&D expenditure and two-thirds of patent filings in the five largest patent offices (Nindl et al., 2023). This concentration of innovation is particularly pronounced in high-tech sectors such as software and computer services, pharmaceuticals and biotechnology, and electrical equipment and technology hardware, but is also significant in mid-tech industries such as the automotive sector. R&D investment and patenting activities are more concentrated among a small number of firms than sales or employment, with these firms having grown bigger over time.

The European Union is a major global player in R&D and innovation, but the share of EU firms among the top global R&D investors has fallen over time. The share of firms from the European Union and Japan in the list of the top 2 500 R&D investors decreased between 2012 and 2022 (Figure 3). This decline is largely attributable to the rise of China, with the number of Chinese companies included in this list rising fast (comprising 40% of firms having joined since 2017). At the same time, the United States remains an innovation leader with the highest number of new entrants to the list, while the number of newly added EU firms is very modest.

The global R&D landscape has changed rapidly over the past decade as the digital economy has become increasingly important. Electrical equipment and hardware represent 23% of total R&D spending by the top 2 500 companies, followed by pharmaceuticals and biotechnology, which account for 21% (Figure 4). R&D spending by companies selling software and computer services has risen sharply over the past decade, with a share of 19% in 2022 (up from 9% in 2012). At the same time, the automotive industry's share declined to 15% in 2022 (from 20% in 2012). Other manufacturing sectors have seen a similar decline.

Figure 3

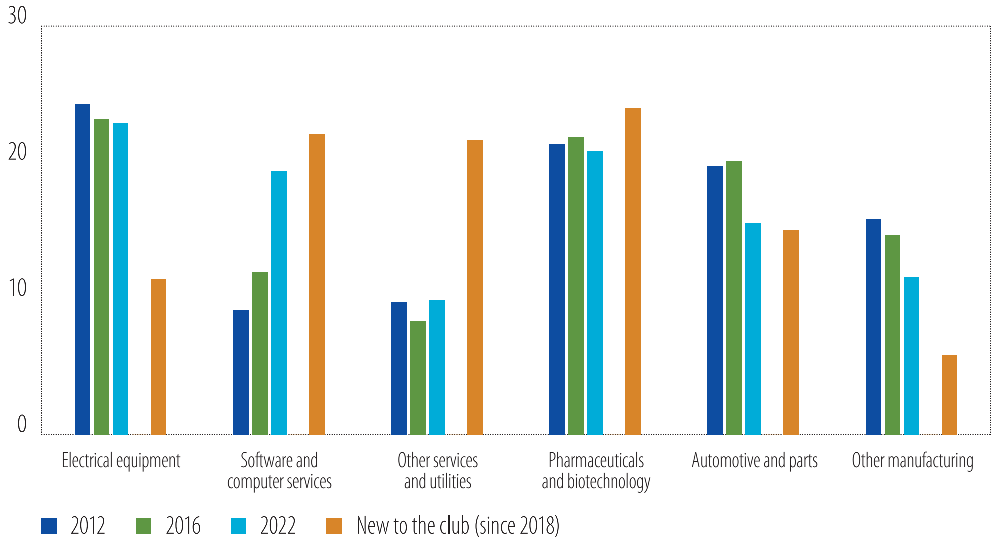
Share of top global R&D firms (in %)**, by country or region**



Source: EIB staff calculations based on EU Industrial R&D Investment Scoreboard 2023.

Figure 4

Share of top global R&D firms (% of R&D expenditure)**, by sector**



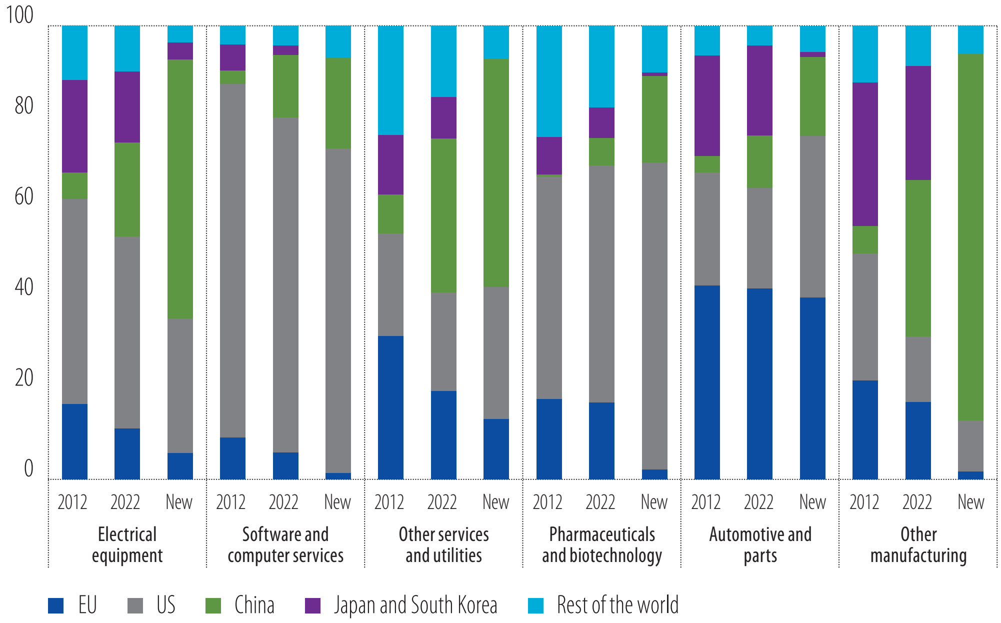
Source: EIB staff calculations based on EU Industrial R&D Investment Scoreboard 2023.

Note: Electrical equipment includes also electronic equipment and technology hardware. Other services and utilities includes fixed line and mobile telecommunications; food and drug retailers; general retailers; industrial transportation; travel and leisure; media; banks; equity investment instruments; life insurance; non-equity investment instruments; non-life insurance; real estate investment and services; support services; alternative energy; electricity; gas; water and multi-utilities; industrial metals and mining; oil and gas producers; oil equipment; services; and distribution. Pharmaceuticals and biotechnology also includes healthcare equipment and services. Automobile and parts also includes aerospace and defence. Other manufacturing includes beverages; food producers; tobacco; chemicals; construction and materials; forestry and paper; general industrials; industrial engineering; household goods and home construction; leisure goods; and personal goods.

Pharmaceuticals and biotechnology and software and computer services have a higher R&D intensity than other industries and are dynamic sectors with new players. R&D investment by global leaders represents more than 15% of turnover in these two sectors – significantly higher than for electrical equipment, automotive or other manufacturing industries – reflecting the major investment and ongoing R&D efforts needed to stay competitive. Software and computer services (followed by pharmaceuticals and biotechnology) also have the highest R&D expenditure by companies that are new to the club (firms that have joined the list of R&D global leaders since 2018).

The European Union specialises less in software and computer services than the United States or China. The European Union only represents 6% of R&D expenditure by leading software and computer services companies, compared with 74% for the United States and 14% for China (Figure 5). Similarly, the European Union accounts for 11% of R&D expenditure by leading electrical equipment and technological hardware firms, compared with 42% for the United States, 20% for China and 16% for Japan and South Korea. The automotive sector is the only area where the European Union is a major player with a relatively high share of R&D expenditure by new entrants. The dearth of leading innovators in key strategic and fast-growing sectors (such as software and computer services) in the European Union shows that it does not create the right conditions for disruptive innovation. This creates major dependencies on digital platforms and artificial intelligence tools developed by non-EU providers at a time when economic security is an increasing concern.

Figure 5
Share of R&D expenditure in 2012 and 2022 (in %)**, by sector and country or region**

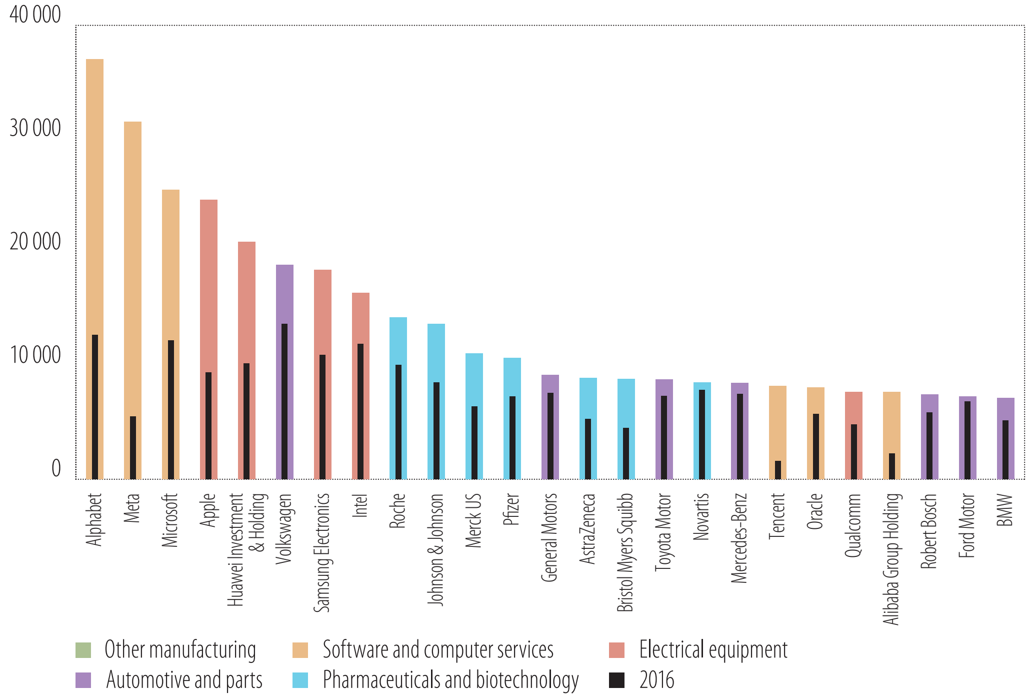


Source: *EIB staff calculations based on EU Industrial R&D Investment Scoreboard 2023.*
Note: *See Figure 4 for the definition of the sectors. "New" refers to firms that entered the list of top global R&D investors after 2017.*

The top four global R&D investors are all US digital companies. With EUR 37 billion spent in 2022, Alphabet (the parent company of Google) was the top global R&D spender, followed by Meta (the conglomerate owning Facebook, Instagram and WhatsApp) and Microsoft (Figure 6). The amounts these three companies spend on R&D every year has increased massively since 2016. The list of the ten largest R&D investors is dominated by US and Asian companies selling software and computer services (Alphabet, Meta and Microsoft) or producing electronic and hardware technology equipment (Apple, Huawei, Samsung and Intel).

The four EU companies among the top 25 global R&D leaders all operate in the automotive sector. Over time, the European Union has developed a key competitive advantage in the automotive sector. Larger in Europe than in China and the United States, this sector has been a key contributor to European research activity, with Volkswagen, Mercedes-Benz, Robert Bosch and BMW holding positions as the top four European R&D performers. However, the EU automotive sector will have to make major investments in innovation and transformation to improve its competitive position and thrive in the transition from the internal combustion engine to battery electric vehicles (McKinsey, 2024). Box A discusses corporate venture capital in the automotive sector, focusing on venture funds controlled by 25 large automotive companies in Europe, the United States, China, Japan and the rest of the world, and their equity participation in innovative startups in different regions.

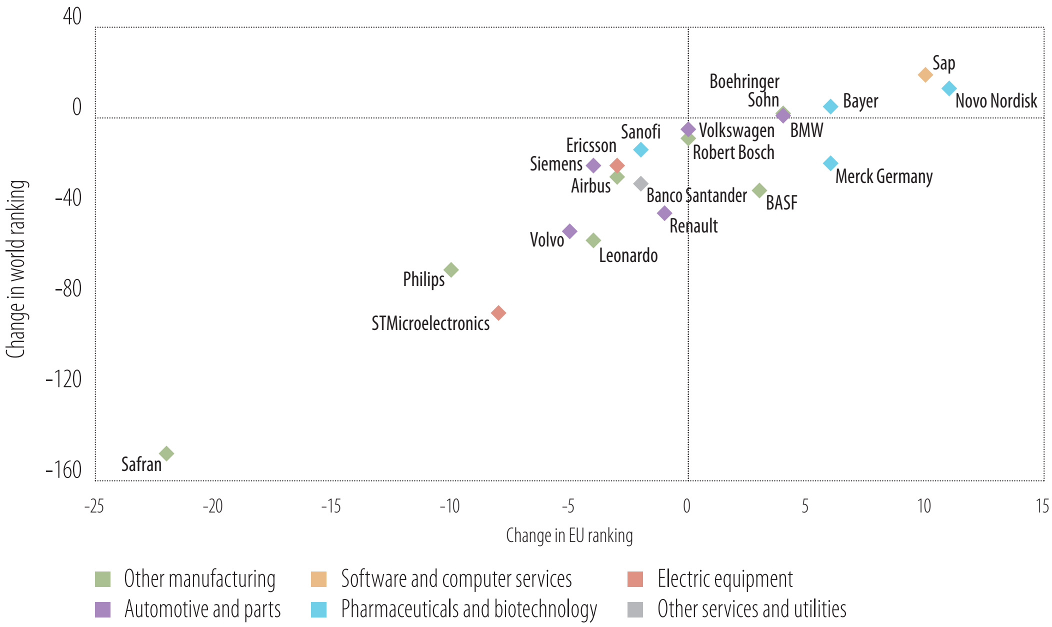
Figure 6
R&D expenditure by the top 25 global R&D firms in 2022 (EUR million)



Source: EIB staff calculations based on EU Industrial R&D Investment Scoreboard 2023.
Note: See Figure 4 for the definition of the sectors.

Only a few EU companies increased their relative position in the list of the top global R&D companies from 2012 to 2022. Among the top 25 companies within the European Union, the software company SAP and pharmaceutical companies Novo Nordisk and Bayer are the only firms that improved their position in the global ranking from 2012 to 2022 (Figure 7). Most other top EU R&D companies fell in the global ranking during this period, by an average of 40 places. Europe's R&D landscape has seen shifts in focus over the past decade from other manufacturing sectors (with companies such as Safran and Philips) to software and computer services and pharmaceuticals and biotechnology. Several EU firms are well positioned in pharmaceuticals and biotech and could take advantage of Europe's excellence in scientific research to develop strong ecosystems in this domain.

Figure 7
Change in the ranking of the top 25 EU R&D firms (number of places)**, 2012-2022**



Source: *EIB staff calculations based on EU Industrial R&D Investment Scoreboard 2023.*
Note: *Firms not included in the EU ranking in 2022 due to Brexit: GlaxoSmithKline and AstraZeneca. Firms omitted from the analysis due to mergers: Alcatel into Nokia, Peugeot and Fiat into Stellantis. Telefonica is not shown in the graph due to scaling. Its world rank decreased by more than 200 positions and its EU rank by more than 30 positions. See Figure 4 for the definition of the sectors.*

Box A
Corporate venture capital in the automotive sector

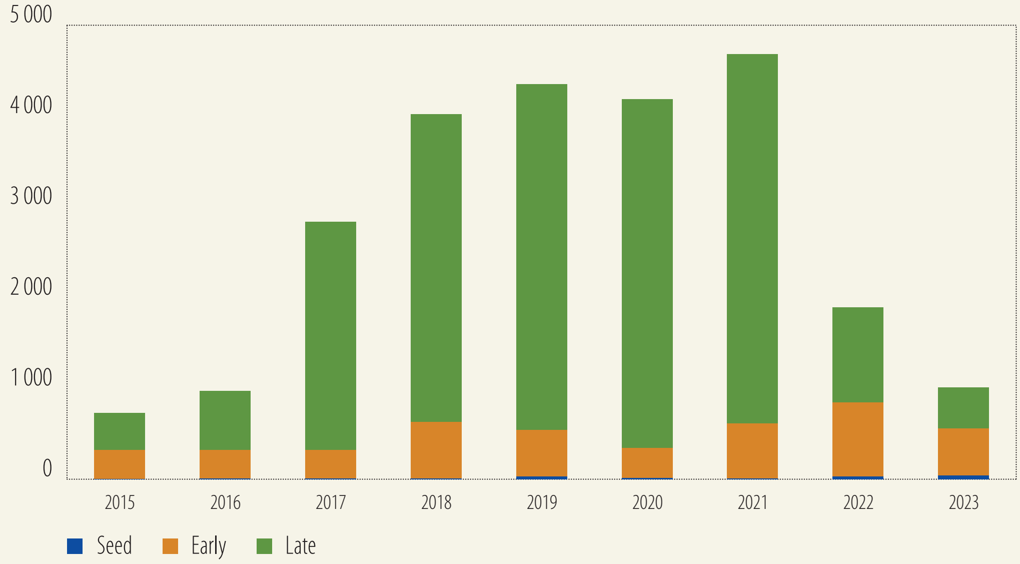
Corporate venture capital (companies buying equity in innovative startups) has become an important way for firms to tap into high-potential, startup-driven innovation (see Chapter 3), allowing for external collaboration and knowledge sharing as well as providing a new source of finance. Corporate venture capital funds now participate in one in four venture capital deals in both Europe and the United States – up from one in ten venture capital deals in 2010 (Hollis, 2024; Chatel, 2023) – while corporate venture capital deal value increased tenfold from 2013 to 2023.

Corporate venture capital investment in innovative startups in the automotive sector (where Europe has always been well represented) has increased markedly in the last decade (Fákó et al., 2024). This funding is concentrated on a handful of companies and is largely focused on late-stage deals (Figures A.1 and A.2).[4]

4 The analysis in this box is restricted to venture capital funds controlled by the five largest automotive companies by R&D investment in Europe, the United States, China, Japan and the rest of the world, based on R&D Scoreboard sector classification, for a total of 25 companies. For more information on the methodology and the sample used, please refer to Fákó et al. (2024). This results in the inclusion of firms like Deere and Caterpillar but, as these have relatively low levels of corporate venture capital, the main messages emerging from the data are not affected. The data set has information on 1 173 venture capital deals financing 827 startups in which one or more of these 25 firms participated from 2010 to 2023. Most of the deals involve multiple investors, though 23% are single investor deals. The amount of financing is disclosed for 945 of the deals, corresponding to 676 startups.

Figure A.1

Total corporate venture capital investment (EUR million) **by the top 25 automotive firms in 2015-2023, by deal type**



Source: *Fákó et al. (2024). Investment data were retrieved from Dealroom.co.*
Note: *The top 25 firms are made up of the top five automotive companies in each of the the following locations: the European Union, the United States, China, Japan and the rest of the world. The companies invest in startups at the seed, early and late stages.*

77% of total corporate venture capital investment went to startups active in areas such as autonomous driving and sensor technology, electric vehicle production (which has a direct link to automotive) and logistics, and mobility (which has an indirect link to automotive). However, a significant amount was invested in startups active in energy (9%), information, communication and technology (7%) and other fields (7%). Most (around 80%) of the corporate venture capital deals in this sample involve two or more investors; the other investors are often private venture capital firms and investors not active in the automotive sector.

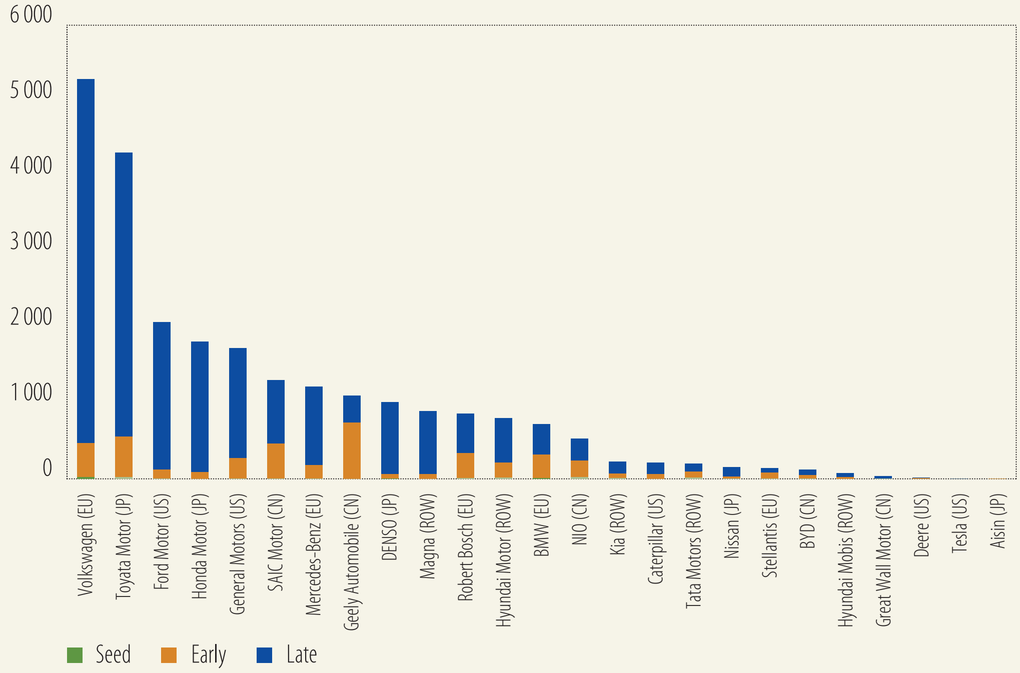
Corporate venture capital activity is mostly located close to the headquarters of parent firms or near large startup ecosystems. This pattern holds for automotive corporate venture capital activity, which is typically handled by offices close to the headquarters of the parent firm (such as Stuttgart, Germany – home to Mercedes-Benz and Porsche; Turin, Italy – Stellantis; or Tokyo and Nagoya, Japan – Toyota). Most also have corporate venture capital offices in locations around the world close to concentrations of talent and venture capital opportunities. For example, Toyota Ventures (Toyota's venture capital arm) was set up in 2017 in San Francisco and had a portfolio of 63 startups, including 51 in North America and just five in Europe.[5] Chinese firm SAIC has also had a venture capital branch in Silicon Valley since 2014, with a portfolio of 24 startups, including 15 in North America, seven in China and two in Europe.[6]

5 Source: Dealroom.co (consulted on 14 June 2024).

6 There are two companies named SAIC: SAIC Venture Capital and SAIC Capital, both registered in Menlo Park, California. Source: Dealroom.co (consulted on 9 September 2024).

Figure A.2

Corporate venture capital investment (EUR million) **by the top 25 automotive firms in 2015-2023, by company**



Source: *Fákó et al. (2024). Investment data were retrieved from Dealroom.co.*
Note: *The top 25 firms are made up of the top five automotive companies in each of the the following locations: the European Union (EU), the United States (US), China (CN), Japan (JP) and the rest of the world (ROW). The companies invest in startups at the seed, early and late stages.*

Most corporate venture capital investment by EU automotive companies goes to the United States, highlighting the less-developed nature of the EU venture capital market for scale-up financing. Figure A.3 shows that United States-based startups are the main beneficiaries of global automotive corporate venture capital investment, with EU, Japanese and rest-of-the-world top automotive firms investing more in United States-based startups than in domestic ones. Chinese and US investors invest mainly at home (Table A.1). On the other hand, startups located in the European Union and Japan (especially) get corporate venture capital funds mainly from domestic firms.

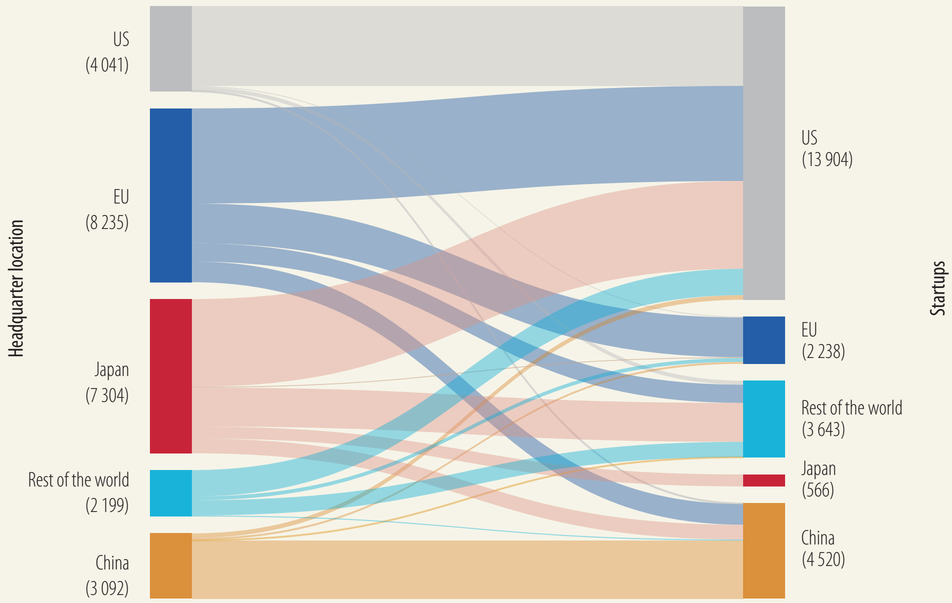
Table A.1

Corporate venture capital investment in domestic startups

Domestic corporate venture capital investment		Domestic origin of startup funding	
EU corporates	23%	EU startups	84%
US corporates	93%	US startups	27%
China corporates	89%	China startups	61%
Japan corporates	8%	Japan startups	100%
Rest-of-the-world corporates	33%	Rest-of-the-world startups	20%

Source: *Fákó et al. (2024). Investment data were retrieved from Dealroom.co.*
Note: *The left column indicates the percentage of domestic corporate venture capital investment by leading automotive companies as a share of their total global investment. The right column shows the percentage of corporate venture capital investment received by startups from leading automotive companies in their own region or country as a share of their total funding.*

Figure A.3
Corporate venture capital investment in startups by top automotive firms (EUR million), **by headquarter location**



Source: *Fákó et al. (2024). Investment data were retrieved from Dealroom.co.*

From 2010 to 2023, the amount of corporate venture capital investment in the United States was 6.21 times larger than in the European Union, which is very similar to the ratio for the total amount of venture capital investment in the respective economies for the same period. Meanwhile, 23% of top EU automotive companies' corporate venture capital stayed within the European Union rather than going to the United States – considerably more than the equivalent share of total corporate venture capital investment (14%, based on European Commission calculations using Pitchbook data).

While this means that corporate venture capital investment by top EU automotive firms shows a certain degree of home bias, it in no way diminishes the urgent need to overcome the overall EU venture capital market's ongoing deficit compared to the United States. Top EU automotive companies invest disproportionately more in the United States than in the European Union, even after controlling for the smaller size of the EU market. This forms part of a broader concern whereby the EU market for disruptive technologies lacks the dynamism and attractiveness of the United States or even China, leading to lower investment.

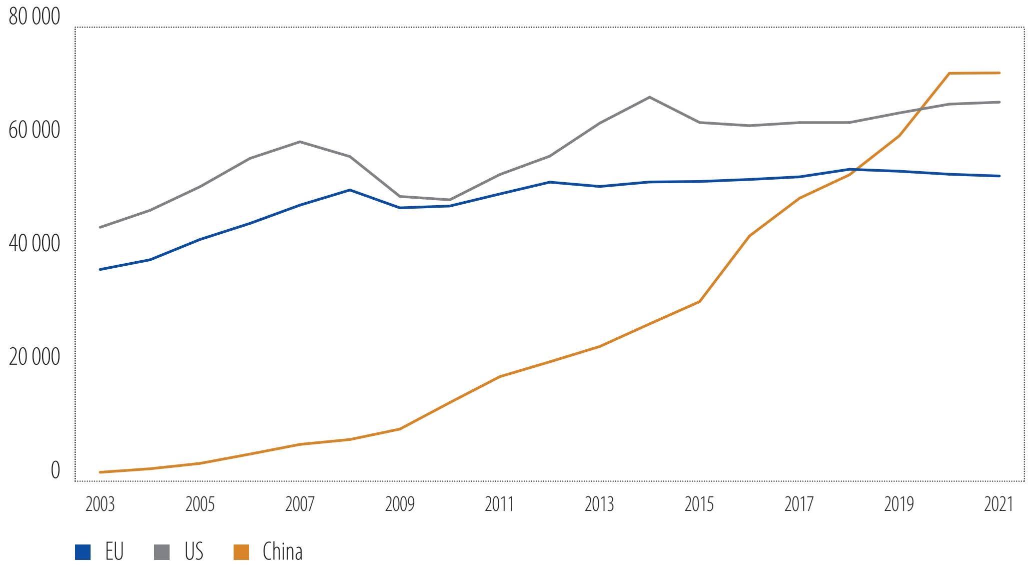
Overall, corporate venture capital is an effective way for companies to develop or procure new technologies. Corporate venture capital investment by leading EU automotive firms is on a par with competitors and is being directed to the technological innovations that are crucial for transforming the sector, such as autonomous driving and sensor technologies.

The European Union is a green pioneer, but weakness in digital technology risks creating potential dependencies

Patents protect novel inventions and technologies used by industry. They are an important part of the innovation process, giving inventors the exclusive rights to their knowledge for a specified period. Patents also foster competition as they support the dissemination of knowledge by mandating the disclosure of technical details, thus promoting further advancements. They are therefore a good indicator of the competitive position of different markets. This section assesses the position of the European Union in the development of green technologies, biotechnologies and digital technologies.

Figure 8

Patent applications (count)**, 2003-2021**



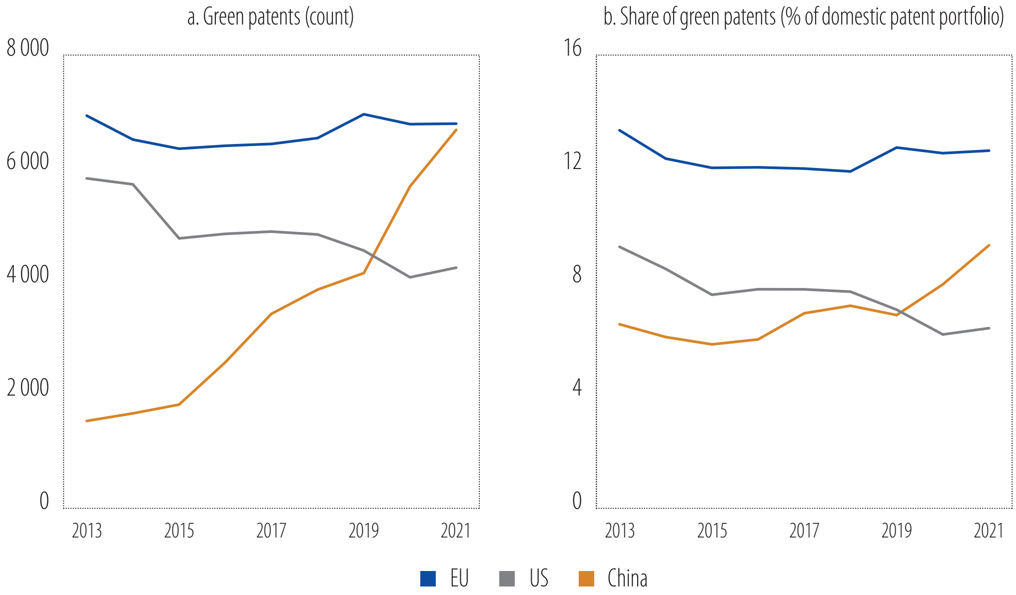
Source: EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.

Patent application numbers show China's surge in the development of new technologies. While the number of new patents under the Patent Cooperation Treaty (PCT) in the European Union and the United States has been relatively stable in recent years, it has been increasing quickly in China (Figure 8). That said, the innovation outlook is very uncertain, with early signs that patent growth may be cooling. The latest insights from the World Intellectual Property Organization's Global Innovation Index 2024 shows an overall decline in the number of PCT patent filings (World Intellectual Property Organization (WIPO), 2024). There are also regional disparities, and while the decline seems to be contained in China, it is for example more pronounced in the United States.

The European Union is a frontrunner in green technologies. Climate is a key focus of EU policy and green tech is a strategic area for the European Union (EIB and European Patent Office (EPO), 2024). The latest data show that the European Union has a similar number of PCT patents in green technologies as China, while the United States has fewer patents in green technologies (Figure 9a). The number of green patents in China has increased very rapidly in recent years. Nevertheless, Europe continues to have a higher share of patents in green technologies than China or the United States, reflecting its relative focus on the development of these technologies (Figure 9b). Moreover, the European Union is much more specialised in the production of clean technologies (see Chapter 1). The strong presence of

European firms in green innovation and production is therefore a source of competitiveness and future resilience for the EU economy.

Figure 9
Green tech patents, 2013-2021



Source: *EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.*
Notes: *Patents in green technologies are measured based on the methodology of Haščič and Migotto (2015), with further adjustments implemented by ECOOM, KU Leuven.*

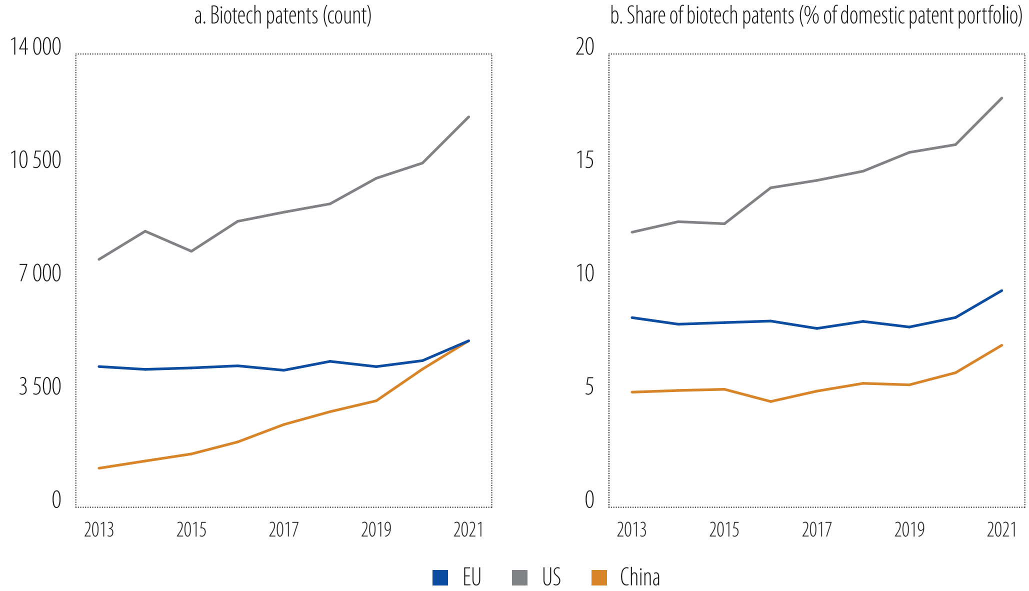
The United States leads in biotechnology patenting, followed by the European Union and China. The number of biotechnology patents has remained relatively stable in the European Union over the past decade, while it has risen in the United States and China (Figure 10). There was an acceleration in the number of biotechnology patents from 2020 to 2021, which may partly reflect the effect of the COVID-19 pandemic on patent filings related to the development of vaccines and treatments (WIPO, 2023). China is catching up with the European Union, reflecting its increased focus on this domain.

Compared to the United States and China, the European Union is not well positioned in digital innovation. The number of patent applications for digital technologies has been growing faster in China than in the United States and the European Union (Figure 11a). The share of digital patents is higher in China and the United States, which indicates that they focus more on digital innovation than the European Union (Figure 11b). If Europe wants to remain globally competitive, it must further strengthen and defend its ability to innovate in digital technologies.

The European Union is falling behind in artificial intelligence innovation. Artificial intelligence is increasingly considered a key digital technology as it has the power to revolutionise industries. It could also help address pressing global challenges, such as climate change, using data-driven solutions. However, the European Union has been trailing the United States and China in this fast-developing area, especially in recent years (Figure 12).[7]

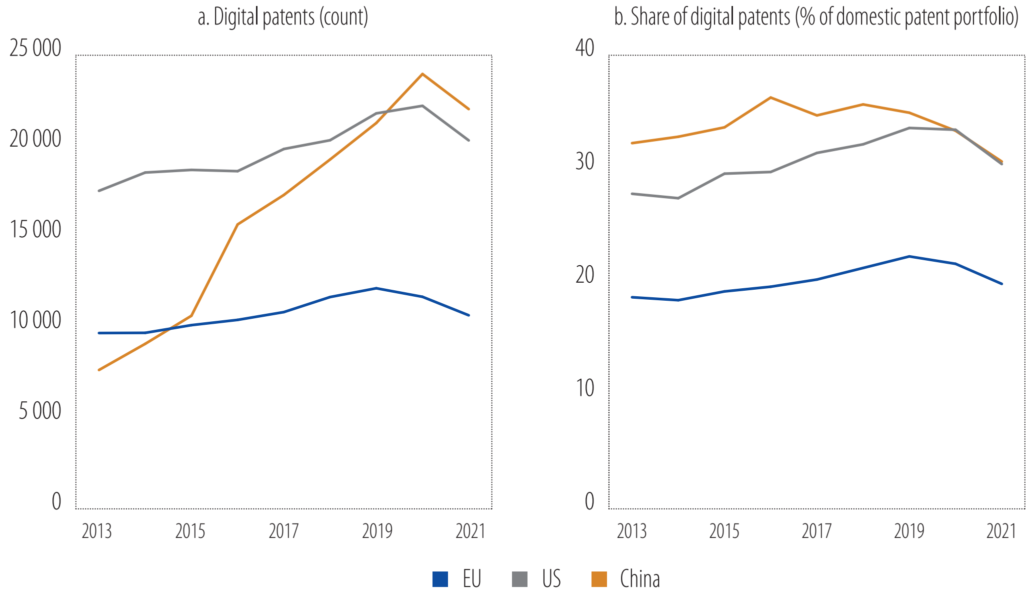
7 The figures do not consider artificial intelligence development that cannot be patented due to being purely software-related, for example. A similar consideration can be made for other technology domains.

Figure 10
Biotech patents, 2013-2021



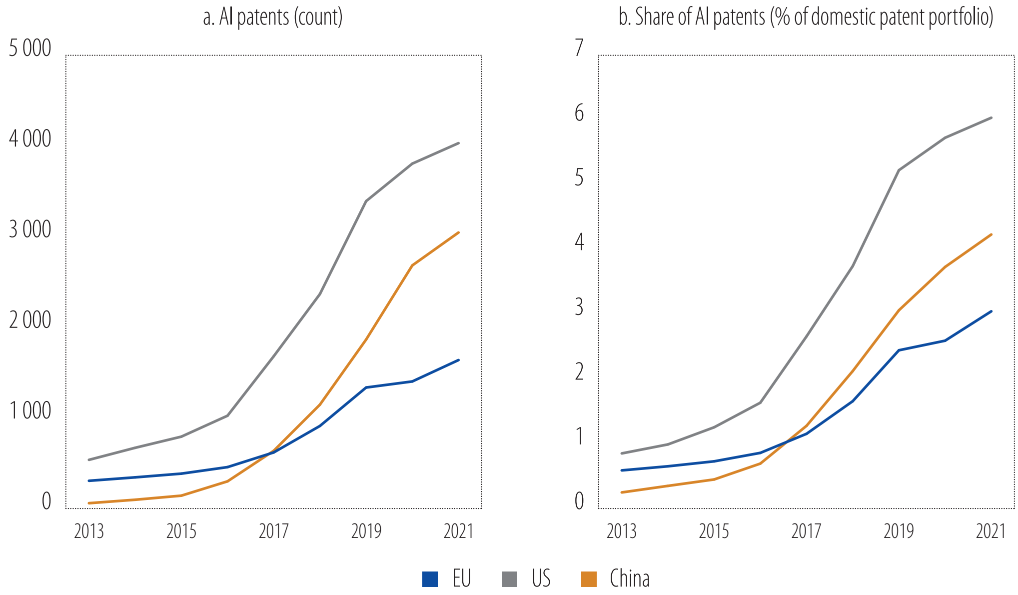
Source: *EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.*
Note: *The patent classification in biotechnology is based on the classification established by KU Leuven. The biotechnology domain is the combination of Fraunhofer technology classes 15 (biotechnology) and 16 (pharmaceuticals).*

Figure 11
Digital patents, 2013-2021



Source: *EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.*
Note: *The digital patent classification is based on European Patent Office (EPO) (2017).*

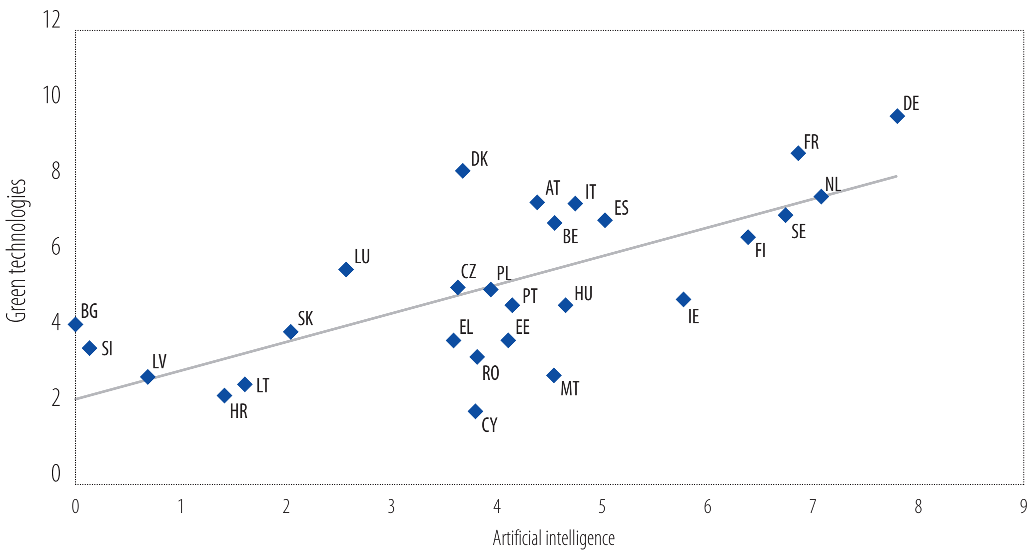
Figure 12
Artificial intelligence patents, 2013-2021



Source: *EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.*
Note: *AI patents are a subdomain of the digital patent classification.*

Specialisations in green technology and artificial intelligence seem to be mutually supportive in EU countries, particularly in Western and Northern Europe. Green technologies and artificial intelligence-related innovation activities in Europe vary significantly by country. Nevertheless, there seems to be a link between patenting specialisation in these two innovation domains (Figure 13). Combined specialisation could pay off in the future given the growing evidence that artificial intelligence could revolutionise the green transition (Rotman, 2019).

Figure 13
National Breeding Ground indices of AI and green technologies (logarithm)**, 2017-2021**

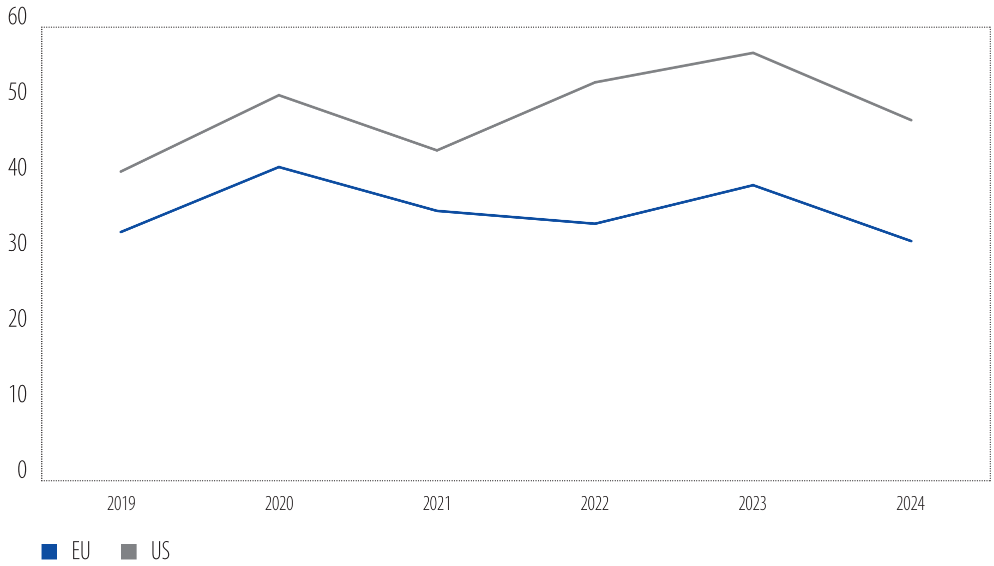


Source: *EIB staff calculations based on PCT patents (PATSTAT) in collaboration with ECOOM, KU Leuven.*
Note: *The National Breeding Ground index (following Leusin et al., 2020) multiplies the revealed technological advantage by the number of patents in each domain in a given country.*

The European Union has a lower share of firms investing in innovation and adopting digital technologies than the United States

Corporate investment in innovation is lower in the European Union than in the United States. The share of EU firms investing to develop or introduce new products, processes or services is lower than in the United States (Figure 14). The gap in innovation between EU and US firms has been widening over time and is broad based, being present in all sectors (including manufacturing) and firm size categories. This evidence from the EIB Investment Survey (EIBIS) confirms the findings of the European Innovation Scoreboard 2024 (European Commission, 2024a) and OECD data, in which the United States scores better than the European Union on several indicators related to R&D and innovation. As suggested in the previous section, the recent slowdown in innovation activities is also apparent in other related measures, such as patent applications (WIPO, 2024).

Figure 14
Investment in innovation (% of firms)

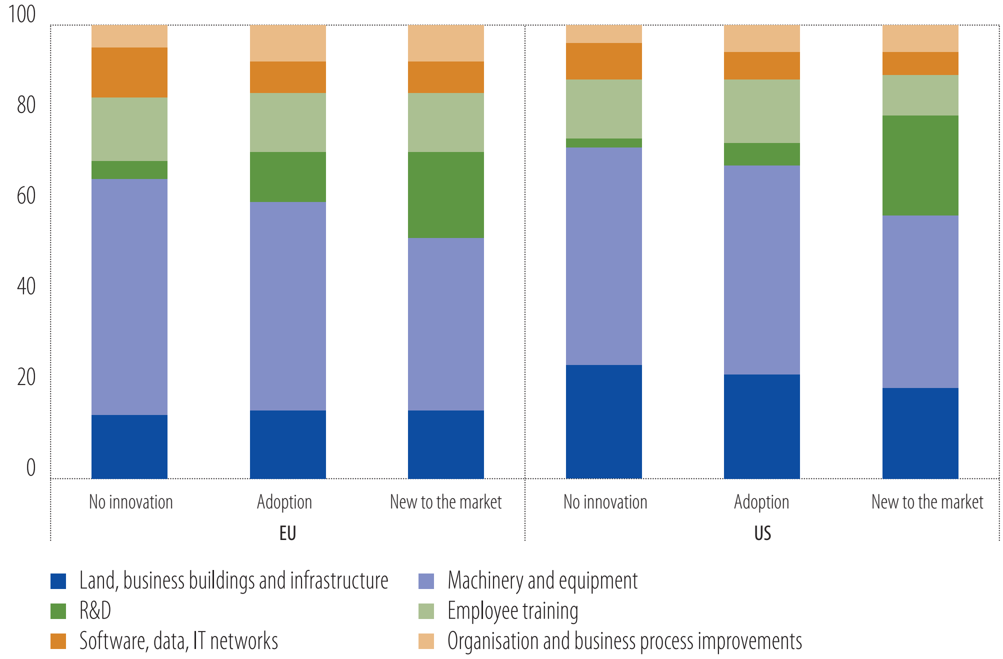


Source: *EIBIS 2019-2024.*
Note: *Firms are weighted by value added.*
Question: *In the previous financial year, did you invest to develop or introduce new products, processes or services?*

Innovation activities are associated with investment in intangible assets. Firms that allocate a greater share of investment to intangible assets (R&D, software and data, training of employees and organisational and business process improvements) tend to innovate more (Figure 15). R&D investment is the main driver of this positive correlation between intangible assets and the introduction or development of new products, processes or services.

The digital adoption gap persists between the United States and the European Union. To strengthen the competitiveness of the European economy, cutting-edge innovation will need to go hand in hand with broader adoption and deployment of technologies. The latest results from the EIBIS show that EU firms are accelerating the adoption of advanced digital technologies: 74% of them adopted these technologies in 2024 (compared with 80% of firms in the United States – Figure 16a). There is a particularly wide digital adoption gap between EU and US firms in services (notably in accommodation and food services), and in other sectors such as manufacturing and infrastructure (especially transportation and storage).

Figure 15
Innovation and investment in intangible assets (% of total investment)



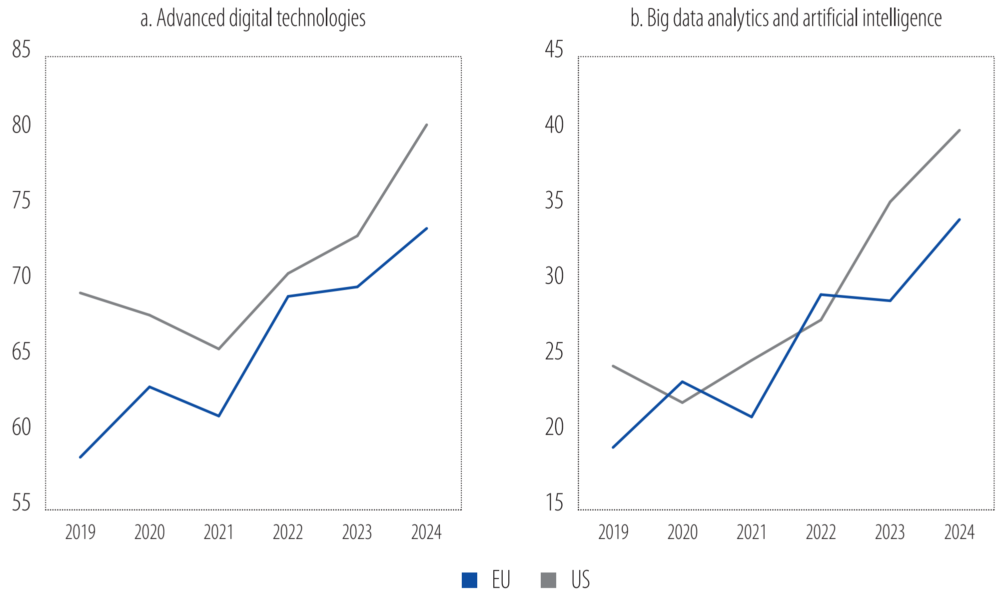
Source: *EIBIS 2024.*
Note: *Firms are weighted by value added.*
Question: *Were the new products, processes or services that you developed or introduced new to the company or new to the country or global market? In the previous financial year, how much did your business invest in each of the following with the intention of maintaining or increasing your company's future earnings?*

To close the gap with US firms, EU firms need to remain vigilant and reinforce the use of artificial intelligence and big data analytics (Figure 16b). Recent developments in generative AI show that it is a key technology with the potential to transform business models (Brynjolfsson et al., 2023).

Sectors that invest more in the development of new products, processes or services also tend to have a higher share of firms using advanced digital technologies (Figure 17). This illustrates the fact that advanced digital technologies – such as big data analytics and artificial intelligence, 3D printing, advanced robotics, drones, the internet of things, digital platform technologies and augmented or virtual reality – are changing the ways new products and services are developed (Cockburn et al., 2019; Acemoglu et al., 2022).

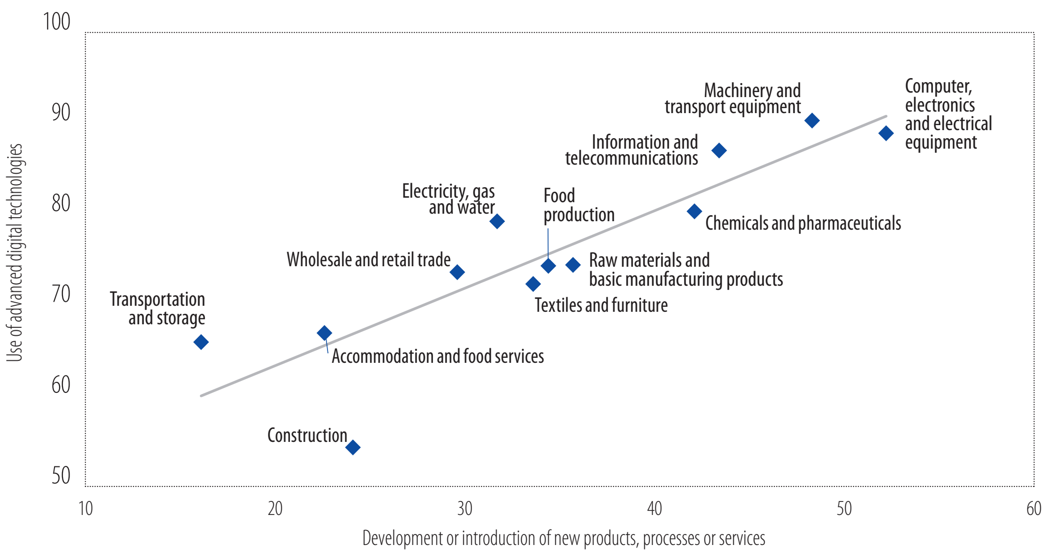
Digital technologies such as internet platforms can offer opportunities for European firms, particularly smaller companies. Box B discusses how these technologies can help small firms respond to changes in demand and reach new customers. However, digital platform service providers are concentrated in specific parts of the globe and are dominated by US companies, while China's market is served by Chinese providers (Figure 5 provides more information on R&D expenditure by the leading innovative companies in software and computer services). European players are significantly smaller, while China has strengthened its position in the global platform market in recent years. Despite its economic size, Europe faces hurdles to scaling and expanding these platforms, such as market fragmentation, a lack of investment in disruptive innovation, and different national regulatory systems, which are characterised by a strong emphasis on data protection and consumer rights (Hosseini, 2023). The major dependencies this creates on digital platforms and other technologies (such as artificial intelligence) developed by non-EU providers come just as economic security considerations are in the spotlight.

Figure 16
Use of advanced digital technologies and artificial intelligence (% of firms)



Source: *EIBIS 2019-2024.*
Note: *Firms are weighted by value added. The question on big data analytics and artificial intelligence was not asked to firms in the construction sector.*
Question: *Are advanced digital technologies used within your business? Are big data analytics and artificial intelligence used within your business?*

Figure 17
Investment in innovation and use of advanced digital technologies (% of firms)



Source: *EIBIS 2024.*
Note: *EU firms. Firms are weighted by value added.*
Question: *What proportion of the total investment in the previous financial year was for developing or introducing new products, processes or services? Are advanced digital technologies used within your business?*

Box B

Digital platforms help level the playing field for small firms

Multisided platforms facilitate exchanges and interactions between different types of users, such as buyers and sellers, businesses finding suppliers, or workers seeking employment with firms searching for candidates (Rochet and Tirole, 2003; Cennamo and Santaló, 2013; Gu and Zhu, 2021). By reducing the need to travel to a central location, digital platforms reduce transaction costs, alleviating information asymmetry and diminishing coordination costs (Garicano and Kaplan, 2001).

Despite the substantial efficiency gains that platforms can offer, not all firms benefit equally, nor do all firms adopt them (Brynjolfsson et al., 2006). Like all outsourcing decisions, the use of standardised solutions provided by platforms involves a trade-off between fixed and variable costs (Loertscher and Riordan, 2019).

Large firms can adopt customised solutions by making significant fixed investments in physical and human capital, while small firms are unable to sustain such investments. Small firms can obtain standardised products and services on the market through outsourcing. Outsourcing involves higher (market) transaction costs, but recent advances in platform technologies have increased the viability of these high variable cost/low fixed cost solutions.

Moreover, large investments in fixed assets can lead to excess capacity during periods of low demand and high overhead costs. The outsourced platform technology allows small firms to scale production seamlessly, making them resilient to demand fluctuations. This suggests that the value of the platform technology increases with the likelihood of negative demand shocks.

Using EIBIS data, Santaló and Weiss (2024) find significant differences in the effect of digital platforms on firm productivity between smaller and larger firms. The estimates in Table B.1 show that firms that adopt platform technologies tend to have higher labour productivity. However, the effect of platform adoption on firm productivity is greater for smaller firms.[8] This difference is illustrated by the negative coefficient on the interaction between the use of a digital platform and firm size (proxied by the value of fixed assets). The estimates in Table B.2 show that platform adoption is associated with an average increase in labour productivity of 5.1%, but small firms experience a larger increase (about 10.4%) than large firms (-0.01%).

To assess whether platforms allow firms to better adapt to sudden changes in demand, Santaló and Weiss (2024) construct an index of sales variability in the sector in which firms operate using data from Eurostat short-term statistics on monthly sales and turnover in the services and trade sectors. A higher index value means that sales in the sector tend to have higher variability. The index is matched to EIBIS firms at the country and sector level.

Table B.3 reports the results of ordinary least squares (OLS) regressions using the index of sales variability interacted with the use of platforms. They are very close to the results reported in Table B.1. For example, the interaction term of platform and firm size (proxied by the log of fixed assets) is -0.033 in Table B.3, compared to -0.034 in Table B.2. The magnitude of the estimated coefficient on the other explanatory variables are also very similar.

The estimates in Table B.3 also show a positive interaction between the use of platform and sector sales variability. In other words, the use of digital platforms can help mitigate sudden changes in

8 The decision for a firm to adopt digital technologies is likely associated with its inherent productivity, even when accounting for country, sector, year and firm-specific characteristics. See Santaló and Weiss (2024) for estimates using instrumental variables to address potential endogeneity concerns in the relationship between platform adoption and productivity.

demand and this is associated with greater firm productivity. This supports the argument that platforms enable firms to operate with lower fixed production costs.

Table B.1

Effect of digital platforms on firm productivity

Dependent variable: Log labour productivity	
Platform	0.513***
	(0.105)
Platform × log of fixed assets	-0.034***
	(0.007)
Log of fixed assets	0.144***
	(0.006)
Sample size	15 752
R-squared	0.372

Source: *Santaló and Weiss (2024) based on EIBIS 2029-2023.*
Note: *Ordinary least squares (OLS) regression. The regression includes controls for number of employees (four firm size categories), age (less than ten years old), management practices, the interactions of country and sector (NACE 1 digit)[9] and year fixed effects. Robust standard errors in parentheses. Robust standard errors in parentheses. Statistical significance: ***p-value<0.01, **p-value<0.05, *p-value<0.1.*

Table B.2

Effect of digital platforms on firm productivity at different points in the distribution of fixed assets

Dependent variable: Log labour productivity	
Average fixed assets	0.051***
	(0.017)
Small: First quartile of fixed assets	0.104***
	(0.023)
Medium: Median fixed assets	0.054***
	(0.018)
Large: Third quartile of fixed assets	-0.013
	(0.020)

Source: *Santaló and Weiss (2024) based on EIBIS 2019-2023.*
Note: *OLS regression from Table B.1. The regression includes controls for the number of employees (four firm size categories), age (less than ten years old), management practices, the interactions of country and sector (NACE 1 digit) and year fixed effects. Robust standard errors in parentheses. Statistical significance: ***p-value<0.01, **p-value<0.05, *p-value<0.1.*

9 Nomenclature of Economic Activities (NACE) is the European statistical classification of economic activities.

Table B.3
Effect of digital platforms on firm productivity, with an index of sales variability

Dependent variable: Digital platform	
Platform	0.424***
	(0.099)
Platform × log of fixed assets	-0.033***
	(0.007)
Platform × index of sales variability	0.033***
	(0.007)
Log of fixed assets	0.144***
	(0.005)
Index of sales variability	-0.333
	(0.399)
Sample size	15 752
R-squared	0.372

Source: *Santaló and Weiss (2024) based on EIBIS 2019-2023.*
Note: *OLS regression. The regression includes controls for number of employees (four firm size categories), age (less than ten years old), management practices, the interactions of country and sector (NACE 1 digit) as well as year fixed effects. Robust standard errors in parentheses. Statistical significance: ***p-value<0.01, **p-value<0.05, *p-value<0.1.*

Green innovation as an enabler of EU competitiveness

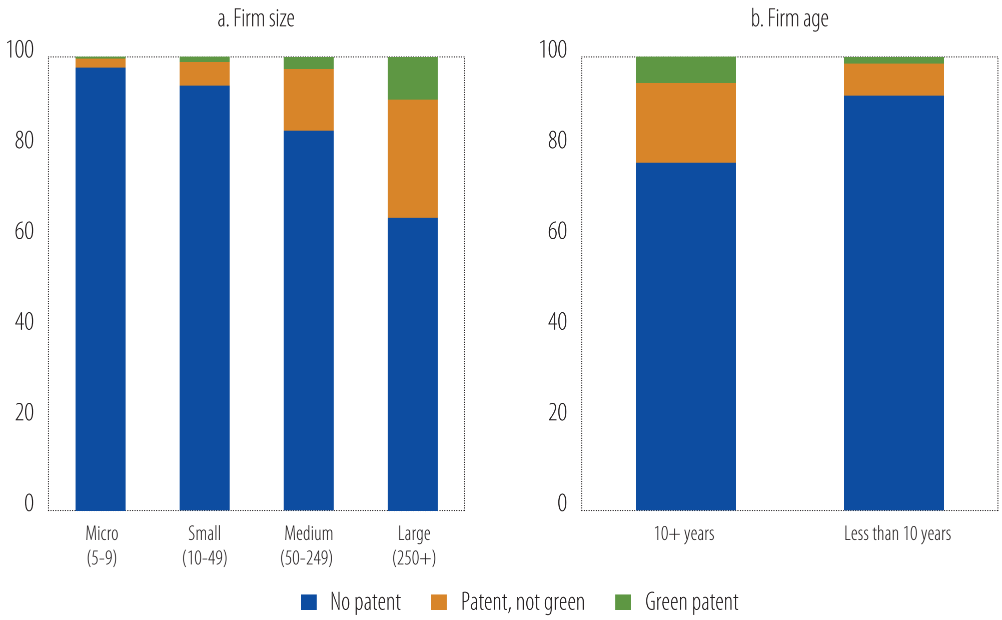
Investment in innovation, especially green technologies, lies at the very heart of EU policy. Innovation benefits society as a whole but it should also sustain the companies investing in these efforts. This section explores the multifaceted relationship between green technologies and firm performance, focusing on innovation output, the green transition, firm productivity and financing conditions by assessing the firm characteristics of patent applicants.[10]

Firms filing patents tend to be larger and older. About 35% of large firms in the EIBIS hold a patent, compared to 6% of small firms (Figure 18). Similarly, firms that have been around for more than ten years are much more likely to have patents than younger firms.

The share of firms with patents and green patents varies widely between sectors. EU firms in the computer, electronics and electrical equipment sector are most likely to hold a green patent, while firms in machinery and transport equipment are most likely to apply for a patent overall (Figure 19). Unsurprisingly, firms in manufacturing are more likely to have patents than firms in other industries. Nevertheless, there are large discrepancies between sectors: Almost half of the firms with patents in the computer, electronics and electrical equipment sector hold at least one green patent. In contrast, in other sectors in manufacturing (such as manufacturing of food, beverages and tobacco), the share of firms with green patents is only slightly more than 10%.

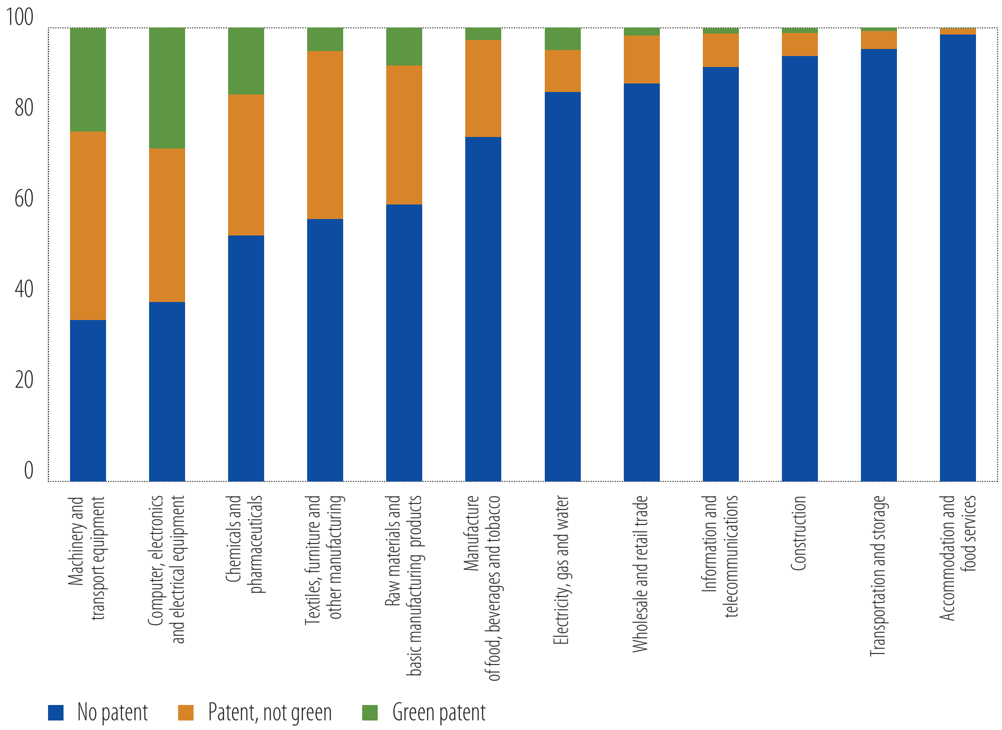
10 Firms in EIBIS waves 2023 and 2024 were matched to Orbis Intellectual Property (IP). In the figures presented in this section, firms with a patent are firms that have applied for at least one patent since 2000, corresponding to about 10% in the EIBIS sample considered. Firms with a green patent are firms that have applied for at least one patent with the Cooperative Patent Classification (CPC) code Y02 ("technologies or applications for mitigation or adaptation against climate change"). This classification overlaps extensively with the classification used in the previous sections.

Figure 18
EU firms with green patents (% of firms)**, by size and age**



Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*

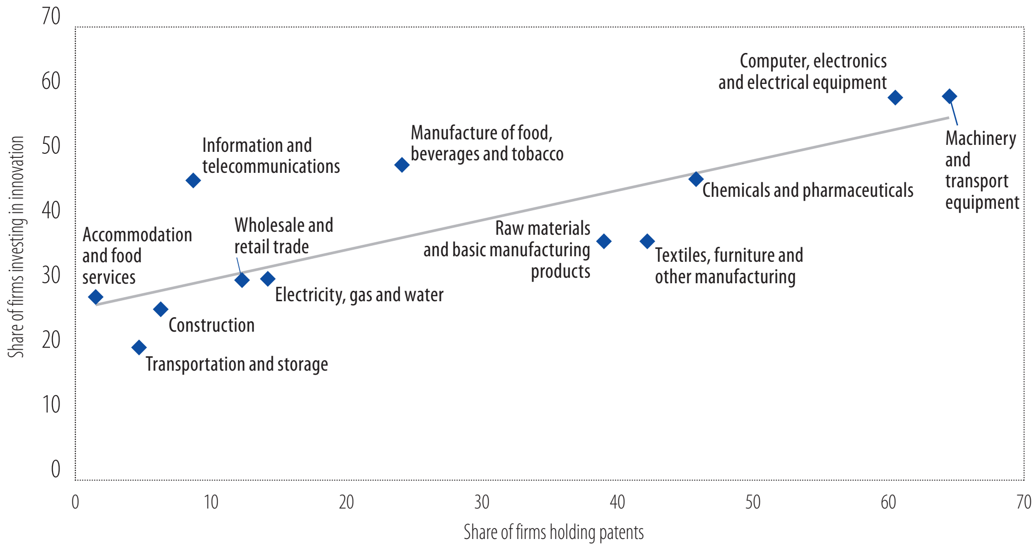
Figure 19
EU firms with green patents (% of firms)**, by sector**



Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*

Figure 20

Investment in innovation and patent applicants (% of firms)**, by sector**



Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*
Question: *In the previous financial year, did you invest to develop or introduce new products, processes or services?*

Sectors with a greater share of firms holding patents are more likely to invest in innovation. The share of firms reporting investments with the purpose of developing or introducing new products, processes or services is greater in sectors with a larger share of patentees (Figure 20). This confirms that patent protection may indeed be one of the factors encouraging an innovative environment.

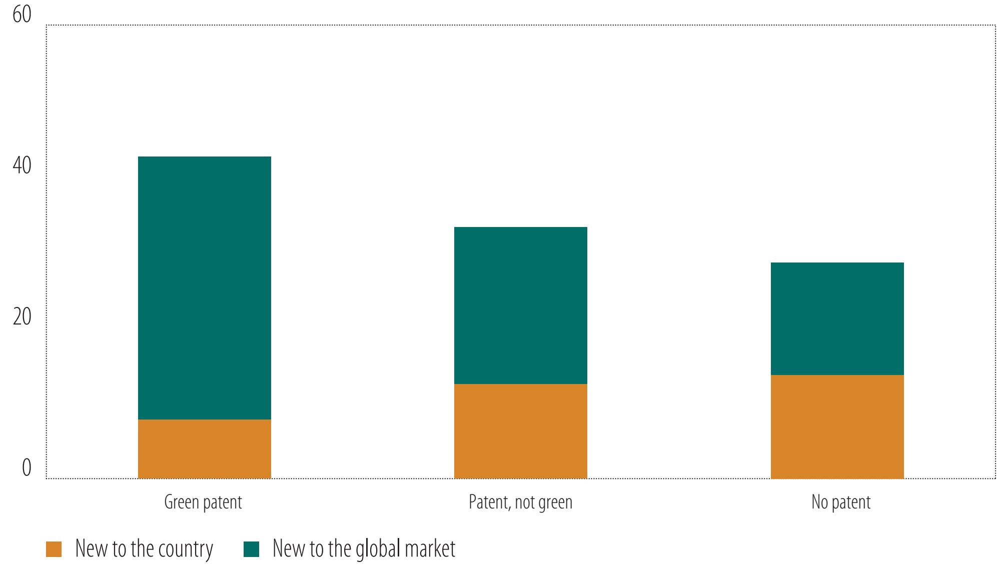
Firms with green patents invest in innovations that are new to the global market. Patentholders are more likely to invest in new products, processes or services in general (Figure 21). But firms holding green patents are nearly 70% more likely to invest in innovations that are new to the global market than firms that hold only patents not related to green technologies (35% vs. 21%, respectively).

Firms with green patents are more likely to see the green transition as an opportunity rather than a risk (Figure 22). This suggests that these companies could gain a competitive edge in the sustainable economy. It is therefore crucial that EU firms reap the benefits of the transition to a greener economy.

Firms that innovate, especially in green technologies, tend to be more productive. Innovation is known to drive economic growth and create a competitive advantage, particularly for firms that hold a green technology patent (Table 2). This suggests that there are substantial productivity gains to be made from engaging in green innovation, which is an area of great strength for Europe.

Figure 21

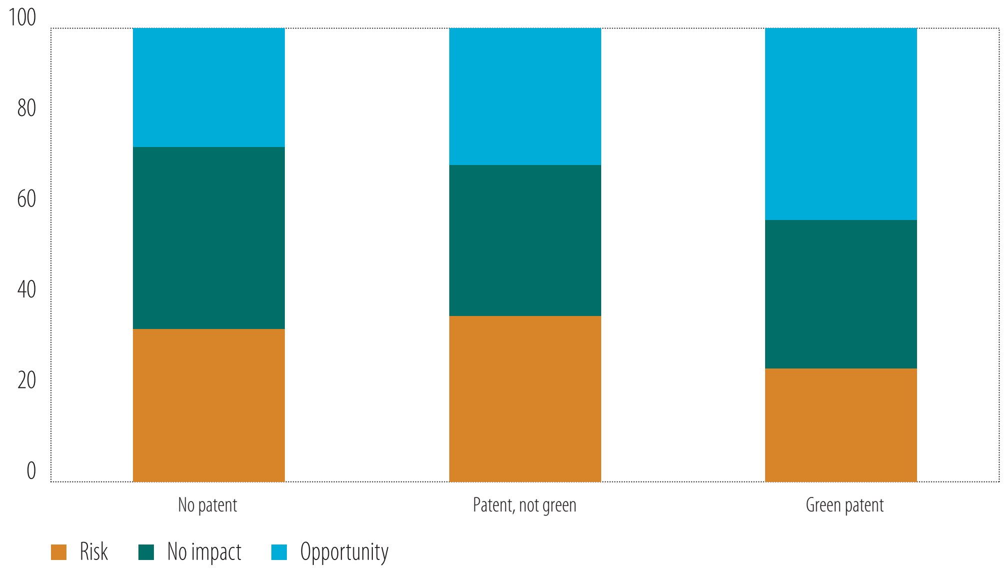
Share of firms investing in innovations that are new to the country or the global market (% of firms)**, by type of patent**



Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined. The bars do not sum up to 100% because some firms invest in innovation that is only new to the company.*
Question: *Were the new products, processes or services (a) new to the company; (b) new to the country; (c) new to the global market?*

Figure 22

Opportunity and risk associated with the transition to a greener economy (% of firms)**, by type of patent**



Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*
Question: *Thinking about your company, what impact do you expect the transition to stricter climate standards and regulations will have on your company over the next five years?*

Table 2
Green patenting activities and labour productivity

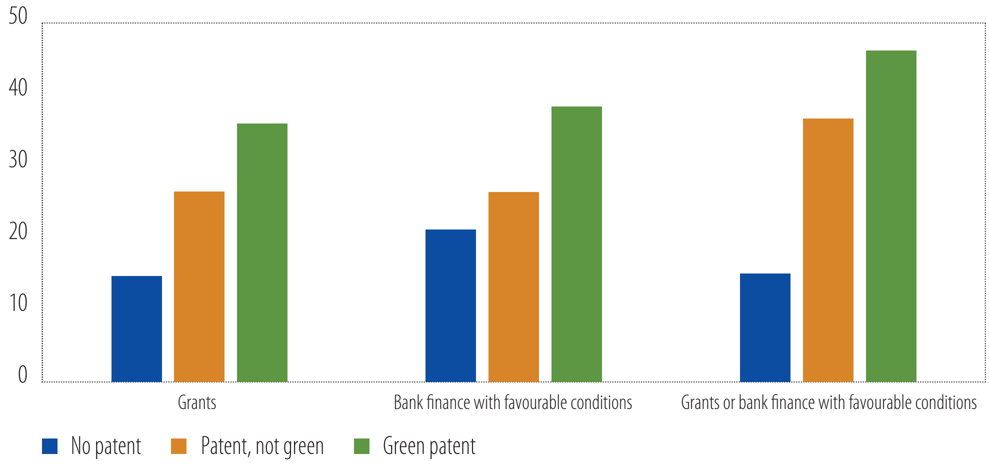
Dependent variable: Log labour productivity	(1)	(2)
Green patent	0.200***	0.232***
	(0.044)	(0.045)
Patent, but not green		0.142***
		(0.022)
Sample size	21 173	21 173
R-squared	0.261	0.262

Source: *EIB staff calculations based on EIBIS 2023-2024 and Orbis IP.*
Note: *EU firms. Labour productivity is expressed in natural logarithms. See footnote 10 for a description of how patent applicants are defined. The OLS regressions control for firm size, country and sector. Robust standard errors in parentheses. Statistical significance: ***p-value<0.01, **p-value<0.05, *p-value<0.1.*

Companies that innovate in green technologies are mostly large firms, meaning that they are not particularly finance constrained or more likely to receive grants. However, they are more likely to receive bank finance with favourable conditions (for example with a subsidised interest rate or a longer grace period, Figure 23). Meanwhile, well-established literature shows that innovators are more exposed to market failures and information asymmetries (Arrow, 1962; Stiglitz and Weiss, 1981) and therefore may find it more difficult to obtain a socially optimal level of financing. However, patent-holding firms are generally large and as such are not necessarily more finance constrained. This makes bank finance with favourable conditions an effective way to support patenting firms.

Finance with favourable conditions, as well as grants or subsidies, are effective when they focus on specific policy objectives. Firms that hold patents, especially green patents, are more likely to receive policy support targeting innovation and digitalisation or the green economy (Figure 24).

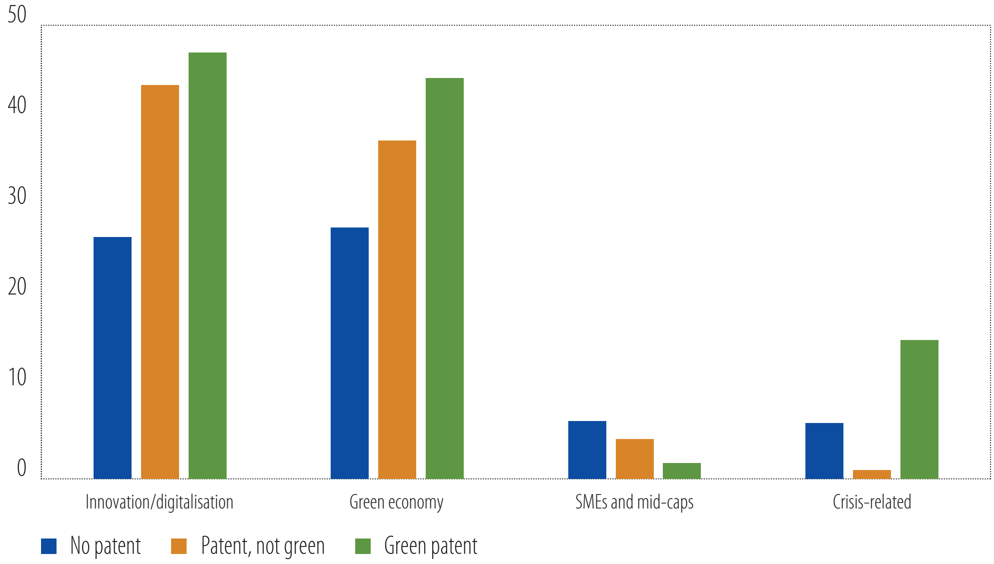
Figure 23
Grants and bank finance with favourable conditions (% of firms using external finance), **by type of patent**



Source: *EIB staff calculations based on EIBIS 2024 and Orbis IP.*
Note: *EU firms using external finance. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*
Question: *Which of the following types of external finance did you use for your investment activities in the last financial year? Was any of the bank finance you received on concessional terms (e.g., subsidised interest rate, longer grace period to make debt payments)?*

Figure 24

Targeted areas of grants, subsidies or bank finance with favourable conditions (% of firms receiving them)**, by type of patent**



Source: *EIB staff calculations based on EIBIS 2024 and Orbis IP.*
Note: *EU firms receiving grants, subsidies or bank finance with favourable conditions. Firms are weighted by value added. See footnote 10 for a description of how patent applicants are defined.*
Question: *Were any of the grants, subsidies or the bank finance you received on concessional terms, in the last financial year targeted at a specific-area of investment for example innovation, digitalisation, sustainability, energy efficiency, mid-caps etc? And in which, if any, of the following areas was it targeted?*

The European Union is at the centre of global collaboration networks in green technologies

Technological interdependencies between regions contribute to the formation of innovation ecosystems in strategically important domains by facilitating access to knowledge, technology transfer and collaborative R&D activities. The dynamics of interconnection in an open innovation environment are central to European innovation ecosystems (Hervás-Oliver et al., 2021; European Commission, 2024b). Understanding these dynamics is key to fostering European innovation and competitiveness.

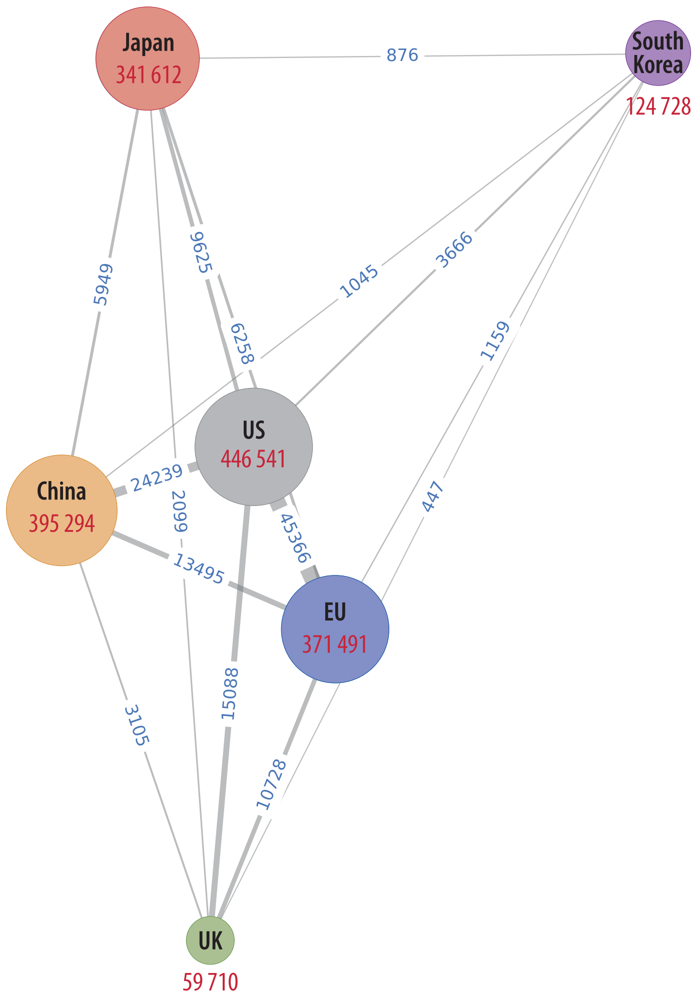
The European Union and the United States are strongly interdependent in all technology domains. Figure 25 illustrates co-patenting networks, a proxy for technology collaboration networks between different regions or countries. The proximity of their respective nodes shows that, overall, the European Union and the United States are very closely linked in the development of new technologies.

China is a key partner in the US-EU hub for digital technologies, but mainly through its collaboration with the United States. Digital technology collaboration networks are driven by the United States, China and the European Union (Figure 26a). However, the United States holds the closest ties with the two regions, with the digital technology connections between the European Union and China being mainly indirect and driven by close collaboration between the United States and China.

The European Union is a central node in green technology collaboration networks and has close ties with the United States. Unlike for digital technologies, there are no close ties between China and the United States or the European Union in green technologies (Figure 26b).

Figure 25

Co-patenting networks between different regions for all technologies, 2016-2022

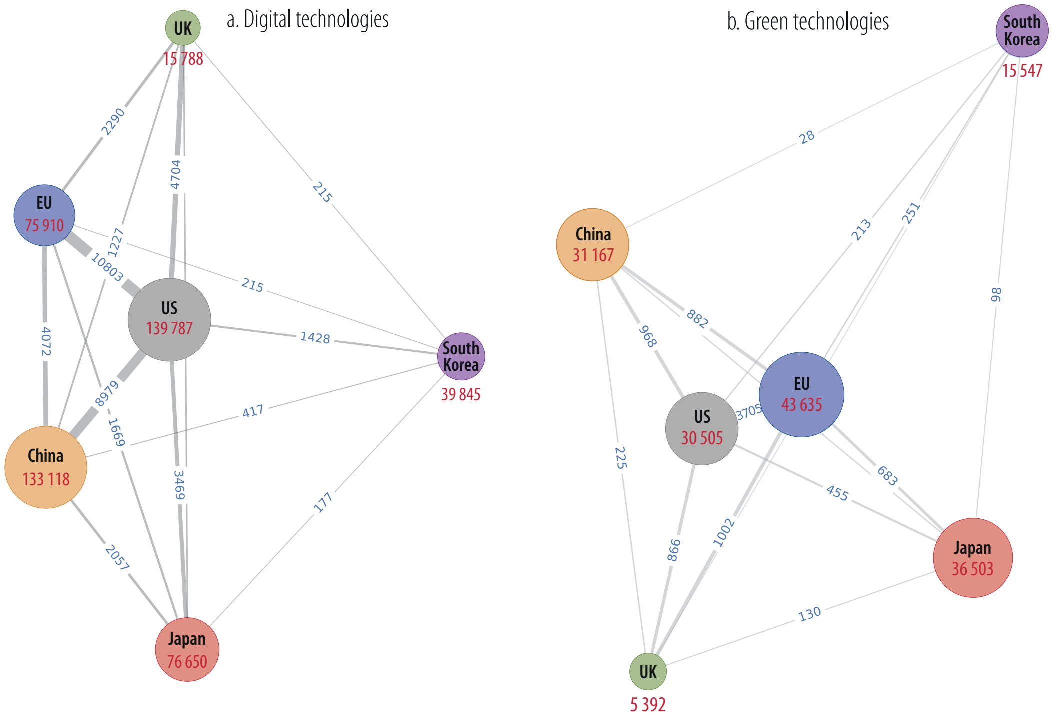


Source: *PCT patents (PATSTAT), calculated by ECOOM, KU Leuven.*
Note: *The illustration is based on co-patents filed with the World Intellectual Property Organization (WIPO) from 2016 to 2022. It depicts co-patenting networks in all technology domains. Each circle (or node) represents a country or region. The size of the node is proportional to the number of patents for the country or region (the number within the nodes). The lines connecting the nodes (edges) represent co-patenting links between the countries or regions. The thickness of the line (which is inversely proportional to the distance between nodes) indicates the strength or volume of the collaboration. A thicker line and nodes that are closer to one another imply more joint patents. The edge labels denote the number of co-patent applications between the connected countries or regions.*

The strongest technology development ties are those between the European Union and the United States. The evidence on collaboration networks can be complemented with the Salton index, which is a metric used to assess the strength of links between entities in a network – in this case, regions and countries. The Salton measure shows that the European Union and the United States are closely linked in all technologies, even when focusing on specific sub-domains such as digital and green technologies (Figure 27). The analysis also shows that the collaboration between the United States and China is stronger than between the European Union and China, and that the collaboration between the United States and China is more prominent for digital technologies than green technologies.

Figure 26

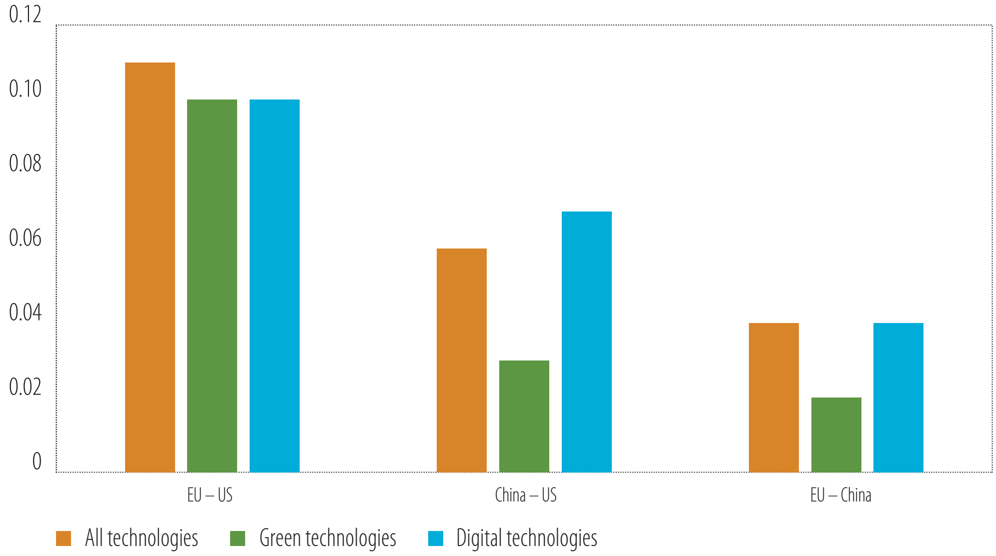
Co-patenting networks between different regions for different technologies, 2016-2022



Source: *PCT patents (PATSTAT), calculated by ECOOM, KU Leuven.*

Note: *The illustration is based on co-patents filed with the WIPO from 2016 to 2022. It depicts co-patenting networks in (a) digital technologies and (b) green technologies. Each circle (or node) represents a country or region. The size of the node is proportional to the number of patents for the country or region (the number within the nodes). The lines connecting the nodes (edges) represent co-patenting links between the countries or regions. The thickness of the line (which is inversely proportional to the distance between nodes) indicates the strength or volume of the collaboration. A thicker line and nodes that are closer to one another imply more joint patents. The edge labels denote the number of co-patent applications between the connected countries or regions.*

Figure 27
Salton index of collaboration for different regions and technologies, 2016-2022



Source: *PCT patents (PATSTAT), calculated by ECOOM, KU Leuven.*
Note: *The Salton measure is calculated by the following formula:*

$$r = \frac{r_{ij}}{\sqrt{n_i . n_j}}$$

where the numerator r_{ij} represents the number of co-patents between country i and country j and the denominator is the square root of the product of each country's total number of patents (n_i and n_j). The Salton measure is also known as the cosine similarity measure.

Strong collaboration links can drive global competitiveness and resilience. As highlighted above, investing in innovation is vital for economic growth and competitiveness. Against a prevailing global backdrop of uncertainty, technological networks may prove crucial to maintaining a region's relevance. However, while innovation is central to creating knowledge and value, it must be understood in the broader context of EU participation in global value chains. The next section therefore provides a review of EU trade dependencies and discusses trade in clean technologies.

Investing in resilience to trade disruptions can make Europe more competitive

In recent decades, the European Union has benefited greatly from its in-depth integration into global value chains. However, recent crises – such as the COVID-19 pandemic, shortages of key strategic inputs, rising shipping costs and disrupted routes, Russia's military aggression against Ukraine, the energy crisis and increased geopolitical tensions – have highlighted vulnerabilities in the supply chains of EU companies (EIB and European Commission, 2024). This section assesses how supply chain disruptions affect EU businesses, and which strategies they are setting in motion to bolster resilience.

Supply chain disruptions eased from 2023 to 2024. In 2024, 17% of EU firms reported that access to commodities and raw materials (steel, copper, fossil fuels, lithium, etc.) was a major obstacle to their business activities, down from 36% in 2023 (Figure 28). Similarly, the share of EU firms considering disruptions of logistics and transport to be a major obstacle decreased to 19% in 2024, from 34% in 2023. However, the share of firms reporting compliance with new regulations, standards or certifications as a major obstacle increased to 20% of EU firms in 2024, from 16% in 2023.

Figure 28
Supply chain disruptions (% of firms)

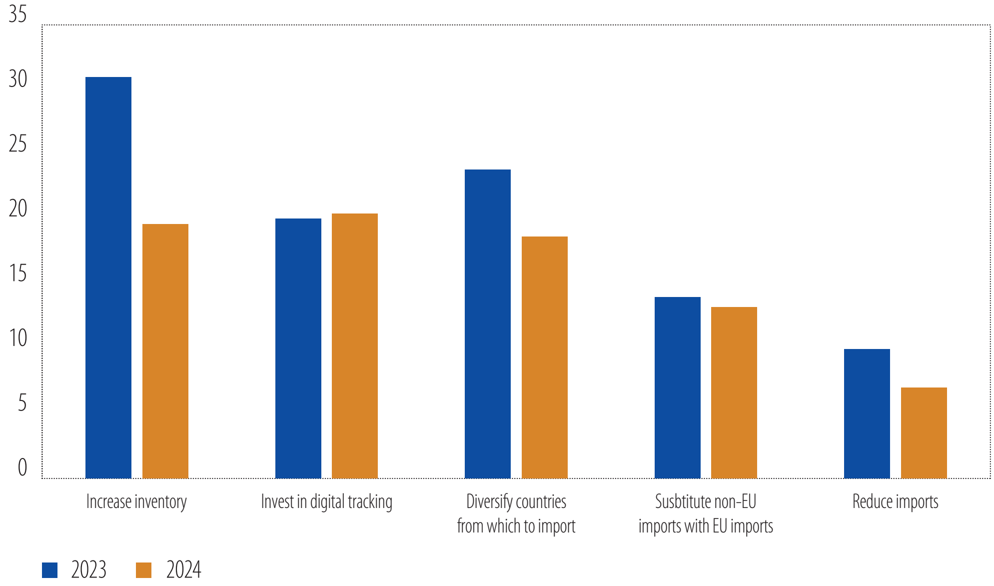
Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *EU firms. Firms are weighted by value added. The question on recent changes in customs and tariffs is only asked to traders (importers or exporters).*
Question: *Since the beginning of 2023, were any of the following an obstacle to your business's activities? A major obstacle, a minor obstacle, or not an obstacle at all?*

EU companies have demonstrated remarkable agility in addressing recent supply chain disruptions. In 2024, disruptions in logistics and compliance with new regulations led firms to invest in changes to their sourcing strategies, including increasing stocks and inventory, digital input tracking, and diversifying the countries they import from (Figure 29). The share of firms reporting that they will withdraw from trade and reduce imports is relatively small, suggesting that EU firms perceive trade disruptions to be temporary. However, they are likely to resort to other measures if barriers to trade become more structural or more acute.

Innovative and digital firms are more heavily affected by supply chain disruptions but are also more likely to invest in resilience to trade risks. These firms are more likely than other firms to report that trade disruptions have been a major obstacle to business activities since the beginning of 2023 (Figure 30a). However, of the firms reporting a major trade-related obstacle, innovative and digital firms are much more likely to change their sourcing strategies, for example by investing in digital input tracking (Figure 30b).

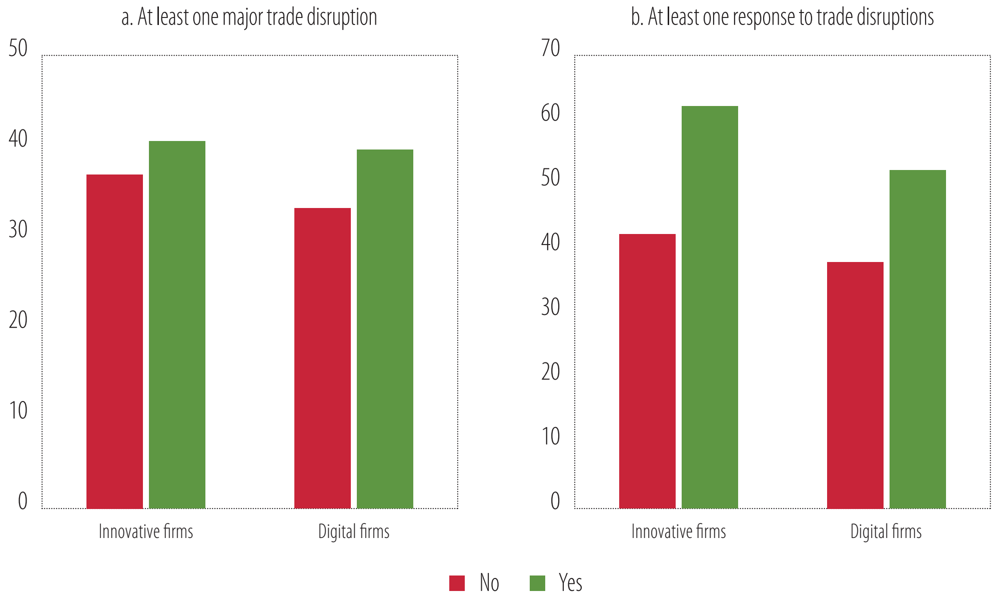
Policy support helps finance-constrained firms address trade disruptions and invest in resilience. Finance-constrained firms suffer more from trade disruptions and are less able to respond effectively, as the absence of financial buffers is likely to prevent investment measures to address risk. However, policy support can make a difference for firms that seek external finance. In fact, those receiving grants or bank finance with favourable conditions are more likely to report changes to their sourcing strategies. This effect is particularly significant for firms that receive grants and are finance constrained, as reflected in the positive estimated coefficient on the interaction term in the regression results reported in Table 3.

Figure 29
Response to trade disruptions (% of firms)



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *EU firms. Firms are weighted by value added. The questions on diversifying trade partners and reducing imports are only posed to importers. The question on substituting non-EU imports with EU products or services is only posed to firms importing from beyond the European Union.*
Question: *Since the beginning of 2023, has your company made any of the following changes to your sourcing strategy, or are you planning to make any of these changes this year?*

Figure 30
Supply chain disruptions and response to trade disruptions (% of firms)



Source: *EIB staff calculations based on EIBIS 2024.*
Note: *EU firms. Firms are weighted by value added. See notes to Figure 29 and 30 for details on the questions. See notes to Figure 28 and 29 for details on the questions on trade disruptions.*
Question: *In the previous financial year, did you invest to develop or introduce new products, processes or services? Are advanced digital technologies used within your business?*

Table 3
Grants, finance constraints and responses to trade disruptions

Dependent variable: Responding to trade disruptions	
Grants or bank finance with favourable conditions	0.032**
	(0.016)
Finance constrained	0.055
	(0.043)
Grants × finance constrained	**0.145***
	(0.075)
Any major trade disruption	0.168***
	(0.016)
Sample size	4 041
R-squared	0.126

Source: *EIB staff calculations based on EIBIS 2024.*
Note: *EU firms that use external finance. The OLS regression controls for firm size, firm age, country and sector. Robust standard errors in parentheses. Statistical significance: ***p-value<0.01, **p-value<0.05, *p-value<0.1.*

Understanding dependencies in critical raw materials is key to economic security

Europe's competitiveness and economic security depend on supply chain resilience. This resilience requires a reliable supply of the raw materials and key products crucial to the growth of the EU economy. Many of these goods are imported, however, and trade dependencies may put economic security at risk. As some of these imported goods are not widely available, diversification across multiple suppliers is difficult and therefore does not mitigate the risk of supply chain distress. Box C estimates that about 5% of all imported products in the European Union can be classified as vulnerable to trade dependencies but shows that some imports could potentially be substituted with production within the single market.

Critical raw materials are of great importance to the EU economy and display substantial supply risk. They are also key enablers of the EU green and digital transition, and some are crucial for economic security and the resilience of key sectors such as defence and aerospace. Critical raw materials must not be seen individually, but rather as part of a wider supply that encompasses extraction and processing. Demand for these materials is expected to grow exponentially. The European Commission used the Critical Raw Materials Act to establish a regulatory framework and identify a list of 34 critical raw materials, 16 of which are also considered strategic raw materials (Table 4).

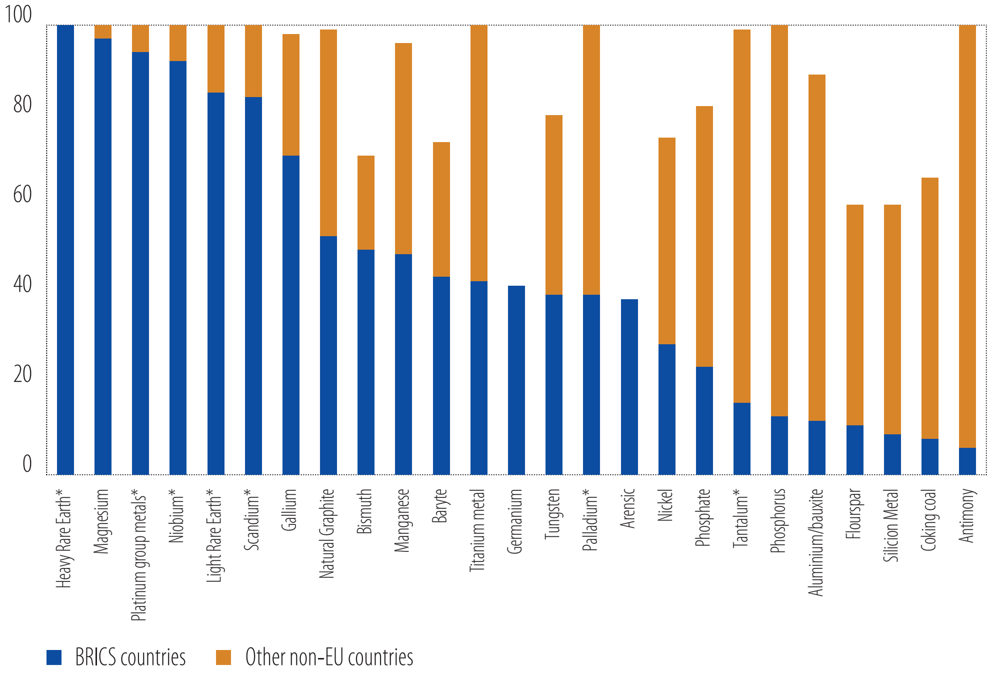
Table 4
List of strategic raw materials (2023)

Bismuth	Gallium	Manganese - battery grade	Rare earth elements for magnets
Boron - metallurgy grade	Germanium	Natural graphite - battery grade	Silicon metal
Cobalt	Lithium - battery grade	Nickel - battery grade	Titanium metal
Copper	Magnesium metal	Platinum group metals	Tungsten

Source: *RMIS - Critical, strategic and advanced materials. The list of strategic raw materials is defined by Article 3 and Annex 1 in European Commission (2023a).*

The supply of many critical raw materials is highly concentrated in specific geographic areas. The European Union's industry and economy are reliant on international markets to provide access to raw materials, since they are produced and supplied by third countries. Although certain critical raw materials are produced in the European Union, in many cases Europe is highly dependent on imports from non-EU countries (especially Brazil, Russia, India, China and South Africa) (Figure 31). The risks associated with production concentration are compounded by low substitution. This not only highlights the competitive advantages that the countries with these raw materials (such as China) hold in developing key technologies and enhancing them, but also exposes the geopolitical risk embedded in the supply chains involving raw materials that could emerge when diplomatic relations become tense. Europe should not only ensure the supply of critical raw materials, but also increase investment in recycling (including of old batteries) and substituting technologies to enable the use of other materials.

Figure 31
Sources of EU imports of selected critical raw materials (in %)



Source: *EIB staff calculations based on European Commission (2023b).*
Note: *BRICS countries include Brazil, Russia, India, China and South Africa. The EU import share of the materials marked with asterisks was estimated on the basis of the BRICS share of global production. The bars do not all add up to 100% because some critical raw materials are sourced domestically or imported from EU countries.*

Box C
A review of EU trade dependencies

Global value chains are complex networks that manage the production and distribution of goods, linking multiple buyers and suppliers across various stages of supply chains. Over the past three decades, global value chains have undergone hyper-globalisation, resulting in highly dispersed geographical production. This fragmentation has increased trade gains and risk sharing for countries, firms and consumers (Antràs and Chor, 2022; Backus et al., 1992). Simultaneously, it has led to a large concentration of production at certain stages, making economies and firms vulnerable to local supply shocks that can propagate to downstream industries (Boehm et al., 2019; Bonadio et al., 2021; Di Giovanni et al., 2024). Such trade dependencies, as underscored by the COVID-19 pandemic and the Russia-Ukraine conflict, can lead to supply chain disruptions and shortages of critical goods (European Commission, 2020; Baldwin and Freeman, 2022; Thoenig, 2023; Mejean and Rousseaux, 2024).

Countries are facing a trade-off between the benefits of global value chains and the need to increase resilience to risks stemming from trade dependencies. The European Union and the United States have recently implemented resilience policies (such as the European Chips Act or the 2021 Executive Order on America's Supply Chains) to mitigate these risks through diversification and local production. Given this trade-off, such policies are essential, especially considering firms' potential underinvestment in resilience because of network and information externalities. The challenge of these policies also lies in correctly identifying vulnerabilities, isolating the risk the policies aim to address and balancing the costs of resilience with traditional trade benefits.[11]

This box identifies trade vulnerabilities imported by the European Union at a product level and cross references them to understand potential risks arising from their position within global value chains, geographical origins and specific sectors. Identification is performed by applying a first set of criteria based on European Commission (2021), where a product is vulnerable if it simultaneously meets criteria for (i) high import concentration, (ii) the significance of extra-EU imports, and (iii) no substitutability of these imports with EU exports. An additional set of criteria based on Mejean and Rousseaux (2024) selects vulnerabilities where a product (iv) is mainly reliant on extra-EU imports to meet domestic demand (absorption) and (v) has very low potential to substitute suppliers.[12]

The inclusion of more criteria identifies fewer but more acute vulnerabilities. Out of the 5 381 products imported by the European Union during the period before the financial crisis, 272 are characterised by high import concentration, the significance of imports coming from beyond the European Union and a lack of domestic exports that can be substituted (Figure C.1). Restricting the analysis to products mainly reliant on extra-EU imports to meet domestic demand reduces vulnerabilities to 125, while adding criterion (v) isolates 29 products with extremely low potential for supplier substitution.

While trade dependencies have increased over time, the difference between the products identified by the two methodologies remains relatively stable. Between 40% and 54% of the vulnerabilities identified have EU production that mainly satisfies domestic demand, and once criterion (iv) has been added, 77% to 80% can easily be substituted by using different suppliers. While acute vulnerabilities represent only a tiny fraction of total EU trade volumes (from 0.19% to 1.01% depending on the period and after applying all five criteria), these products pose significant risks to European value chains.

Vulnerabilities tend to persist over time. While trade dependencies can change over time, 41% of dependencies identified before the global financial crisis persisted directly after the crisis, and 35% remained after that (after applying all five criteria). The COVID-19 pandemic marked a turning point in the number of dependencies, regardless of the methodology.

The more upstream a product is in the global value chain (for example raw materials or intermediate inputs at the early stages of the production process within a supply chain), the larger its potential

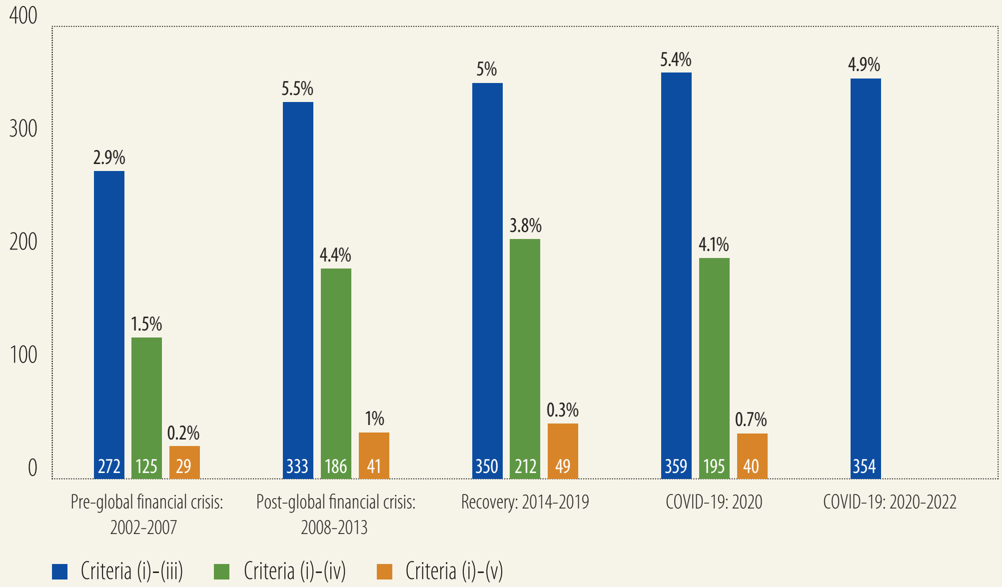
11 Several methodologies have emerged following the COVID-19 pandemic, including those by the French Treasury (Bonneau and Nakaa, 2020), the French Council of Economic Advisors (Jaravel and Mejean, 2021), the European Commission (2021), the CESifo (Baur and Flach, 2022) and Mejean and Rousseaux (2024).

12 The five criteria are applied to EU commodity trade from 2002 to 2022, covering pre/post-global financial crisis, recovery and COVID-19 periods using the CEPII-BACI dataset (Gaulier et al. 2010), covering worldwide trade flows of over 5 000 products at the detailed HS 6-digit level. Criteria (iv) and (v) incorporate, at the same product level, manufacturing output from the Eurostat Prodcom dataset and the relationship stickiness measure of Martin et al. (2023).

impact. However, a downstream product can also cause significant damage if it is central to the production of essential goods (Baur and Flach, 2022). As stressed in Mejean and Rousseaux (2024), some 30% of vulnerable products are consumer goods imported from China. Shortages of these items can hurt consumers and specific firms, but they tend to affect production less. Conversely, supply shocks in the most upstream parts of global value chains (especially through intermediate goods that enter the value chains at early stages) can propagate to downstream industries, adjacent supply chains and consumers. Figure C.2 displays the share of products according to how far upstream they are in the value chain – or how many production stages are needed before a product is ready for final consumption (Antràs et al., 2012). The riskiest vulnerabilities are located more than three production stages away from the final consumer. Despite a slight decrease over time, these products represent 49% of the vulnerabilities identified by the five criteria (on average and across all periods).

Figure C.1

EU trade dependencies over time (% of imports and number of products)**, by methodology**

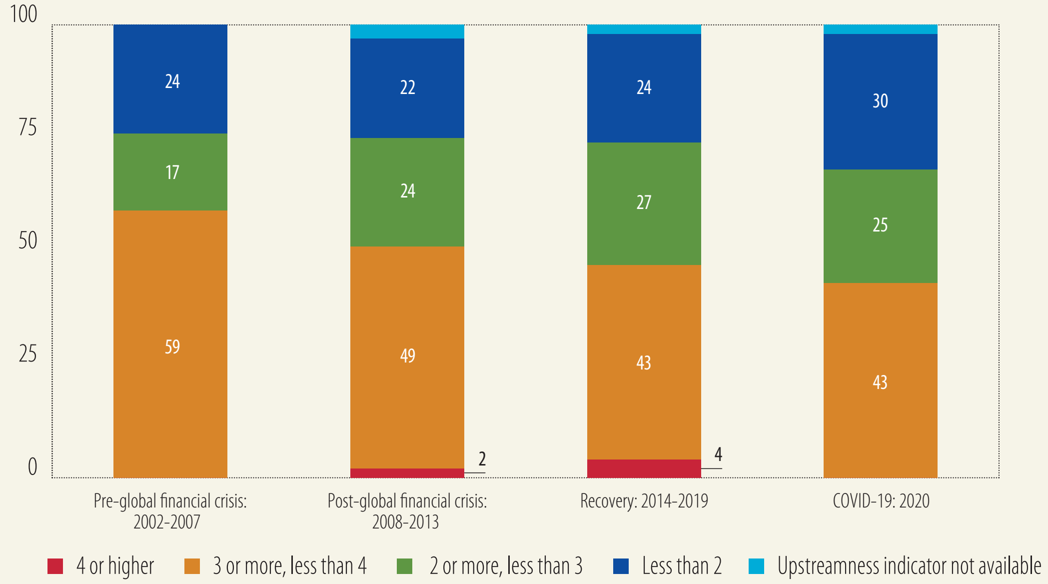


Source: *CEPII-BACI data over 2002-2022 and Eurostat Prodcom over 2002-2020.*
Note: *The total number of products imported by the European Union for each period is 5 381 except for the period following the global financial crisis (2008-2013), when it is 5 379. The products are classified as UN Harmonised System 6-digit (HS6). Criteria (i-iii) follow European Commission (2021), Criteria (iv-v) follow Mejean and Rousseaux (2024).*

Trade dependencies are increasingly associated with Chinese exports. Against a backdrop of rising geopolitical tensions, the concentration of a large share of global production in China poses a significant risk. Political instability (such as the US-China trade war that started in 2018 or issues in the sourcing of cobalt in the Democratic Republic of the Congo) imposes heavy costs on reliant economies. The share of China in EU import vulnerabilities is rising, while the shares of the United States and the rest of the world have dropped by 3 to 10 percentage points (Figure C.3). Overall, China's share is higher for products that are not readily produced in the European Union.

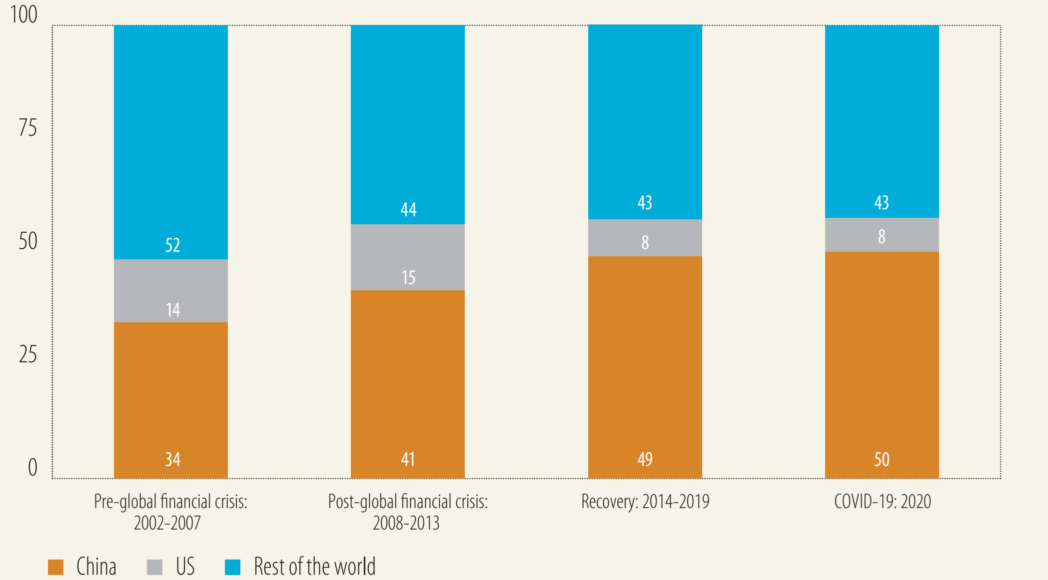
Most vulnerabilities and risks are concentrated in the chemicals, ceramics and metals sectors. The imported products identified by the European Commission's three criteria are mainly produced in manufacturing sectors, and nearly all appear when applying all five criteria (Figure C.4). When products with the lowest levels of substitution with EU production and between suppliers are isolated, the shares of the chemicals, ceramics and metals sectors are particularly high.

Figure C.2
Upstreamness of EU trade dependencies for the five criteria methodology (% of products)



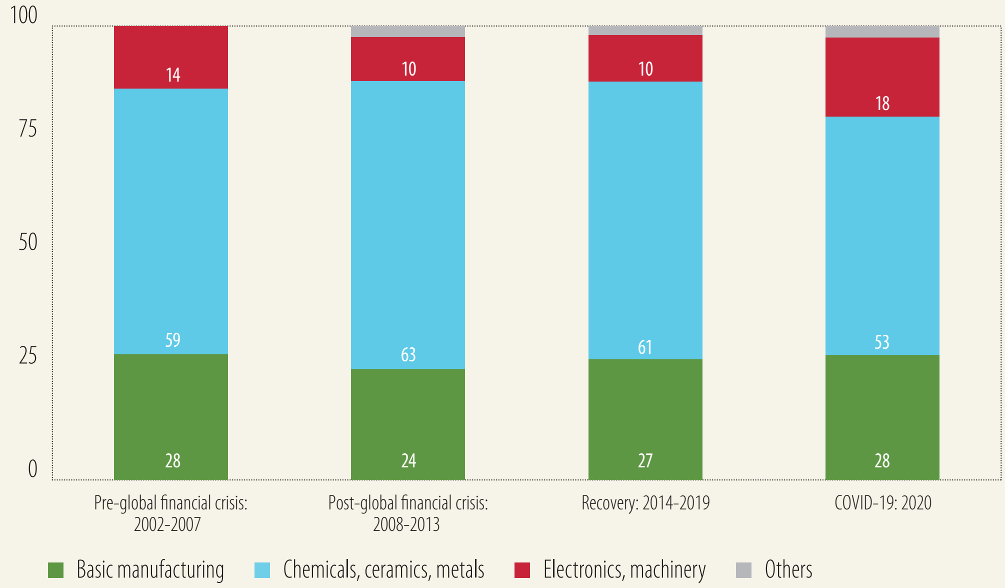
Source: *CEPII-BACI data over 2002-2022 and Eurostat Prodcom over 2002-2020.*
Note: *The total number of products imported by the European Union for each period is 5 381 except for the period following the global financial crisis (2008-2013), when it is 5 379. The upstreamness indicator value shows the approximate number of production stages before a good reaches its final consumer. An upstreamness value of 1 corresponds to a product ready for immediate consumption and an upstreamness value of 4 indicates that there are four remaining stages before the product reaches the consumer. The products are defined at UN Harmonised System 6-digit (HS6), and vulnerability criteria follow Mejean and Rousseaux (2024).*

Figure C.3
Main origin of EU trade dependencies for the five criteria methodology (% of products)



Source: *CEPII-BACI data and Eurostat Prodcom over 2002-2020.*
Note: *The total of vulnerable products (HS6) imported by the European Union for each period respectively is 29, 41, 49 and 40, as calculated using the five criteria of the HS methodology (Mejean and Rousseaux, 2024).*

Figure C.4
EU trade dependencies (% of products)**, by sector**



Source: *CEPII-BACI data and Eurostat Prodcom over 2002-2020.*
Note: *The total of vulnerable products (HS6) imported by the European Union for each period respectively is 29, 41, 49 and 40, as calculated using the five criteria of the HS methodology (Mejean and Rousseaux, 2024). Basic manufacturing (NACE 2: 10 to 18, 31 to 32); chemicals, ceramics, metals (NACE 2: 19 to 25); and electronics, machinery (NACE 2: 26 to 30).*

Incorporating how countries substitute goods after an economic shock, and the impact that has on trade vulnerability, enhances our understanding of weaknesses and sources of resilience. It highlights the need for policies that target specific dependencies on products not easily substituted within the European Union and supplier diversification. Such targeted policies must consider the risks posed by these products to determine their nature and intensity. Dependencies in sectors like electronics and machinery mostly originate from China, but these products are close to the end consumer, limiting the risk of propagation through supply chains. Conversely, while dependencies in the chemicals, ceramics and metals sectors are less reliant on China, they come into play very early in global value chains, posing significant supply chain risks for the European Union and importing firms. Evaluating additional risks driven by these dependencies is crucial for the EU economy.

The debate on the need for and form of policy intervention contrasts enhanced resilience and diversification with more active industrial policies. However, intervention might be costly and subject to imperfect information and network effects. Real-time information sharing, assessing and sharing firms' indirect exposure,[13] and industry coordination between different stages of global value chains could mitigate the risks.

13 Firms can be exposed to risks unknowingly through indirect exposure, which is non-negligible in the European Union according to available data (Mejean and Rousseaux, 2024).

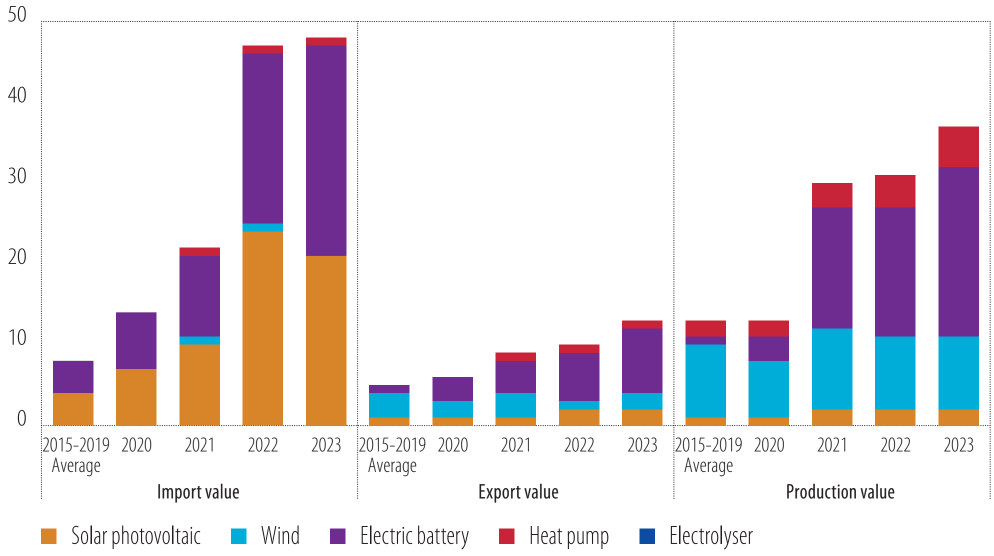
Securing supplies of green technologies for the European Union

Clean technology innovation and manufacturing is critical to Europe's competitiveness. As discussed in Chapter 1, the European Union holds a competitive advantage in green innovation and production. It performs strongly in cleantech products and is also a key market for their deployment. However, Europe has struggled to remain globally competitive in some green technologies in recent years, with China becoming a significant player in the sector. The role of China as a major producer of various cleantech products has pushed prices down substantially, facilitating a wider rollout of Chinese products. At the same time, concerns regarding oversupply by Chinese producers and non-competitive practices have emerged, opening the debate on potential response policies.

The value of cleantech imports has more than doubled since 2021, reaching almost EUR 50 billion in 2023. Accounting for about 50% of the cost of an electric car, electric batteries represent half of total cleantech imports to the European Union (Figure 32). The steep rise in spending on imported batteries offsets the slight dip in imports of solar photovoltaic cells, signalling overcapacity in the Chinese market (International Energy Agency (IEA), 2024). In contrast, EU exports of cleantech rose much more gradually and stood just above EUR 10 billion in 2023. The bulk of EU clean technology production remains largely directed to covering domestic needs, with 57% of production value stemming from battery assembly.

Figure 32

Exports, imports and production of clean technologies in the European Union (EUR billion)

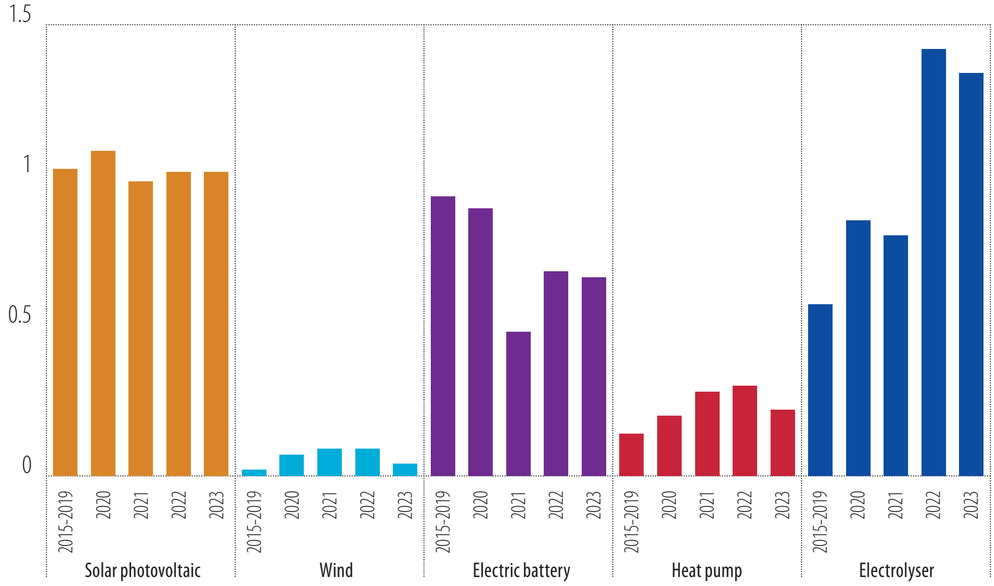


Source: *EIB staff calculations based on Eurostat PRODCOM (2024).*

Note: *The analysis rests on the following cleantech components: heat pumps other than air conditioning machines for heat pumps (PRODCOM code 28.25.13.80); photosensitive semiconductor devices, solar cells, photodiodes, phototransistors for solar photovoltaic (PRODCOM code 26.11.22.40); wind turbines - generating sets, wind-powered (PRODCOM code 28.11.24.00); lithium-ion accumulators for electric batteries (PRODCOM codes 27.20.23.50 and 27.20.23.00); machines and apparatus for electroplating, electrolysis or electrophoresis for electrolysers (PRODCOM code 28.49.12.83).*

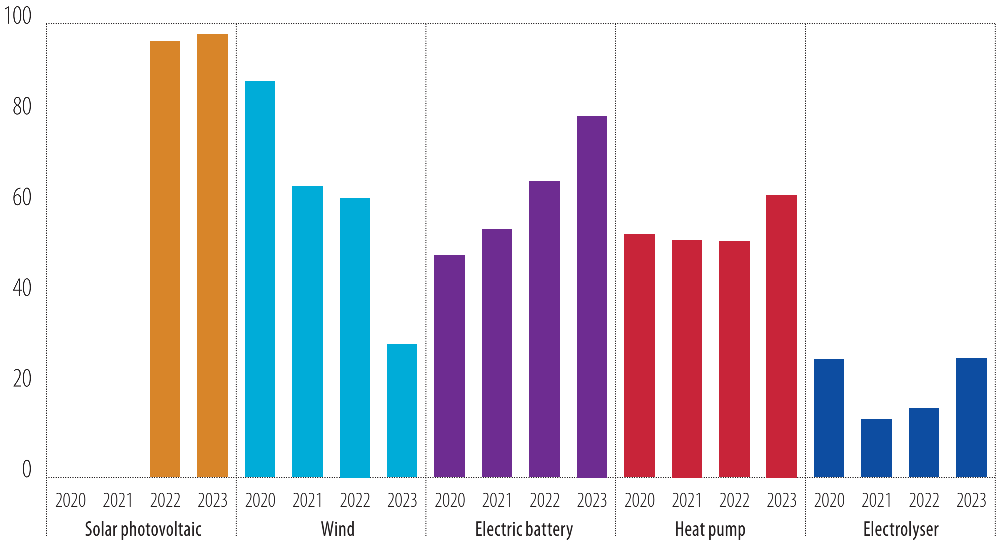
The European Union does not have a comparative advantage in the manufacturing of some of the more mature clean technologies, such as solar photovoltaic cells. The bulk of the European Union's need for solar photovoltaic cells is already met with imported products, with the ratio of import to domestic use for these products lying close to 100% (Figure 33). According to the International Energy Agency, ramping up the manufacturing of solar photovoltaic cells on European soil would result in a 35% increase in costs, compounded by limited access to lithium ore (IEA, 2022). This suggests that there is a need for policies securing a resilient supply, but casts doubt on the true value added of production independence strategies for mature technologies.

Figure 33
Ratio of imports to domestic use of clean technologies in the European Union



Source: *EIB staff calculations based on Eurostat PRODCOM (2024).*
Note: *The ratio is calculated as Imports / (Production – Exports + Imports) based on Figure 32.*

Figure 34
China's share of imports of clean technologies to the European Union (in %)



Source: *EIB staff calculations based on Eurostat COMEXT (2024).*
Note: *The analysis is based on the HS 2022 nomenclature. Solar photovoltaic is classified as HS 6-digit codes 854142 and 854143 (solar photovoltaic statistics are not available before 2022, since solar and photovoltaics were not separable from LED lights in the HS classification system before 2022). Wind is classified as HS 50231; electric batteries as HS 850760 (lithium ion accumulators); heat pumps as HS 841581 and HS 841861; and electrolysers as HS 854330.*

At the same time, investment in less mature clean technologies could create value and jobs in Europe and contribute decisively to the long-term competitiveness of European industries, while making it possible to take advantage of spillover effects. EU manufacturers still hold a competitive position in wind turbines and heat pumps – making up more than half of global exports – while the European Union's dependence on imports in this area is still modest. Although import dependency is high for electrolysers, the market is less mature and import competition is low, including for imports from China (Figure 34). The share of EU countries in global exports of electrolysers is even comparable to or higher than that of China. This indicates that cleantech segments with more room for innovation and positive spillovers as well as higher margins for producers may offer better prospects for positioning the EU manufacturing sector at a time of intense global competition.

The role of policy

In a fast-changing global landscape, the nexus between trade, economic security and competitiveness is increasingly taking centre stage in EU policy (Draghi, 2024). Relatively high energy costs and the fragmentation of the internal market are also putting the competitiveness of EU businesses under pressure. The European Union needs to invest more in cutting-edge innovation, improve the diffusion of innovation, increase the resilience of supply chains and reduce strategic dependencies in critical sectors.

The ability of the European economy to transform and adjust to the new global order will depend on a supportive operating environment. Global uncertainty, an economic downturn and tight financing conditions can adversely affect investment in innovation activities (Aghion et al., 2012), especially for those breaking new ground, as innovation's uncertain nature exacerbates information asymmetry. This may hamper the structural investment required in areas where Europe needs to maintain or step up its competitiveness. Investment in innovation must be accompanied by reforms and regulations that create the right incentives for businesses to fully contribute to the structural transformation (OECD, 2023; Draghi, 2024).

Highly innovative firms in the European Union tend to suffer from a lack of suitable finance, which becomes particularly severe as companies grow. The gap in financing innovation stems from a European market that is more resistant to disruptive innovation than the United States and lacks the appropriate instruments, scale, risk appetite and skills (EIB, 2024). The public sector has recognised the need to intervene to support innovation in Europe, and EU instruments are being put in place to ensure a level playing field across the single market. At the same time, many countries are working to consolidate their finances, and resources at the EU level are limited. That means that incentives and direct support will have to become more targeted.

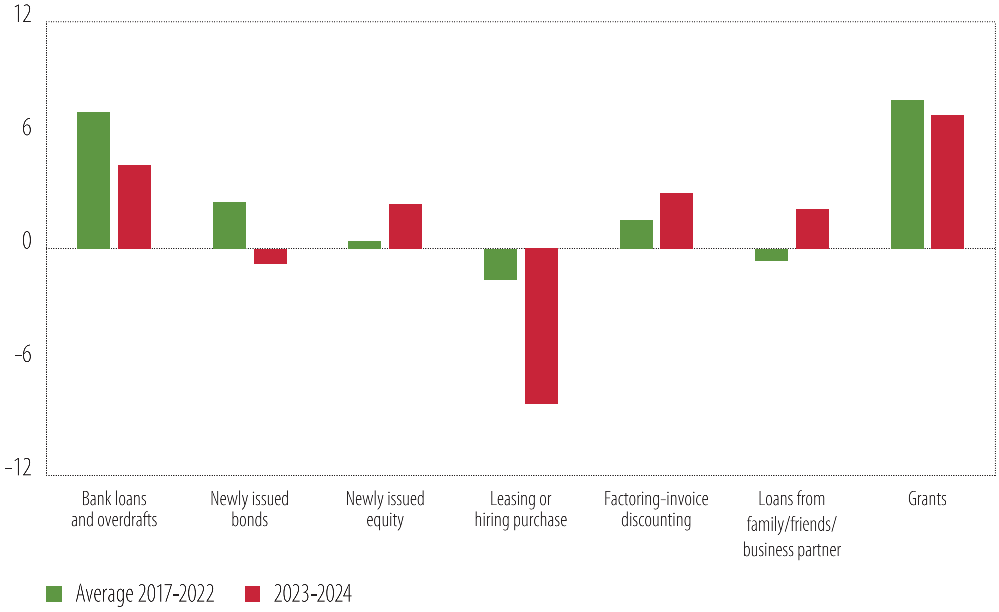
Different instruments such as equity incentives, venture capital and bank finance with favourable conditions can complement each other to foster investment in R&D and innovation. As discussed above, firms that innovate in green technologies are more likely to receive bank finance with favourable conditions (Figure 23). In addition, innovators (and especially firms that have developed green technologies) are more likely to receive grants or bank finance with favourable conditions targeting investments in innovation and digitalisation or the green economy (Figure 24).

Targeted instruments play a crucial role in addressing obstacles to investment in R&D and innovation. Targeted R&D grants can promote innovation in certain technology domains that are still in an early stage, especially for smaller and younger firms (Howell, 2017; European Commission, 2024b). However, while R&D grants are generally considered to have a positive impact on innovation, funding agencies may have difficulties choosing the best-suited projects. Conversely, R&D tax credit programmes do not have the same selection problem, but mostly target profitable companies, often excluding smaller and especially younger firms with potential and in need of support (Czarnitzki and

Giebel, 2024). Tax credits do not necessarily incentivise firms to invest in technologies that are further from the market since companies are most likely to prioritise the projects that are most profitable in the short term (Cervantes et al., 2023).

Equity plays a more important role for successful innovators than for firms that are neither innovative nor profitable, but EU equity markets remain underdeveloped. When using external finance, successful innovators and struggling firms tend to rely mainly on bank loans and overdrafts.[14] Interestingly, innovative and highly profitable firms are more likely to have issued new equity since 2023 than struggling firms (Figure 35). Equity funding is crucial in the funding journey of scale-ups, but EU markets lag behind those of the United States (EIB, 2024).

Figure 35
Difference in the use of financial instruments between innovative and highly profitable firms and struggling firms (in percentage points)



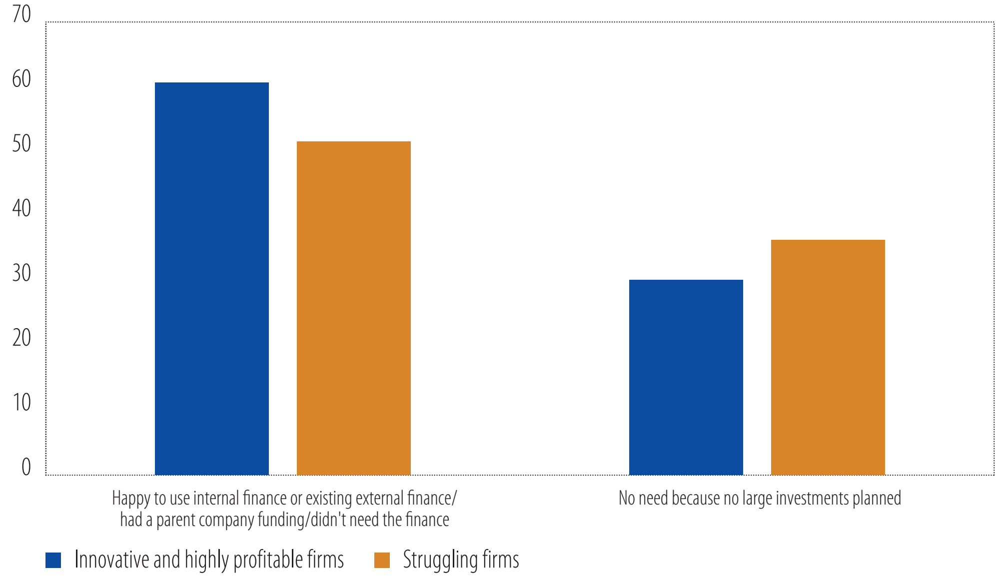
Source: *EIB staff calculations based on EIBIS 2017-2024.*
Note: *EU firms. Firms are weighted by value added. The difference is calculated by subtracting the level of highly innovative and profitable firms from the level of struggling firms for each period. A negative amount means that the share of struggling firms using a specific financial instrument is higher than the share of innovative and profitable peers using that same financial instrument. See footnote 14 for the definition of innovative and highly profitable firms and struggling firms.*

Internal financing may still provide some leeway for successful innovators, but the amount of leeway provided depends on how long these buffers last. Most innovative and highly profitable firms report that the main reason for not looking to finance investment externally is that they did not need outside help (Figure 36), potentially due to stronger internal financing buffers or pre-existing external finance. At the other end of the spectrum, struggling firms also cite that they are happy to use internal finance or existing external finance as the main reason, but are more likely than successful innovators to report that they did not apply for external finance because they did not plan to make a large investment.

14 An innovative and highly profitable firm is defined as a firm that reports profit margins over 10% and that invests in the development or introduction of new products, processes or services. A struggling firm is defined as a firm that reports a loss or breakeven and that does not invest in innovation.

Figure 36

Main reasons not to ask for external finance (% of firms that did not apply)



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *EU firms. Firms are weighted by value added. See footnote 14 for the definition of innovative and highly profitable firms and struggling firms.*
Question: *What was your main reason for not applying for external finance for your investment activities?*

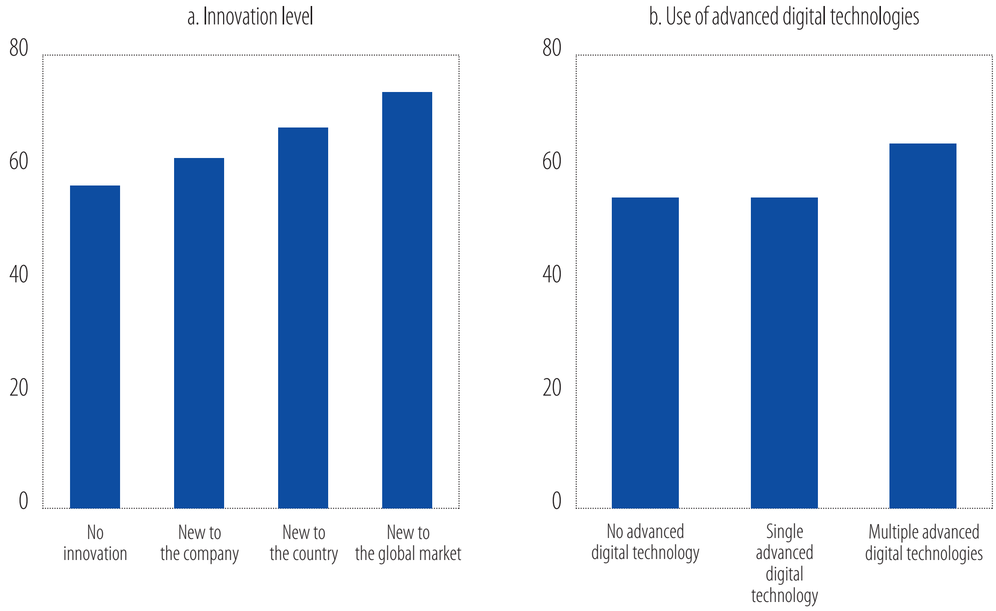
Given the size of the innovation financing gap in the European Union, public sector support must be highly targeted and effectively catalyse private finance. It should focus on early support to kick-start new, risky technologies and the patient capital needed to scale up new projects and invest in key enabling infrastructure. Expanding the EU single market and advancing the capital markets union are key priorities, as they would provide the market scale and depth needed for firms to take advantage of growth opportunities (Letta, 2024). A strategy to reduce barriers to investment and integrate capital markets would further crowd in private investment and foster the creation of an innovation-enhancing environment.

Regulatory differences between EU countries tend to have a stronger impact on innovative and digital firms, highlighting a need to streamline and strengthen the single market. More innovative or digital firms are more likely to report that their main product or service must comply with varying regulatory requirements, standards or consumer protection rules in different EU countries (Figure 37).[15] This resonates with recent findings from the International Monetary Fund (IMF, 2024) showing that, despite substantial progress, trade barriers within the European Union remain significant.

15 Part of this correlation could also be driven by the fact that more innovative and digital firms (which also tend to be larger companies) are more likely to be exposed to a larger number of export markets.

Figure 37

Exporters reporting that they have to comply with different regulations across EU countries (in %), by innovation level and use of advanced digital technologies



Source: *EIBIS 2024.*
Note: *EU exporters. Firms are weighted by value added.*
Question: *Does your main product or service have to comply with differentiated regulatory requirements, standards or consumer protection rules across EU member states. What proportion of the total investment in the previous financial year was for developing or introducing new products, processes or services? Are advanced digital technologies used within your business?*

Conclusion and policy implications

To enhance the global competitiveness of European firms, Europe must invest more in cutting-edge innovation, improve the diffusion of innovation, increase the resilience of supply chains and reduce strategic dependencies in critical sectors. The European Union is at the forefront of clean technology, but lags behind the United States and China in digital innovation. This creates major dependencies on digital platforms and other technologies (such as artificial intelligence) developed outside the European Union. Relatively high energy costs and the fragmentation of the internal market are also putting the competitiveness of EU businesses under pressure. A successful green transition will require sustained efforts in innovation and the widespread uptake of green and digital technologies, as they are key drivers of Europe's competitiveness and its ability to withstand economic disruption and climate change.

To increase resilience, the European Union needs to reduce its dependency on imports of critical raw materials and products that are strategic to EU businesses. This will help encourage investment in diversification and possibly encourage the build-up of domestic production for high-tech products in which EU businesses have a comparative advantage. This will improve the position of EU manufacturing in an intensely competitive global market. Certain industries have the potential to boost value and create jobs in Europe and contribute decisively to its competitiveness, but this will require policy measures to make the economic environment more efficient, bring down regulatory barriers and strengthen the internal market, ensuring there is an equal playing field across the European Union.

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Chapter 6

The European Union's green ambitions are driving its economic transformation

Europe's decarbonisation strategy sets out a bold vision of achieving carbon neutrality by 2050. This strategy is built on three pillars: carbon pricing through mechanisms like the EU Emissions Trading System; regulatory measures that mandate renewable energy adoption, emissions reductions and energy efficiency; and financial incentives, including subsidies and tax breaks, to foster green innovation. Together, these measures are driving the energy transition, promoting innovation and encouraging the transformation of energy-intensive industries, while also laying the groundwork for a competitive and sustainable green economy.

This framework is encouraging the rapid expansion of renewable electricity and the rise of electric mobility, leading to a drop in emissions in many industries. Clean energy has become the default choice for power utilities, driving broader electrification. However, progress is uneven. While efficiency gains and process improvements have contributed to emissions cuts in many sectors, industries such as chemicals, steel and cement – vital for manufacturing and construction – continue to face significant technological and financial challenges. Addressing these gaps will require targeted policies to accelerate innovation and bring economically viable clean solutions to market.

Strong and consistent environmental regulations play a pivotal role in overcoming these challenges. In sectors with stringent regulations, firms investing in energy efficiency benefit from significant gains in profitability, productivity and innovation. These improvements not only enhance competitiveness but also reinforce the European Union's climate ambitions, creating a positive feedback loop between sustainability and economic performance. Energy-efficient firms are also better equipped to navigate volatile energy prices and global competition. By contrast, weaker regulatory environments fail to provide sufficient incentives, particularly for energy-intensive industries. To ensure an inclusive transition, robust policies that provide clear direction could be paired with targeted support that encourages the transformation of businesses facing the greatest barriers to decarbonisation.

The success of the Emissions Trading System demonstrates the power of proactive policies to advance the transformation. By pricing carbon effectively, the system has spurred innovation and emissions reductions in key sectors. However, to ensure a balanced transformation, continuous adjustments must be made to guarantee leaders and laggards have the resources and incentives needed to make progress on their green goals.

While current policies focus on efforts to mitigate climate change, adaptation must not be overlooked. Climate risks are already affecting public and private entities, yet investments in resilience (such as improved infrastructure and other solutions) remain limited. Combining adaptation measures with emissions reductions will not only guard against the most direct impact of climate change, but also ensure the EU economy remains resilient in the face of future challenges.

Introduction

This chapter reviews Europe's progress in reducing emissions and transitioning sectors to greener and more sustainable practices. It looks at the diverging global patterns emerging in decarbonisation, increasing geopolitical tensions and widespread concerns about European competitiveness. It consists of three sections and four boxes.

The first section examines long-term trends in the carbon emissions of specific sectors, as well as the key drivers and deployment of climate mitigation technologies. It emphasises the achievements made to date and shows that they vary from sector to sector. Decarbonisation often comes at the cost of reduced production, especially in highly energy-intensive industries. The section also provides evidence of the rapid transformation of EU electricity production to clean energy – a critical enabler of the green transition. A box looks at the impact of new EU rules for corporate sustainability.

The second section focuses on disparities in how EU firms use energy and emit carbon, and how those disparities affect their overall performance. Using data from the EIB Investment Survey (EIBIS) and the Emissions Trading System, the section identifies factors distinguishing transition leaders from laggards, including operational efficiency, technological adoption, financial constraints and regional or sectoral differences. It examines the relationship between energy efficiency and firm performance for profitability, productivity, innovation and employment. It contains a box explaining meta-stochastic frontier analysis (the methodology used to evaluate firms' energy efficiency).

The section also shows that combining encouragement for green investment with stricter climate regulation often results in greater returns for firms that invest in energy efficiency. These companies tend to have higher profitability, productivity, innovation and employment. In environments with weaker regulation, however, firms in energy-intensive industries that invest in energy efficiency do not have higher returns than those that do not invest, which weakens the rationale for energy efficiency efforts. A third box summarises the findings of a study on the regulatory environment and access to finance as major forces driving energy-efficiency investment. A fourth box focuses on leaders and laggards in sectors covered by the Emissions Trading System.

The third section addresses climate adaptation efforts by firms and municipalities. It identifies shared challenges, unique barriers and opportunities to work together as firms and local governments respond to the growing effects of climate change.

By integrating insights from these three perspectives, this chapter provides a comprehensive overview of Europe's decarbonisation journey, highlighting successes and ongoing challenges as it moves to a sustainable and competitive future.

Europe's emissions-reduction progress masks sector differences

This section provides an overview of the European Union's transition to a sustainable economy, focusing on the progress made in emissions reductions, the evolution of EU energy markets, advances in the deployment of green technologies and an assessment of cleantech innovation.

Europe's decarbonisation continues amid global climate uncertainty

The global political environment may be casting a long shadow over our collective ability to maintain temperatures well below 2° Celsius, but Europe's direction of travel is clear. The European Union's Copernicus Climate Change Service (C3S) said that 2024 was the hottest year on record. Damaging extreme weather events are being seen across the world, but there is a lack of global consensus on the urgency of climate change. Against this backdrop, the newly appointed European Commission has reinforced its ambition to reduce net greenhouse gas emissions at least 55% by 2030 (relative to 1990 levels), and to reach climate neutrality by the middle of the century (von der Leyen, 2024).

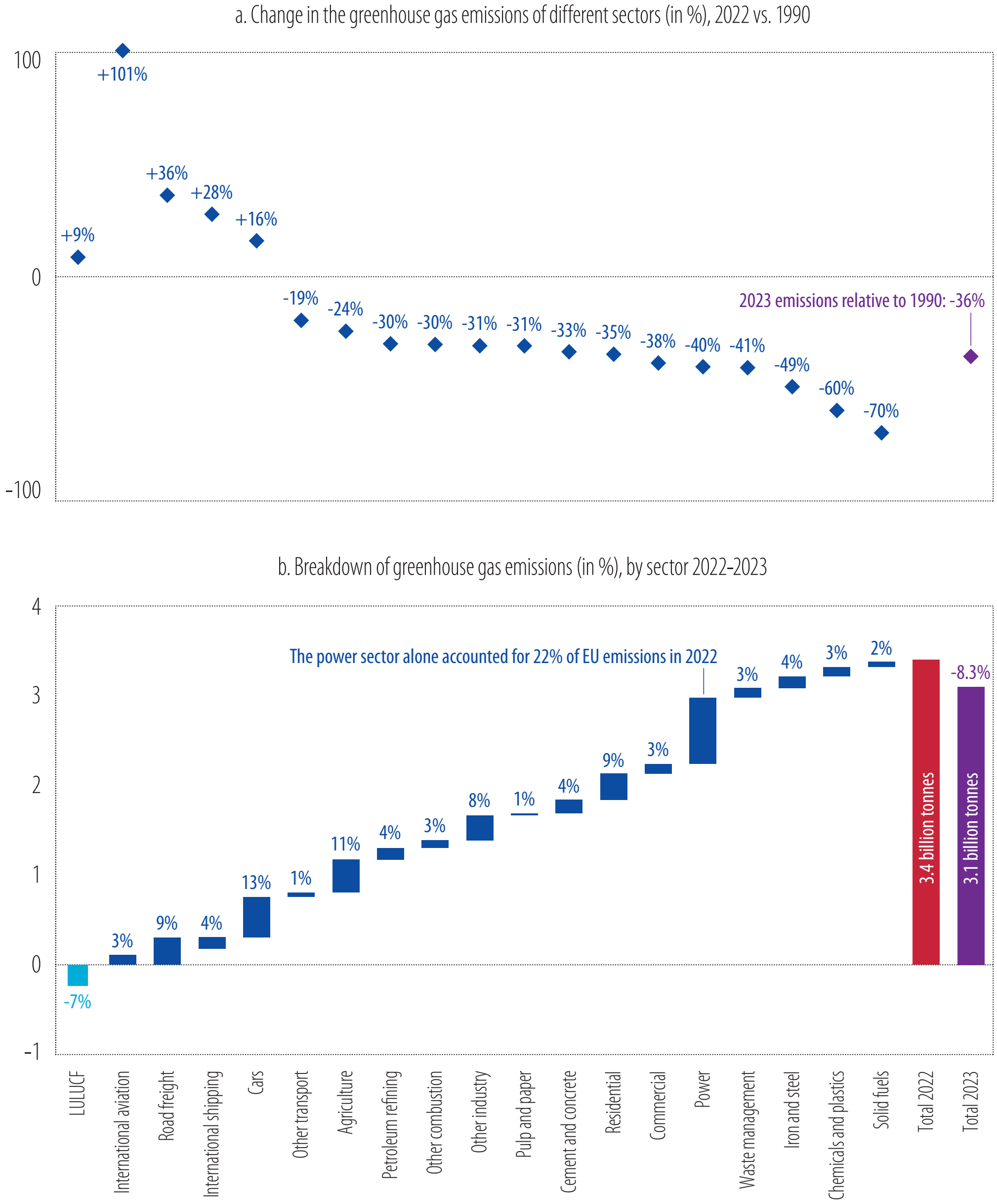
Halfway through the United Nations' Decade for Action, the European Union's decarbonisation journey is very much underway, with the groundwork being laid for a new model of economic growth that will help preserve its long-term competitiveness. The EU economy has grown by almost 170% in per capita terms since 1990, and EU net greenhouse emissions are now 37% below 1990 levels (an average reduction of 1.2% a year). In 2023 alone, emissions fell by 8.3% compared to the previous year. Looking forward, the annual emissions-reduction rate needs to rise significantly to bring harmful emissions down 90% by 2040, relative to 1990 levels – as proposed by the EU 2040 assessment (European Commission, 2024b) – and to reach full decarbonisation a decade later. To meet this objective, policies and actions must follow a coherent plan and be implemented with seamless coordination. Europe must also apply all available solutions without favouring any specific technology. If successfully completed, such an approach could actually improve Europe's economic prospects (Draghi, 2024).

The transformation of power production is driving Europe's green transition. Accounting for almost 20% of total greenhouse gas emissions, the power sector is the continent's top emitter (Figure 1). However, it has undergone a rapid transformation, with emissions falling by 59% in 2024, compared to 1990 levels. This trend accelerated in recent years, with a 24% decline in 2023, followed by a further 13% drop in 2024 (Eurelectric, 2024). Behind this trend is a substantial reduction in the carbon intensity and energy intensity (Figure 2) of power production, as coal was gradually replaced by gas and competitive renewable energy sources substantially increased since 2010. The trend has also benefited from continued reliance on nuclear power, which now covers about one-quarter of EU electricity needs (Figure 3).

Industrial activities generate similar volumes of emissions to those of the power sector, but improvements are more incremental and mainly result from optimised processes and energy efficiency gains (European Commission, 2024a). Energy efficiency investment has become a key priority in many sectors, but in some hard-to-abate domains, decarbonisation is mostly being achieved by scaling back activities. The increase in the price of EU Emissions Trading System allowances is forcing companies to transform, while the switch to less emissions-intensive technologies is not always economically viable. As such, reducing emissions is mostly done by reducing production or by reducing the carbon intensity of that production (see Chapter 3, Figure 2). Chemicals and steel have cut emissions the most among hard-to-abate sectors, more than halving their emissions since 1990 (European Chemical Industry Council (CEFIC), 2023).

Industries focused on mobility and shipping are lagging behind on decarbonisation. Progress in the adoption of electric vehicles or other low-emission transport has not yet translated into sizeable carbon reductions, and is moving too slowly to offset the growing number of conventional cars on the road (Figure 2). Similarly, the benefits of fuel efficiency improvements barely compensate for increased freight activity, leaving current emissions close to their 2010 levels. In the aviation sector, a revision of the EU Emissions Trading System Directive will lead to the full auctioning of allowances and will enhance support for eligible alternative aviation fuels that are financed by the system. The carbon charge is still not enough to close the price gap between conventional fossil fuels and eligible alternative aviation fuels. Despite global initiatives to cut emissions in the shipping industry (Getting to Zero Coalition, 2021), which is the backbone of global trade, the absence of viable alternatives to marine diesel oil means that a notable cut in emissions is not realistically possible before 2030.

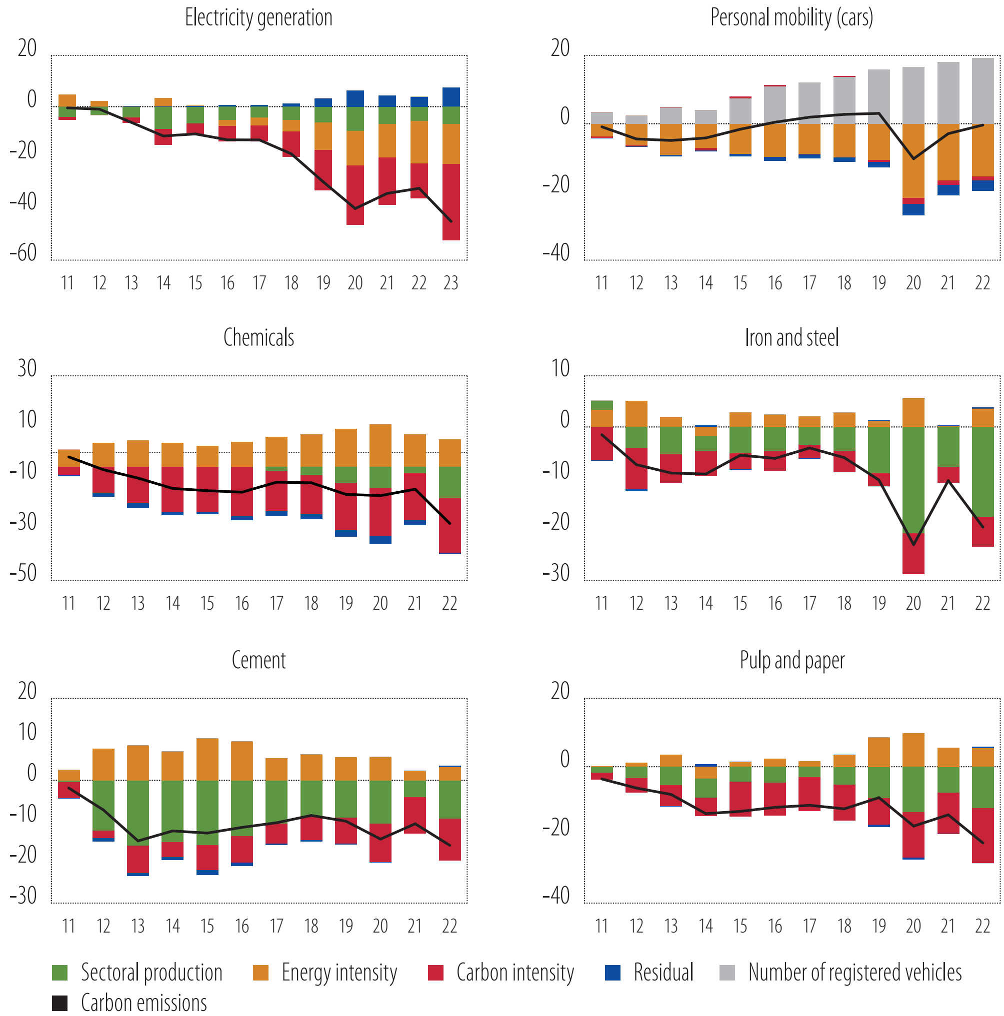
Figure 1
Europe is making significant progress in cutting emissions



Source: *European Environment Agency (EEA).*
Note: *LULUCF stands for land use, land-use change and forestry.*

Figure 2

Change in the composition of carbon emissions (in %) **since 2010, by sector**



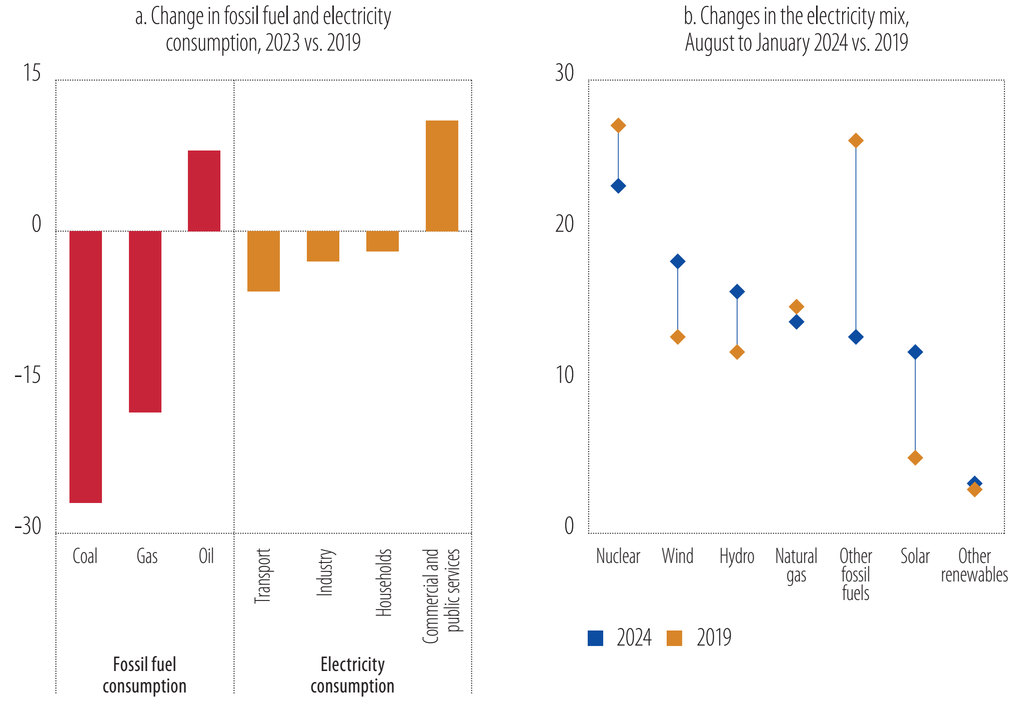
Source: *Eurostat, EEA 2024.*
Note: *The decomposition analysis uses the Kaya identity, which gives rise to residual components unlike approaches using a logarithmic mean divisia index (LMDI).*

Clean energy is gaining ground

Fossil fuels are losing their prominence – a tangible sign of the transition unfolding in Europe. The use of fossil fuel for electricity generation dropped a record 19% in 2023 (Ember, 2024). Coal supplied a mere 12% of electricity to European customers (below levels seen during the COVID-19 pandemic in 2020), pushed out of the mix by expanded renewable capacities and a resumption of nuclear power. Coal use slumped in 23 European countries from January to August 2023, compared to the prior year, while the European Union-wide figure fell by 27% from 2019 to 2023 (Figure 3). There has been a clear drop in oil use in countries such as the Netherlands and Sweden, which are among Europe's most dynamic markets for electric cars. Natural gas is also losing ground due to the strong uptake of clean electricity sources – about half (48%) of electricity in Europe was generated from renewable sources in 2024. Solar capacities have expanded rapidly (by 25% in 2023), and are on track to meet their 2030 target (600 GW of newly installed capacity by 2030). Capacity increases are particularly notable in Germany and Italy. Solar capacity rose 15% in Germany and 45% in Italy in the first half of 2024 (International Energy Agency (IEA), 2024a). However, end-use applications of renewable energy are progressing more slowly. In 2022, 23% of energy needs were met with renewable sources, still far from the 42.5% objective set for 2030 (Figure 4).

Figure 3

Changes in the energy supply and demand (in %)

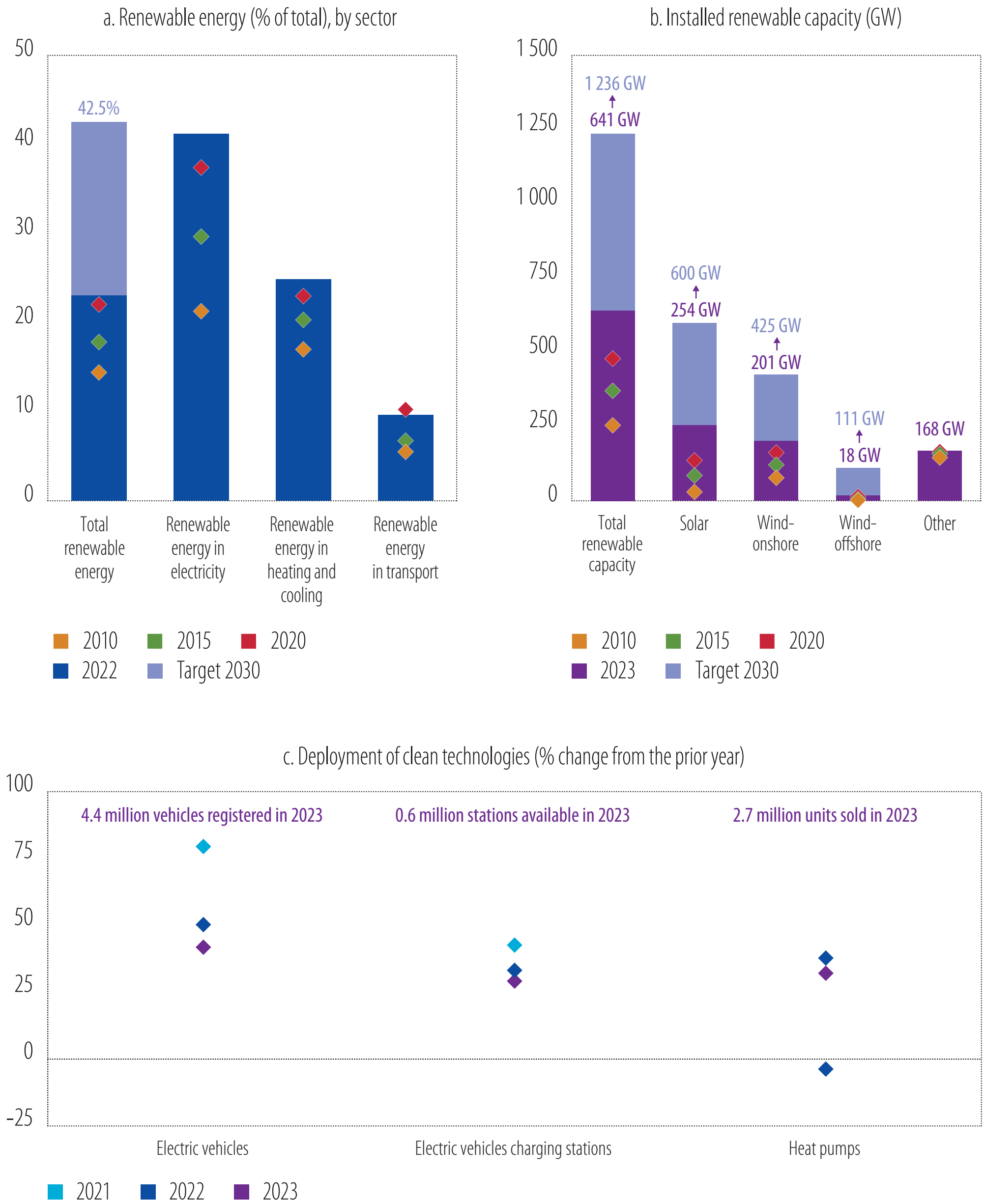


Source: *Eurostat.*

Despite their potential for cutting emissions, the markets for electric vehicles and heat pumps are showing signs of weakness. Electric vehicle adoption in Europe is levelling off after the phase-out of public incentives in Germany and despite a 6% increase in electric vehicle sales in other EU countries (IEA, 2024a). In 2024, the heat pump market also experienced a strong correction as natural gas prices returned to pre-crisis levels, thereby discouraging household spending on energy-efficient devices.

Figure 4

Renewable energy deployment



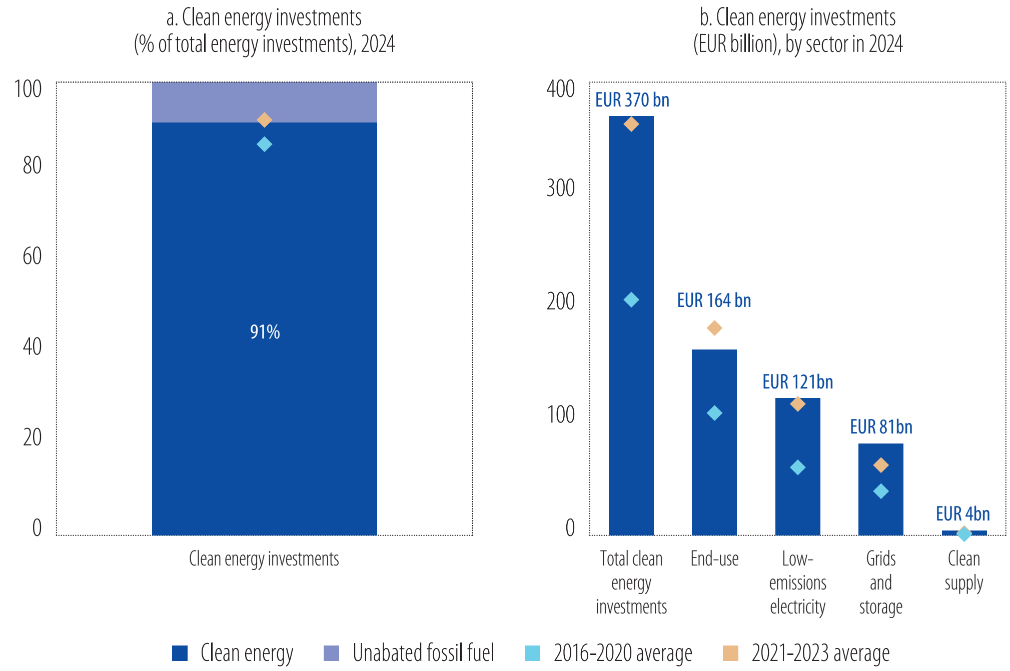
Source: *European Commission's Directorate-General for Energy, International Energy Agency (IEA), International Renewable Energy Agency, Ember, European Heat Pump Association, European Automobile Manufacturers' Association, Alternative Fuels Infrastructure Regulation.*

Clean energy investments remain dynamic despite challenges

Clean energy investments lost some of their momentum after the sharp rise seen until 2020, but remain broadly in line with the European Union's energy and climate goals. Investments in oil and gas production and storage exceeded EUR 30 billion in 2024, with about EUR 7 billion invested in liquefied natural gas to offset the shortage in Russian supplies and secure supplies following the energy crisis. Clean energy investments have remained very attractive in Europe, even in 2023 when supply chain constraints and inflationary pressure drove up financing costs. Europe's clear commitments to the green transition have resulted in clean energy investments that account for over 90% of total energy investments. Early estimates from the International Energy Agency (IEA) indicate that clean energy investments hovered around EUR 370 billion in 2024 (Figure 5). Low-emission electricity and grid developments account for more than half of clean energy investments. Power network extensions and digitalisation are now seen as a priority for enabling end-use electrification (industries, transport and heating) and more power market integration (Draghi, 2024).

Outside of power generation, the switch to clean energy is largely concentrated in a few segments, mainly electric vehicles and heat pumps. These areas have seen notable growth driven by strong consumer demand and supportive policy frameworks. However, despite some progress, there is little indication that a marked shift to faster and greater emissions reductions is on the way. Breakthrough innovations are still needed to drive faster and more widespread emissions reductions in a broader range of industries. Without addressing these investment hurdles and scaling up solutions in hard-to-abate sectors, the overall pace of Europe's clean energy transformation may remain constrained.

Figure 5
Clean energy investment trends



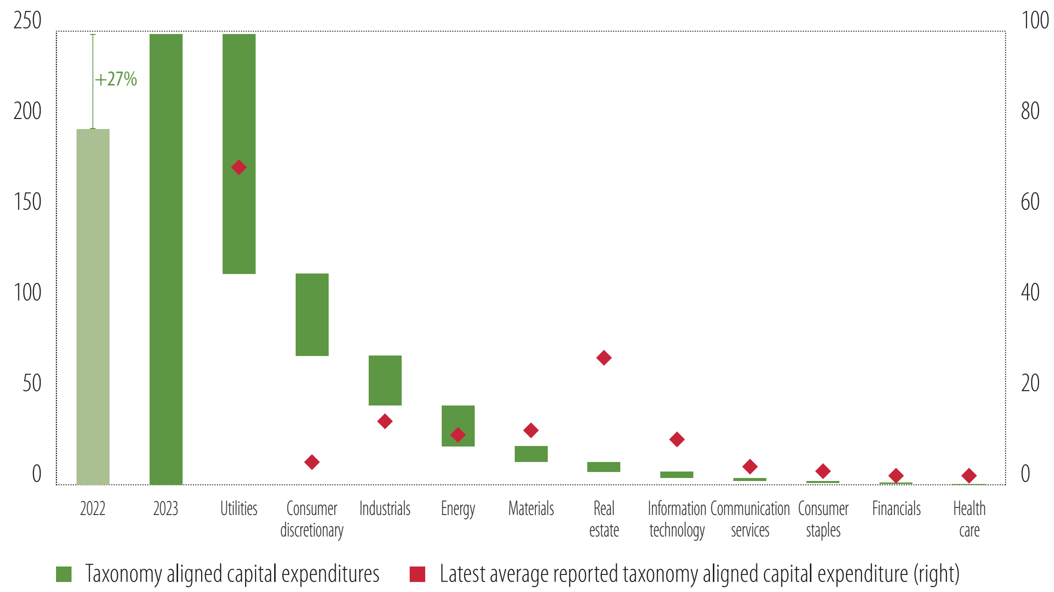
Source: *IEA.*

Disclosures of large EU firms' investments in green activities shed some new light on investor appetite for the green transition. The EU sustainable finance framework – now in its second year of implementation – requires firms to disclose their sustainability efforts. These requirements are showing encouraging signs of uptake by companies (European Commission, 2024c). In 2023, some 1 500 companies representing a total of EUR 6.8 trillion in market capitalisation reported capital expenditure earmarked as green or aligned with the EU taxonomy for sustainable activities (Goldman Sachs, 2024). The majority of EU taxonomy-aligned investments have been declared in France and Germany, where domestic policy, regulatory frameworks and access to capital support disclosures.

Green investments are concentrated in a handful of industries that are key to climate change mitigation. The first batches of disclosures confirm that capital is flowing to clean energy in the ways highlighted above. In total, about EUR 250 billion of green capital expenditure was reported in 2023, a 27% increase vs. 2022 (Figure 5). Key reporting sectors include power utilities and network operators, which are responsible for more than half of reported capital expenditure, and companies involved in clean mobility (such as electric motor manufacturing and automobile assembly), the manufacturing of energy-efficient equipment for buildings and industries and, to a lesser extent, the construction of new buildings.

Figure 6

Taxonomy alignment of capital expenditure (left axis: EUR billion; right axis: % of total capital expenditure)**, by sector**



Source: *Bloomberg, Goldman Sachs (2024).*

Box A

Corporate sustainability as a driver of green transformation

A sustainable and competitive European economy must also be transparent and accountable, especially when it comes to pricing green assets and risks. The European Union has taken a significant step forward by introducing a framework for corporate sustainability reporting underpinned by the Corporate Sustainability Reporting Directive (CSRD). This transformative initiative aims to equip investors, consumers and civil society with reliable and consistent data on companies' environmental and social impact, fostering the creation of a trusted and liquid market for sustainable investments.

Sustainability reporting serves investors by enabling them to identify green assets and manage risks. It also empowers companies to assess their own exposure to environmental and social risks, and signals these risks to potential investors and financiers. However, the implementation of the European Union's ambitious reporting framework presents opportunities and challenges.

The EU sustainability reporting framework: Objectives and challenges

The CSRD builds upon earlier initiatives such as the Non-Financial Reporting Directive and introduces stricter requirements under the European Sustainability Reporting Standards. Approximately 50 000 companies – including large firms, listed small and medium-sized enterprises (SMEs), and non-EU companies with securities on EU-regulated markets – are required to report on their sustainability performance, starting with 2024 data. These reports must cover technical screening criteria for six environmental objectives under the EU taxonomy, including climate mitigation and adaptation.

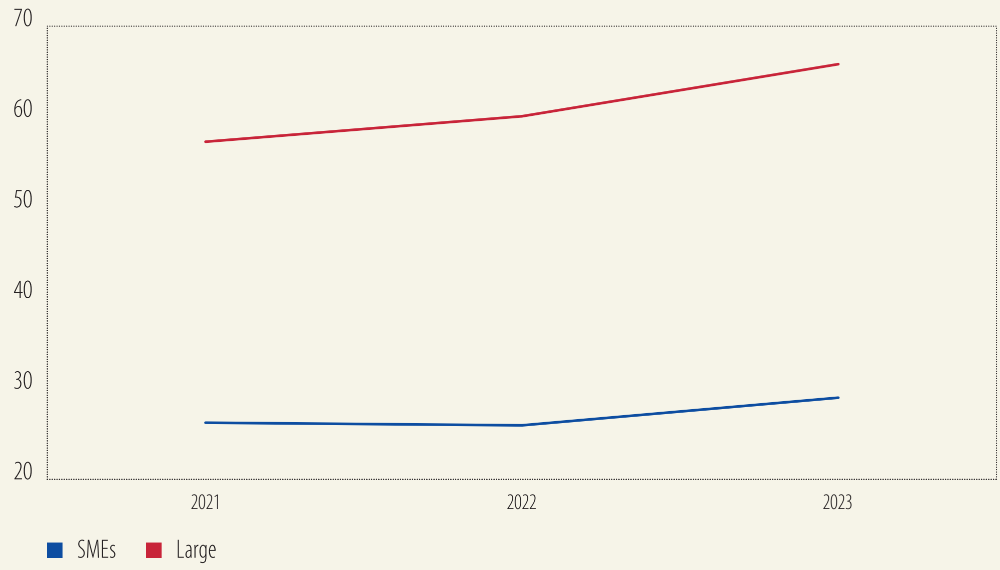
However, concerns have been raised about the complexity of complying with these rules. Companies are required to document transition plans, conduct double materiality assessments (which look at the broader impact of climate change on the operating environment or society as whole) and report up to 1 200 data points. The associated administrative costs are significant, particularly for smaller firms, with recurring annual costs estimated to be EUR 240 000 per company (European Financial Reporting Advisory Group (EFRAG), 2022). Smaller firms were only supposed to be affected if they were listed publicly, but some of them are finding themselves drawn into regulatory reporting, as large companies often need certifications from their suppliers.

Setting and reporting climate targets for EU firms: Insights from the EIBIS

Data from the EIBIS sheds light on EU firms' climate reporting readiness. Figure A.1 shows that some 65% of large EU firms were already setting and reporting targets in 2023, up from 57% in 2021. The share of SMEs is much lower, at 29%, with these businesses not directly required to report this information.

Figure A.1

Share of firms (in %) **setting climate targets, by firm size**

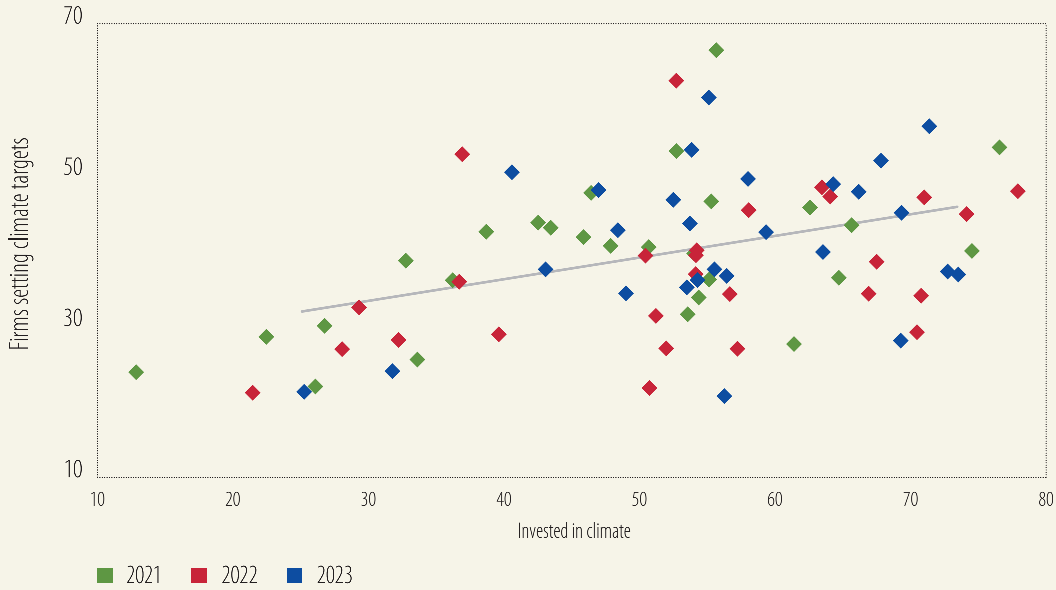


Source: EIB staff calculations based on EIBIS 2022-2024

EIBIS data highlights a positive link between setting climate targets and investing in mitigation and adaptation. Figure A.2 shows that from 2021 to 2023, the share of firms investing in climate-related initiatives has increased, correlating with a rise in the percentage of firms setting climate targets.

Figure A.2

Comparison of firms (in %) **investing in climate measures and those setting climate targets, by year**



Source: EIB staff calculations based on EIBIS 2022-2024. The diamonds refer to the 27 EU countries.

Working towards a balanced and effective sustainability framework

The CSRD and related EU regulations are crucial to nurturing green transformation. To implement these initiatives in the current environment, however, regulators need to strike a balance between the positive effects on transparency, accountability and practicality and the potentially excessive burden these regulations pose to firms, particularly SMEs. The European Commission has therefore proposed an omnibus package for 2025 that aims to simplify and streamline the regulatory framework, while preserving the long-term objectives of the measures.

As the EIBIS data shows, the growing commitment of firms to setting climate targets and investing in climate action signals a promising shift. By addressing the unique challenges faced by firms and supporting their green endeavours, the European Union can foster a more inclusive and competitive market.

Clean energy innovation needs to ramp up and overcome technological barriers

Innovation is critical for the transition, because the lack of commercially viable alternatives to polluting activities and production processes often blocks decarbonisation. A vast array of technologies is required to radically transform the way energy is produced and consumed. According to the IEA, about 600 technologies are needed to make supply chains fully green, with various stages of development.[1,2] Some are mature and competitive, such as solutions for power generation and building renovation. Figure 6 provides a summary of the number of technologies involved in various supply chains that are vital for the decarbonisation of industry, suggesting that in most cases technologies are still far from commercialisation and large-scale deployment.

A strategic and coordinated approach to innovation is crucial. Technologies involved in energy transformation (which often involve electrons or molecules) have complex supply chains, namely the production and storage of clean hydrogen and carbon capture and storage technologies. Bolstering innovation and bringing these technologies closer to market is a critical step towards electrification and the decarbonisation of hard-to-abate activities. The production of greener materials with lower carbon footprints (such as green steel, green cement, green aluminium and low-emission chemical products) will eventually enable more sustainable mobility, freight, shipping, construction and agricultural practices. However, major technological breakthroughs for most raw commodities are not expected before the mid-2030s (Mission Possible Partnership (MPP), 2022; MPP, 2023).

The right business environment and financial frameworks will help European innovators overcome technological hurdles. However, EU firms have difficulty commercialising innovative products (EIB, 2024). The lack of a clear business case compounded by supply chain constraints and high energy and carbon abatement costs often hinders industrial transformations and discourages investors (Draghi, 2024). These transformations must come with upgraded infrastructure such as more integrated power, distribution and transport networks, a boost in demand for sustainable products, more effective and targeted public policies and easier access to capital for firms developing disruptive technologies (World Economic Forum (WEF), 2023).

1 The IEA Clean Energy Technology Guide is an interactive database maintained by the International Energy Agency containing information about nearly 600 individual technology designs and components across the whole energy system that can contribute to achieving net zero emissions.

2 Technologies are characterised by their technology readiness levels. These track the development of products from basic scientific discovery, through demonstration in various settings, up to technology validation and mass-scale deployment.

Figure 7
Maturity of cleantech supply chains, by end-use sector

Source: *IEA (2024c), ETP Clean Energy Technology Guide.*
Note: *The figure brings together the various supply chains (listed on the vertical axis) that are indispensable to the decarbonisation of energy end-use (listed on the horizontal axis). Bubble sizes indicate the number of technologies involved in each clean energy supply chain. Colours refer to average readiness levels of technologies (TRLs). TRLs 1-3 are labelled as "not ready," while technologies with TRLs ranging 6 to 9 are deemed "close-to-market." Colours refer to the level of readiness of each pertinent technology for a given end-use sector.*

Regulation and energy efficiency as a strategic lever for transformation

This section examines the energy efficiency performance of European firms using data from the EIBIS. It assesses deviations from the most energy efficient practices and identifies whether these gaps stem from operational inefficiencies or a reliance on less advanced technologies. The analysis explores the drivers and barriers shaping energy efficiency in different regions and sectors and estimates the returns on energy efficiency investments for profitability, productivity, innovation and employment. This work can inform targeted strategies to close energy efficiency gaps, addressing key barriers and unlocking new ways for the EU economy to grow equitably and sustainably.

EU firms respond to rising energy costs with efficiency measures

Energy efficiency has become a cornerstone of the European Union's efforts to reduce carbon emissions and enhance economic competitiveness. Figure 8 highlights the evolution of firms investing in energy efficiency in the European Union and across its major regions: Central Europe, Western and Northern Europe and Southern Europe. Energy efficiency investments recovered in 2023 after declining in 2020, likely because of the COVID-19 pandemic, surpassing pre-pandemic levels in most European regions. Investment by Western and Northern European companies increased the most sharply in 2019 and reached the highest share of firms by 2023, despite declining in 2020. Similarly, Southern European firms steadily improved from 2020, reaching the highest share of firms investing in energy efficiency in 2023. Firms in Central and Eastern Europe recorded a more gradual rise, but eventually exceeded the levels seen in the other two regions.

Figure 8

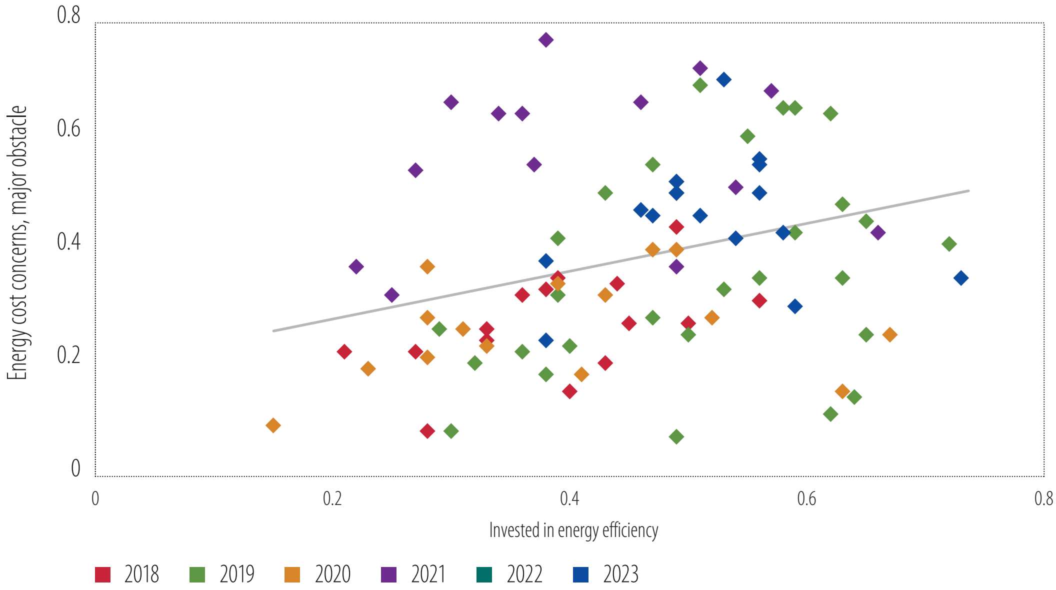
Firms investing in energy efficiency (in %)

Source: *EIBIS 2018-2024.*
Question: *What proportion of the total investment in the last financial year was primarily for measures to improve energy efficiency in your organisation?*

Firms have been expanding investment in energy efficiency in recent years as concerns about rising energy costs grow. Figure 9 illustrates a sector-adjusted relationship between the share of firms reporting energy costs as a major obstacle to investment and the share investing in energy efficiency from 2018 to 2023. A positive correlation emerges, suggesting that firms are increasingly likely to invest in energy efficiency as cost concerns rise. A temporal pattern is evident, with earlier years like 2018 and 2019 showing a lower share of firms saying they were concerned about energy costs, and subsequently lower energy efficiency investments, while 2022 and 2023 have higher values in both areas.

Figure 9

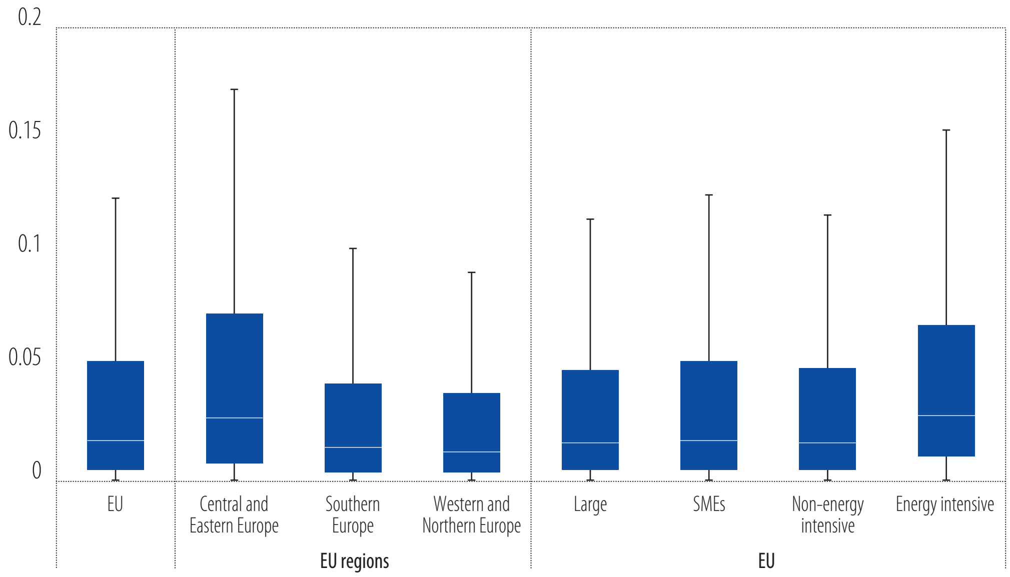
The share of firms (in %) **that have invested in energy efficiency compared with those saying energy costs are a major obstacle to investment, 2018-2022**



Source: *EIBIS 2018-2024.*
Question: *What proportion of the total investment in the last financial year was primarily for measures to improve energy efficiency in your organisation? Thinking about your investment activities, to what extent is energy cost a major, minor or not an obstacle?*

Figure 10

Energy spending as a share of turnover (in %)**, by region, size and energy intensity**



Source: *EIBIS 2023-2024.*
Question: *How much did your company spend on energy in the last financial year?*

This variability is evident across regions, firm sizes and sectors, with Central Europe, small and medium firms and energy-intensive firms experiencing the highest energy costs relative to turnover. At the EU level, firms show moderate variability in energy spending, as indicated by the range and distribution in Figure 10. However, noticeable differences emerge when examining regions. Central Europe exhibits the highest variability and median energy spending, suggesting that energy costs have had a greater impact, while Southern and Western and Northern Europe show lower medians and narrower ranges. For firm size categories, small and medium-sized enterprises (SMEs) tend to have slightly higher ratios for energy costs as a share of turnover and greater variability than large firms, reflecting their limited ability to absorb rising energy costs. Large firms, on the other hand, have more stable ratios, likely because they benefit from economies of scale and better energy management practices. Differences can also be observed between energy-intensive and non-energy-intensive firms. Energy-intensive firms consistently allocate a much larger proportion of their turnover to energy spending, as reflected by higher medians and broader interquartile ranges. This shows the significant financial strain faced by energy-intensive sectors because of their reliance on energy and exposure to price fluctuations.

Box B
Evaluating energy efficiency using meta-stochastic frontier analysis

This box outlines the use of meta-stochastic frontier analysis to evaluate the firms' energy efficiency, by comparing energy spending relative to output and other inputs (capital and labour) in different sectors based on the EIBIS. The parametric meta-stochastic frontier analysis approach is more robust than non-parametric techniques (such as data envelopment analysis or descriptive indicators such as energy intensity) for assessing the efficiency of resource utilisation, particularly energy, in different sectors employing varying technologies.

Conceptual framework
Stochastic frontier analysis measures firm efficiency by comparing actual performance to the "frontier" (the maximum possible output achievable given the inputs). Meta-stochastic frontier analysis extends this framework by incorporating a meta-frontier (combining all sector frontiers) setting a benchmark for the best performance across all sectors (in this section), regardless of the technology used. This enables inefficiency to be broken down into two components: a) sector inefficiency, which is assessed relative to the sector-specific frontier; and b) the technological gap, which is assessed relative to the meta-frontier.

In sum, the meta-stochastic frontier analysis methodology provides three key efficiency measures:

- **Sector technical factor energy efficiency (within-sector TFEE):** This indicates a firm's efficiency relative to its sector's frontier, which represents the firm's operational efficiency.
- **Technology gap ratio (TGR):** This captures the gap between the sector frontier and the meta-frontier, reflecting the sector's relative technological advancement.
- **Meta-frontier (meta):** This reflects overall efficiency relative to the meta-frontier, defined as the product of sector technical factor energy efficiency and the technology gap ratio.

Methodological steps

The analysis assumes a Cobb-Douglas production function, following the methodological approach of Honma and Hu (2018), and implements an input distance function to quantify firms' energy efficiency performance. The Cobb-Douglas functional form simplifies the estimation process while remaining flexible enough to analyse energy efficiency. The function is homogeneous of degree one in inputs, that is, f(y, μ*x)=μ*f(x,y), μ>0.

Specifically, the current analysis employs a two-step approach to estimate sector technical factor energy efficiency and the technology gap ratio using stochastic frontier analysis, overcoming the limitations of earlier methods. This ensures consistency in efficiency measurement while addressing technology heterogeneity between sectors.

- **Step 1:** Sector frontier estimation

The sector input distance function for each sector s is estimated using the following stochastic frontier analysis model:

$$-\ln x_{N,i,s,t} = \ln f(y, x_{i,s,t}/x_{N,i,s,t}, \beta) + \nu - u^{+} \quad (1)$$

Where *y* is the value added of firm *i*, in sector *s* and year *t*, $x_{N,i,s,t}$ is the energy spending, $x_{i,s,t}$ are the other two input factors, labour and capital, *v* is a two-sided error term satisfying the classical assumptions and *u* is an on-sided random variable representing technical inefficiency, and *β* is a vector of technological parameters. All factors have been normalised by turnover, and energy spending has been deflated by the energy price index to isolate changes in spending due to quantity changes rather than price fluctuations. Similarly, all the other variables have been deflated by the consumer price index to reflect overall economic conditions and general inflationary trends. In addition, the stochastic frontier analysis model controls for any country and size-specific invariant factors.

The within-sector technical factor energy efficiency is estimated from: Within-sector TFEE=1/exp(u+)

- **Step 2:** Meta-frontier estimation

The technology gap ratio is then estimated by considering the distance of the actual energy spending over turnover from the optimal level based on the estimated sector technical factor energy efficiency, which is the dependent variable. In other words, this variable is the product of the sector technical factor energy efficiency and the actual level. The new estimated technical efficiency will reflect the technology gap ratio based on a pooled estimation with yearly effects following exactly the same process as in step 1.

By combining the estimated within-sector sector technical factor energy efficiency and technology gap ratio, the meta can be obtained as follows:

$$\text{Meta}_{ist} = \text{Within-sector TFEE}_{ist} * \text{TGR}_{ist}$$

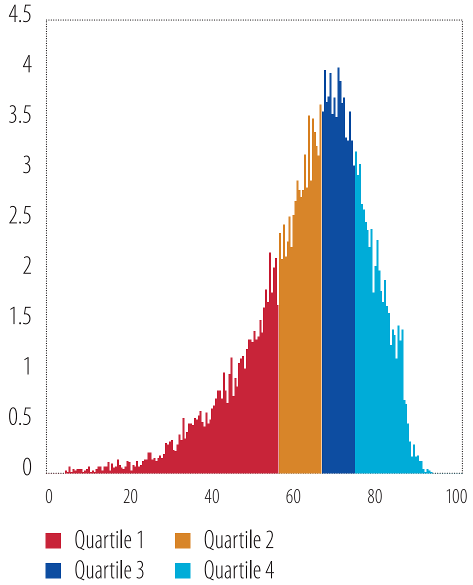
In sum, the technical factor energy efficiency evaluates how efficiently firms in the same sector use their resources, the technology gap ratio identifies technological advancements in that sector, and the meta integrates both measures, capturing the overall efficiency of a firm compared to the best possible performance across all sectors and technologies.

Energy efficiency gaps stemming from technological and governance challenges

The energy efficiency performance of European firms varies significantly from sector to sector, underscoring the need for targeted policies to reduce inefficiencies and promote more sustainable practices. Using the meta-stochastic frontier analysis methodology described in Box B, firms' energy efficiency performance was assessed based on their ability to minimise energy spending given their output and inputs. The estimated meta score – ranging from 0 (least efficient) to 100 (frontier performance) – measures how close firms are to their most efficient counterparts within their sector and throughout different sectors, thereby assessing their operational efficiency. Figure 11 shows the distribution of European firms' energy efficiency performance based on a measure of sector meta-stochastic frontier analysis, highlighted by quartile. There is a strong dispersion in operational efficiency among firms in the lowest efficiency quartiles. Figure 12 illustrates the average EU meta scores by sector, highlighting that leading sectors exhibit higher operational efficiency and narrower technological gaps. The analysis reveals clear sector differences across Europe. Sectors that have so far not been among the most energy intensive or polluting (such as IT and telecommunications and electronics) excel in energy efficiency, while more critical sectors for decarbonisation (such as transport, energy, chemicals and pharmaceuticals, and construction) perform below the EU average.

Figure 11

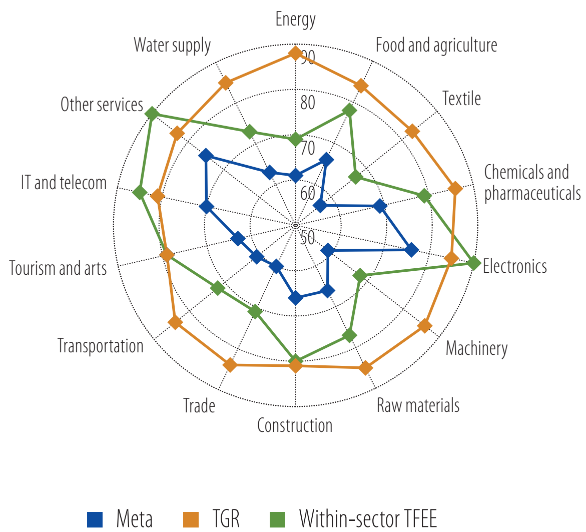
Density distribution of EU firms' energy efficiency performance (meta score)**, by quartile**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *Density distribution of energy efficiency performance (meta scores) across performance quartiles. The quartiles have been calculated based on the overall EU data for 2023 and 2024. The indexes range from 0 to 100%, with 100% reflecting frontier firms.*

Figure 12

Average energy efficiency (meta)**, technology gap ratio and technical factor energy efficiency scores of EU firms, by sector**

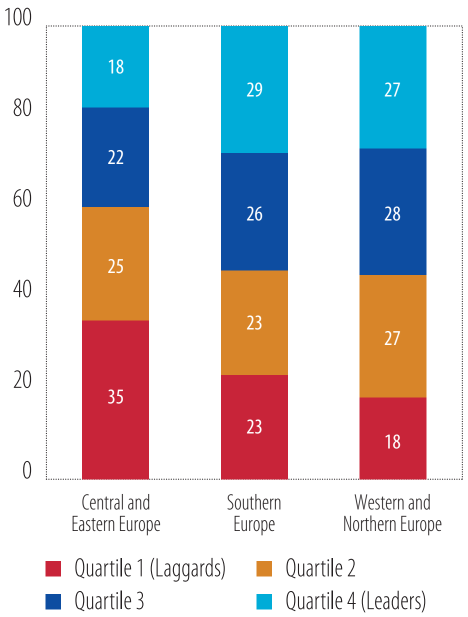


Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The figure shows the average energy efficiency performance (across sector comparison), the technology gap ratio (TGR) and the technical factor energy efficiency (TFEE) of firms within a specific sector.*

Regional disparities in energy efficiency performance are also evident. Figure 13 shows the distribution of meta scores in the different performance quartiles for different European regions, while Figure 14 provides average sector scores by region. According to both figures, firms in Western and Northern Europe consistently achieve the highest energy efficiency scores, reflecting the advanced technologies they use and more efficient operations. Southern Europe follows, while Central and Eastern European firms lag behind, highlighting opportunities for significant improvement. For example, the meta analysis suggests that textile firms in Central and Eastern Europe could reduce their energy expenditure to turnover ratio up to 50% to match similar firms' energy performance in Western and Northern Europe, with the same inputs and outputs and production technology.

Figure 13

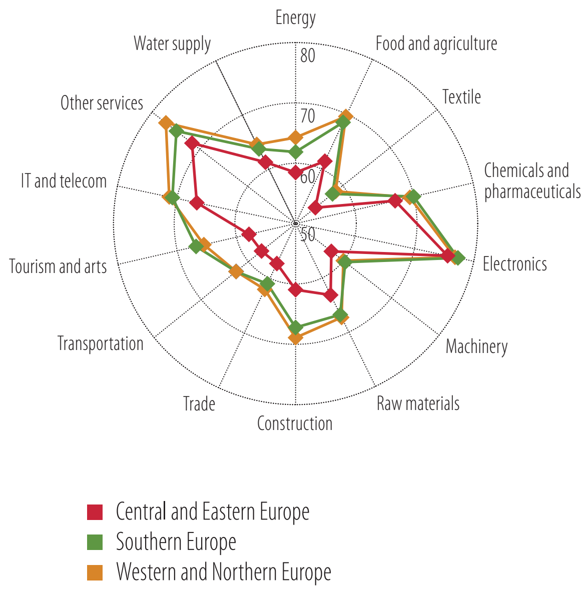
Distribution of EU firms' energy efficiency performance (meta score)**, by quartile and region**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The quartiles have been calculated based on EU data for the last two years.*

Figure 14

Average energy efficiency of EU firms, aggregated (meta scores)**, by sector and region**

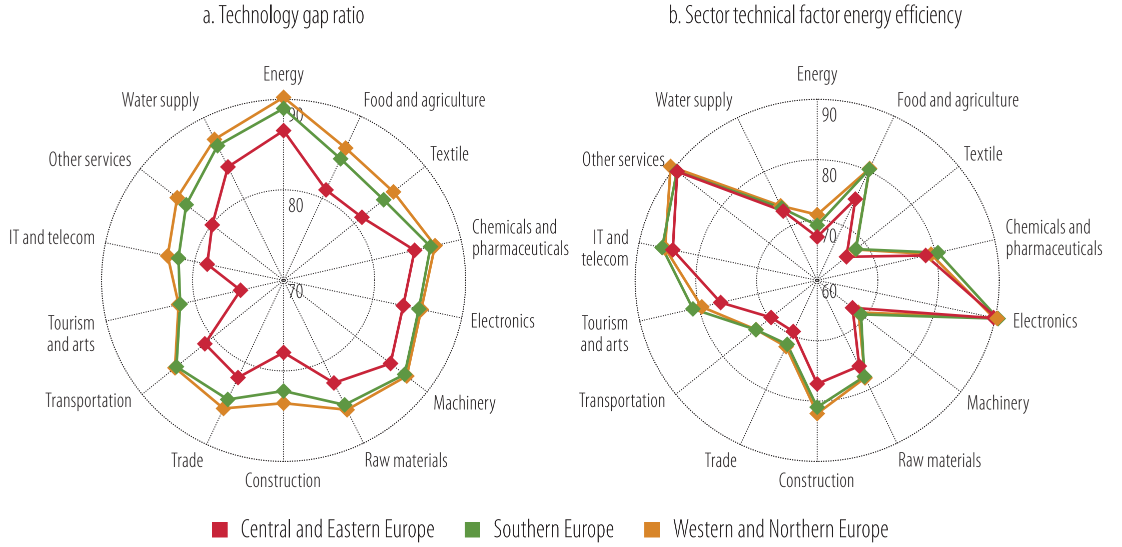


Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *See Box B for more information on the indicators. The index ranges from 0 to 100%, with 100% reflecting frontier firms.*

These disparities can be explained by differences in technology adoption (technology gap ratio) and operational energy management (technical factor energy efficiency within a specific sector). For instance, firms in sectors such as electronics, chemicals and pharmaceuticals, and IT and telecommunications perform well in all regions (Figure 15, right panel), with relatively small differences between firms in the same sector across the European Union. This indicates that in these sectors firms show high operational efficiency, given the available technology. However, despite the higher technical factor energy efficiency, these industries do not implement cutting-edge solutions (Figure 15, left panel), as reflected by their low technology gap ratios. Further efficiency gains will therefore come from adopting state-of-the-art technologies rather than merely improving current operational practices.

Figure 15

Average within-sector TFEE and TGR, by sector and region

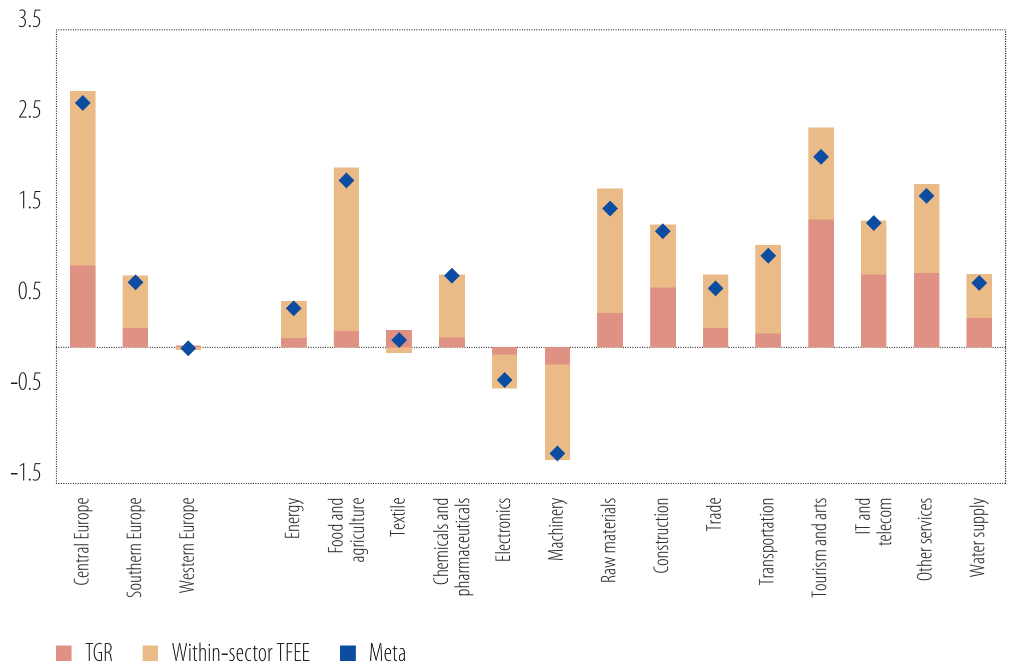


Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The index ranges from 0 to 100%, with 100% reflecting frontier firms.*

Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The index ranges from 0 to 100%, with 100% reflecting frontier firms.*

Figure 16

Decomposition of meta scores (% change from the prior year)**, by sector and EU region 2023-2024**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The meta score change and technology gap ratio (TGR) and within-sector technical factor energy efficiency (TFEE) contributions are calculated as the percentage change for 2023 compared to 2022 for EU regions and sectors.*

In contrast, firms in sectors like textiles, machinery, trade and energy have much lower energy efficiency scores, suggesting that companies suffer from operational inefficiencies even where advanced technology is available. Despite access to better technology as indicated by their higher technology gap ratio ratios (Figure 15), firms in these sectors are not fully utilising energy-efficient practices. This inefficiency could be due to poor management, a lack of skilled labour or suboptimal use of the technologies available. For example, firms in the transportation sector in all regions could reduce their energy expenditure to turnover ratio by up to 30% by enhancing their operational efficiency while continuing to use current production technologies.

Energy efficiency performance improved in all sectors and regions from 2023 to 2024, with previously lagging sectors and regions making notable progress. As shown in Figure 16, while sectors such as machinery and electronics experienced marginal drops in meta scores due to operational inefficiencies, industries like food and agriculture saw the largest improvements, driven by enhanced operational efficiency and technological upgrades. Raw materials, construction and tourism also recorded substantial gains. Central Europe had the greatest regional improvement, with an average 3% increase in energy efficiency performance, primarily by way of improved operational practices and a narrowing technological gap. Western and Northern Europe continued to lead, maintaining stable efficiency levels and setting the performance frontier.

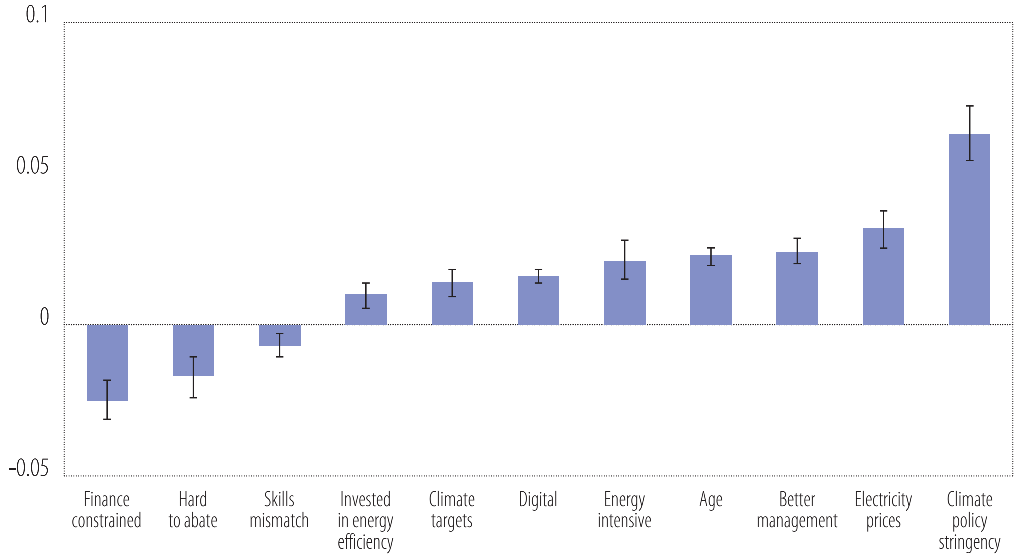
Firms’ energy efficiency performance hinges on internal strategies and external factors

Firms’ energy efficiency performance is shaped by internal and external factors. Internal factors include firm-specific elements such as financial constraints, management practices and the extent of their digital transformation. Meanwhile, external influences such as climate policy stringency and industry and country-related dynamics also play a crucial role. Figure 17 shows the estimated impact (marginal effects) of the determinants on firms’ operational energy efficiency level, capturing the marginal effects of these factors using a standard ordinary least squares (OLS) regression. Conversely, Figure 18 takes a broader approach by using a multinomial logit model to illustrate how likely firms are to reach higher quartiles of energy efficiency. Together, these analyses offer a more comprehensive picture of the mechanisms driving energy efficiency and the factors that support firms in both gradual improvements and larger, more impactful changes.

The most significant factor enhancing firms’ energy efficiency performance is the stringency of climate policy. Stricter regulations create the pressure needed to encourage firms to adopt energy-saving measures, as seen in sectors subject to the EU Emissions Trading System (Barrera-Santana et al., 2022). Firms in regions with stronger climate policies not only face higher compliance costs, but also benefit from a greater push to innovate and adopt cutting-edge energy-efficient technologies. This demonstrates that policy interventions are key in fostering widespread progress towards more sustainable and energy-efficient business practices across Europe.

Figure 17

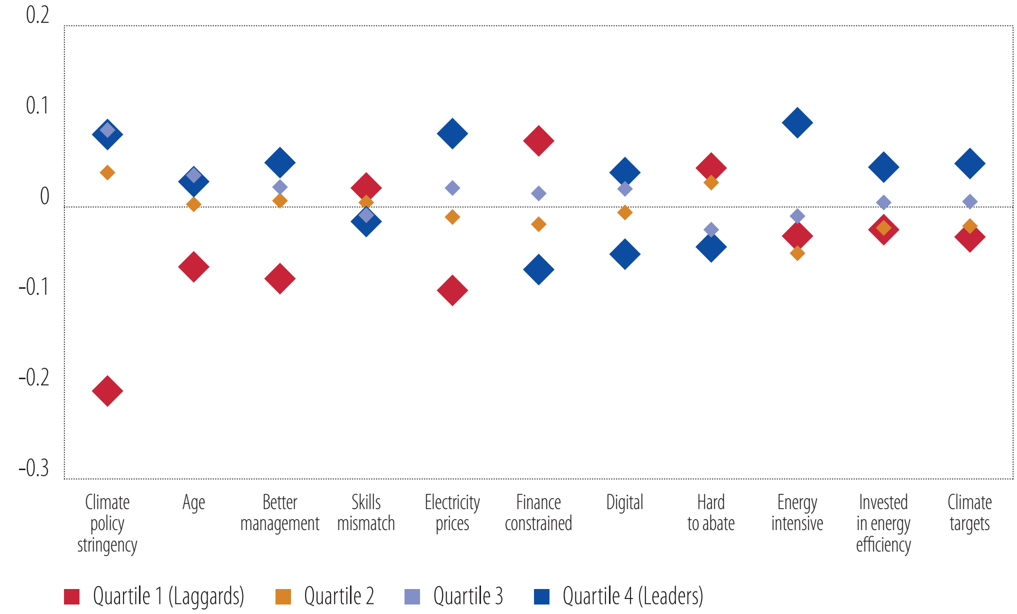
The impact of various determinants on energy efficiency performance (intensive margin)



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The blue bars represent the intensive marginal effects of various factors on energy efficiency, as represented by the meta score, accounting for year and size effects. The black lines indicate 95% confidence intervals.*

Figure 18

Probability of firms belonging to different quartiles of energy efficiency performance (extensive margin)**, based on various determinants**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The first quartile represents firms that are lagging behind, and the fourth quartile those that are leading.*

Market conditions also play a crucial role in shaping firms' energy efficiency performance. High energy prices compel firms to reduce operational costs by adopting energy-saving technologies. This effect is particularly pronounced in energy-intensive sectors, where cost pressures force firms to prioritise investments in energy efficiency to maintain their competitiveness. However, firms with fewer resources (especially those in the lower quartiles of energy performance) often struggle to capitalise on these opportunities, leaving them vulnerable to energy price fluctuations.

Firms with more advanced internal capabilities are better positioned to save energy. Better management practices, digital transformation and climate targets enable firms to improve their energy efficiency. Firms with better management practices consistently outperform their peers by implementing clear strategies, allocating resources effectively and fostering a culture of innovation (Niu et al., 2022). Digital transformation enhances energy efficiency by optimising operational processes, reducing downtime and facilitating the adoption of clean technologies. Firms that integrate digital tools into their energy management systems save significantly on energy costs, particularly in energy-intensive sectors such as chemicals and machinery (Lin and Huang, 2023). Setting climate targets provides firms with a clear roadmap, encouraging accountability and attracting green financing to support energy-efficient investments.

Despite these drivers, various barriers hinder firms' progress in improving energy efficiency. Financial constraints remain one of the most significant challenges, particularly for SMEs, which often lack access to affordable capital to pay for energy-efficient upgrades (Islam and Luo, 2016). Similarly, skill mismatches prevent firms from fully utilising advanced energy-efficient technologies, especially in industries such as raw materials, construction and agriculture. Addressing these barriers with targeted policy measures like training programmes and financial support mechanisms will encourage the broader adoption of energy efficiency in all sectors and regions.

Industry challenges also shape firms' energy efficiency performance. Energy-intensive firms are more likely to invest in energy-efficient technologies because of the substantial long-term cost savings these investments provide. However, firms in hard-to-abate sectors face inherent difficulties linked to the nature of their processes. While these firms often struggle to reduce their energy intensity, adopting advanced technologies and digital solutions can help them improve their energy efficiency. This underscores the importance of fostering innovation and supporting the development of new technologies to bridge the energy efficiency gap in these challenging sectors (Niu et al., 2022).

Energy efficiency measures can improve firms' financial performance

Energy efficiency gains lead to reduced operational costs and increased profitability in several key ways. First, improving energy efficiency directly lowers firms' energy bills, freeing up resources for other investments or expansions. Additionally, by optimising energy use, firms reduce waste and downtime, which enables them to produce more with fewer resources. Productivity gains also increase firms' competitiveness in the market and allow for greater investment in new technologies that further enhance energy efficiency. This positive feedback loop can help energy-efficient firms sustain long-term profitability.

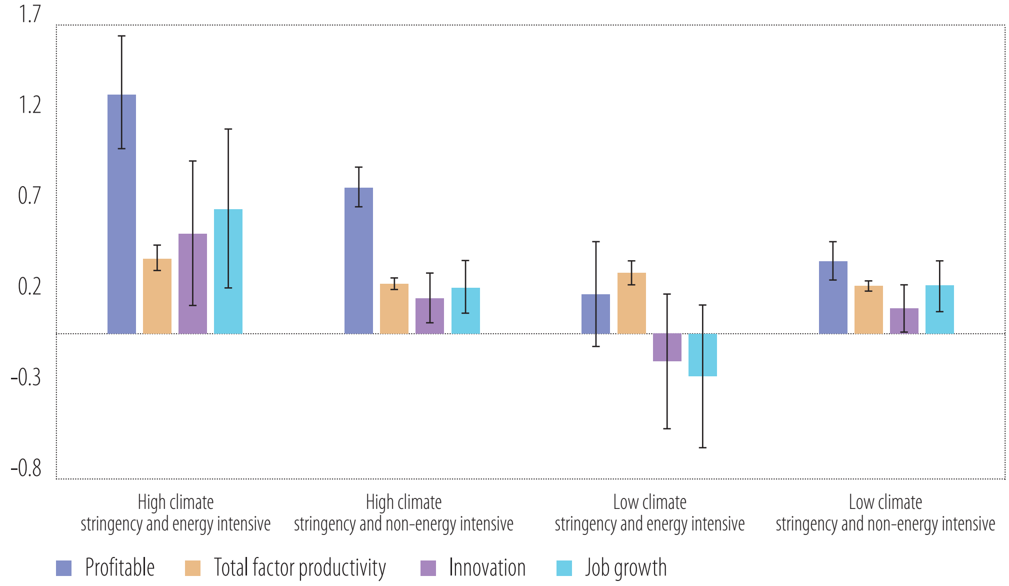
Stricter climate regulations have an impact on firm's performance, particularly for those in energy-intensive sectors. Figure 19 illustrates the estimated impact of energy efficiency on different performance indicators under varying climate policy stringency and energy intensity. Under stringent policies, firms that have improved their energy performance experience substantial gains in profitability, total factor productivity, innovation and job creation. The incentives to transform under these conditions are clear, with heightened regulatory pressure driving investments in energy-saving technologies, improved operations and innovative processes. Both firms in energy-intensive and non-energy-intensive industries benefit from improved energy efficiency with stricter regulation. Non-energy-intensive firms benefit to a lesser extent because their compliance costs are generally lower, but they still leverage energy efficiency to enhance performance.

With more lenient climate regulations, firms in energy-intensive industries have fewer incentives to improve their energy efficiency. Figure 19 shows that, in this scenario, the economic benefits are marginal and not statistically significant without strong regulatory drivers (Martin et al., 2014). The high costs and limited returns of transitioning to energy-efficient operations reduce the appeal of such investments, in line with the findings of existing literature (DeCanio, 1993; Allcott and Greenstone, 2012).

In the same way, a low stringency environment considerably reduces the benefits of being more efficient in non-energy-intensive sectors, especially the likelihood of being more profitable than less efficient firms. This highlights how differences in cost structures, climate regulation and energy dependencies shape firms' motivation to pursue energy-efficiency improvements.

Figure 19

Impact of energy efficiency (meta score) **on firms' performance, by climate policy stringency and energy intensity**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The bars represent the marginal effects of energy efficiency on the probability of being profitable, productive, innovative, and increasing firm's employment, after accounting for year, and size effects. Climate policy stringency uses a normalised sub-indicator from the Climate Change Performance Index that assesses the strictness of national and international climate policies. The black lines indicate 95% confidence intervals.*

Box C

Firms' energy efficiency investment depends on the regulatory environment and access to finance

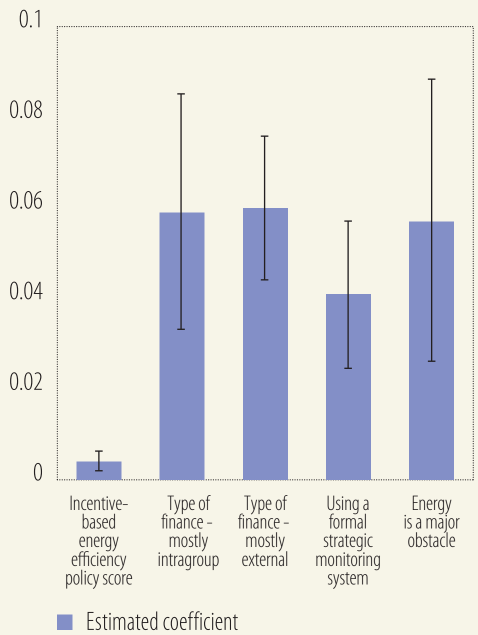
Firms' energy efficiency investments have the potential to lower energy costs and raise competitiveness. On the other hand, energy efficiency accounts for a sizeable share of firms' investment, and high financing costs and suboptimal regulatory environments may pose significant challenges to its deployment. More than two in five EU firms invested in energy efficiency from 2018 to 2022, directing an average of 23% of their total investment to this area. Three-quarters of firms investing in energy efficiency during this time spent more than EUR 11 715, and half of them spent an average of more than EUR 61 650.

The proportion of EU small and medium businesses investing in energy efficiency differs depending on the source of their finance. One-third of firms that rely mainly on internal finance have invested in energy efficiency vs. 44% of firms that rely mainly on external finance. In addition, SMEs relying mainly on internal funding direct a smaller share of their total investment to energy efficiency than their peers relying mainly on external finance (24% vs. 30%, respectively). This analysis shows that in some cases, firms' energy efficiency investment is constrained by financial frictions, with improved access to external sources of finance potentially enabling businesses (particularly SMEs) to make these long-term investments.

There are also other economic and regulatory factors beyond finance that predict how likely firms are to invest in energy efficiency and the intensity of this investment. Econometric estimations suggest that the decision to invest in energy efficiency is associated with economic factors such as size, profitability, perceiving energy costs as a barrier to investment, and the use of a formal strategic monitoring system or advanced digital technologies.[3] In addition, operating in a country with a favourable energy efficiency regulatory environment has a positive and statistically significant relationship with a firm's decision to make energy efficiency investments.[4] One way to measure the strength of the regulatory environment is to look at the strength of its incentive-based component. This is reflected in the proportion of incentive-based policies (policy measures designed to encourage and orient energy efficiency investment) captured within the overall Regulatory Indicators for Sustainable Energy (RISE) energy efficiency scores.

Figure C.1

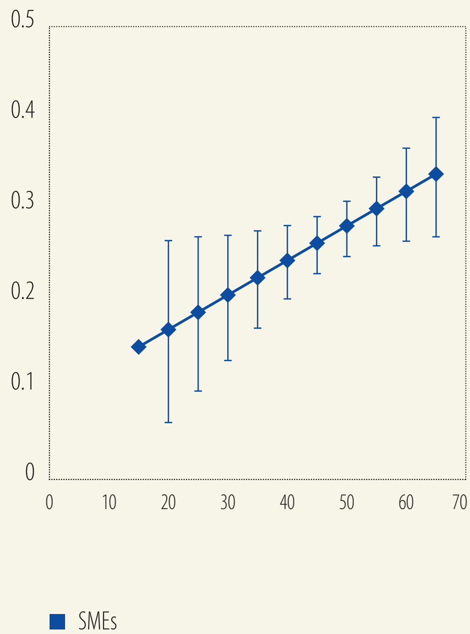
Drivers of energy efficiency



Source: *EIB staff calculations based on EIBIS 2018-2022.*
Note: *The results are estimated from a second stage Heckman selection model. The calculations use an inverse mills ratio from the first stage probit model to correct for selection bias. The estimates include entity and time fixed effects for 2018-2022. They also control for firm size, age, profit, total fixed assets and level of digitalisation.*

Figure C.2

The impact of adopting effective regulation on firms' investment in energy efficiency (a coefficient)



Source: *EIB staff calculations based on EIBIS 2018-2022.*
Note: *Post-estimation results of second stage Heckman selection model.*

A firm's decision to make energy efficiency investments is dependent on business size, access to external finance (particularly for SMEs), and whether it is operating in a country with a favourable regulatory environment. Once firms opt to make an energy efficiency investment, the intensity of this investment is predicted by their capacity to access finance, internal management practices and

3 See Tueske and Lasheras Sancho (forthcoming).

4 The World Bank Group's Regulatory Indicators for Sustainable Energy (RISE) evaluate the policy and regulatory landscape for energy efficiency in 140 countries, including 20 of the 27 EU Member States. The RISE energy efficiency score offers a comprehensive measure that makes it possible to examine the relationship between a country's policy environment and how likely firms are to invest in energy efficiency.

the strength of incentives in the regulatory environment. Estimation results suggest that once firms decide to invest in energy efficiency, their reliance on finance from internal or external sources and the score of national incentive-based energy efficiency regulatory policies are important factors encouraging firms to devote a larger share of their investment to energy efficiency. The use of a formal strategic business monitoring system and a perception of energy costs as a major obstacle to investment are also significant predictors of energy efficiency investment (Figure C.1).

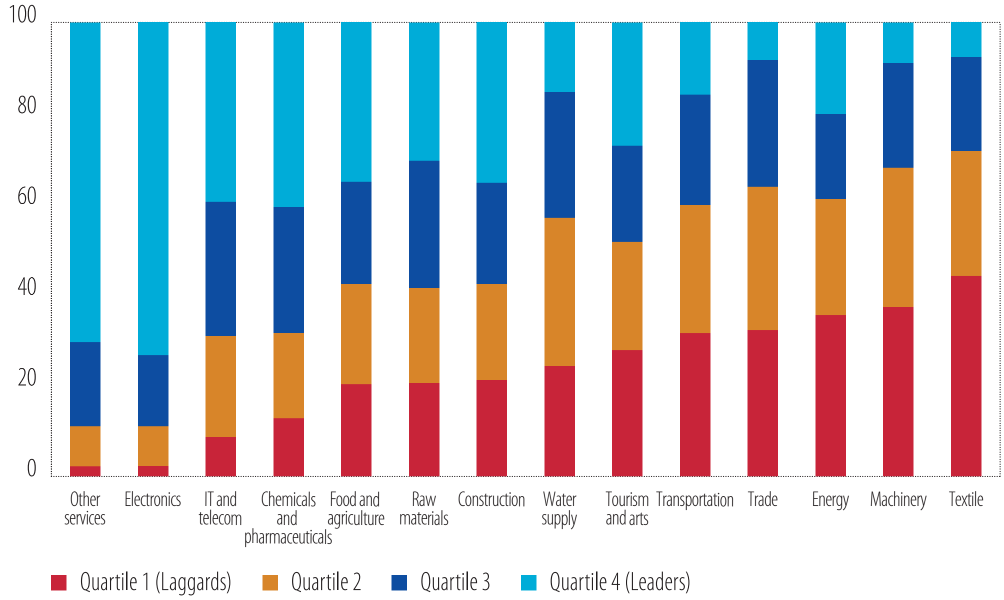
The estimation results can be used to simulate the impact of implementing best practices in energy efficiency regulation. How much SMEs invest in energy efficiency rises in line with the country's incentive-based regulatory score (Figure C.2). Closing the gap between the lowest and the highest energy efficiency regulatory policy score (25 points) could lead to a 9.5 percentage point increase in the share of total investment devoted to energy efficiency measures by SMEs in the least favourable environment. Enhanced access to finance for SMEs has the potential to further increase how much of their investment they direct to energy efficiency.

Energy efficiency leaders outperform laggards in economic performance and innovation

Energy efficiency laggards exist in almost all sectors – even those with good average performance. The gaps shown in Figure 20 highlight the untapped potential of energy efficiency improvements to deliver benefits for the environment, firms and the broader economy. Enhancing energy efficiency reduces costs, boosts competitiveness and supports sustainable growth, much like improvements in other production factors. However, firms often underestimate these benefits, focusing on short-term costs and returns. This tendency is further compounded by market failures such as information asymmetry, limited access to financing and misaligned incentives, making energy efficiency investments appear less appealing. By examining the economic performance differences between leaders (fourth quartile) and laggards (first quartile) under varying conditions, the subsequent analysis demonstrates how targeted improvements can address these disparities, unlock economic gains and align business objectives with environmental goals, creating a win-win outcome for all groups.

Figure 20

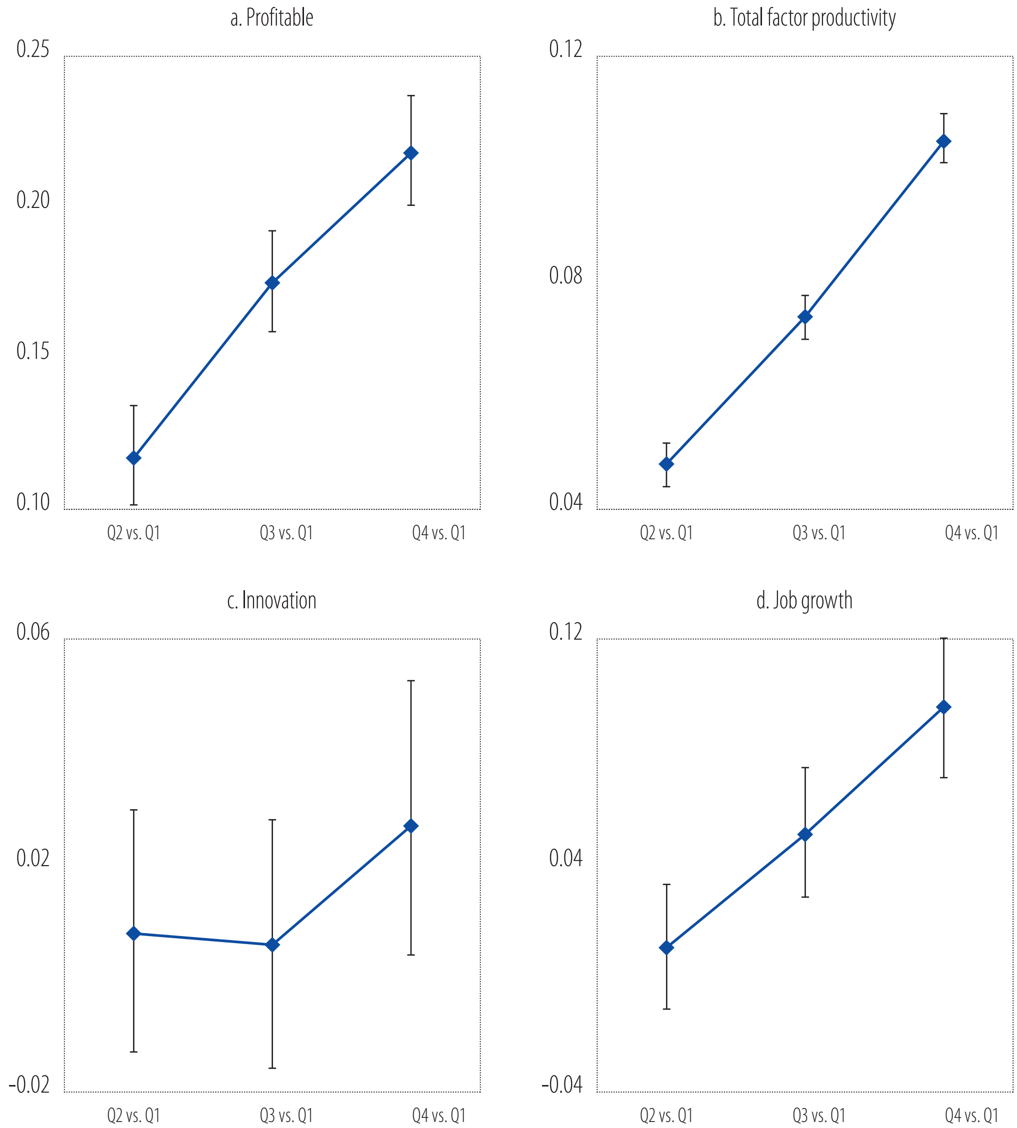
Distribution of EU firms' energy performance (meta score)**, by quartile and sector**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The bars represent the share of firms in each quartile based on their energy efficiency performance (meta score).*

Figure 21

Comparison of firms' performance across energy efficiency quartiles (meta score)**, comparison with the quartile 1 baseline**

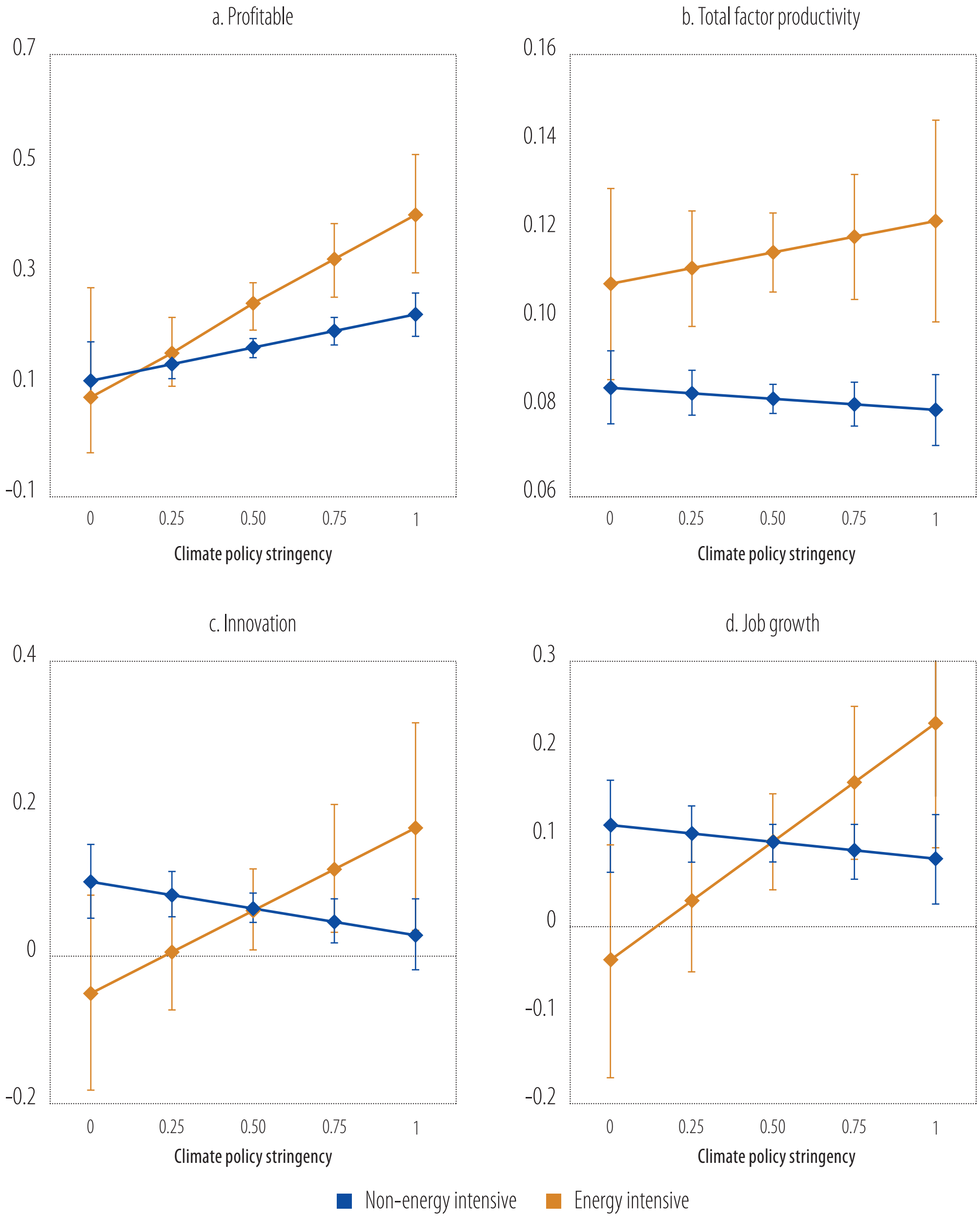


Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The blue dots represent the marginal effects of of being in different energy efficiency quartiles on the probability of being profitable, productive, innovative, and adding jobs, after accounting for country, sector, year and size effects. Quartile 1 (laggards) is the baseline. The black lines indicate 95% confidence intervals.*

Improving energy efficiency enhances several measures of firm performance, including profitability, productivity, innovation and employment growth. Figure 21 shows the differences in outcomes for firms in the most efficient vs. least efficient quartile. Firms in the most efficient quartiles of energy efficiency exhibit stronger financial outcomes. The cost savings from reduced energy use translate into increased profitability, consistent with the conclusions of Barrera-Santana et al. (2022). Moreover, total factor productivity improvements are particularly pronounced, as energy-efficient firms optimise resources, leading to higher output, which mirrors findings from Honma and Hu (2018). Although the effect on innovation is less pronounced, the likelihood of adopting advanced technologies and innovative processes rises with energy efficiency, supporting research by Palm and Thollander (2010) indicating that energy-efficient firms foster a culture of continuous improvement. Additionally, firms with higher energy efficiency tend to experience greater job growth, aligning with the broader economic benefits of energy-efficient practices. This suggests that energy efficiency not only sharpens firms ability to compete, but also contributes to the broader economy through innovation and job creation.

Figure 22

Comparison of firms' performance between energy efficiency leaders (quartile 4) **and laggards** (quartile 1) **in energy-intensive vs. non-energy-intensive sectors as climate regulations become more stringent**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *The lines represent the marginal effects of energy efficiency on the probability of being profitable, productive, innovative, and adding jobs, under different climate policy stringency levels in energy-intensive and non-energy-intensive sectors, after accounting for year and size effects. Climate policy stringency refers to a normalized sub-indicator from the Climate Change Performance Index, which assesses the strictness of national and international climate policies. The vertical lines indicate 95% confidence intervals. Energy efficiency performance measured by meta score.*

Higher energy efficiency improves profitability, especially for companies that must adhere to stricter climate policies. While stricter climate policies can negatively impact profitability, they also provide a competitive advantage to energy-efficient firms (Figure 22). Companies that improve their energy efficiency – particularly when they move from lower to higher efficiency quartiles of the distribution – significantly increase their likelihood of being profitable. The shift is more pronounced in countries with stricter climate policies, as firms in these areas face higher compliance costs and have an incentive to optimise their energy use to maintain or enhance their margins. This aligns with the findings of Dechezleprêtre and Glachant (2014), who show that firms adopting energy-efficient technologies benefit from reduced operational costs, especially when faced with stringent regulatory environments. In conclusion, improving energy efficiency helps to reduce costs and gives firms in regions with demanding climate policies a competitive edge.

Stricter climate policy amplifies energy efficiency gains, particularly in energy-intensive sectors. The greatest benefits go to firms that are more energy efficient (when comparing leading firms to laggards), operate under strict climate regulations and are energy intensive. This trend reflects the broader literature on environmental regulation and firm behaviour, which posits that stringent policies can spur improvements in efficiency by internalising the cost of carbon and encouraging investment in energy-saving technologies (Porter and van der Linde, 1995). Energy-intensive firms, which are more exposed to carbon pricing mechanisms like the EU Emissions Trading System, tend to benefit more from these efficiency improvements (particularly for profitability and total factor productivity), as shown in Figure 22. This confirms findings from Costantini et al. (2017) showing that firms facing stricter regulations often perform better environmentally and economically because they are more innovative and use resources more efficiently.

Box D

Decarbonisation in sectors covered by the Emissions Trading System depends on leaders' actions and laggards' adaptation

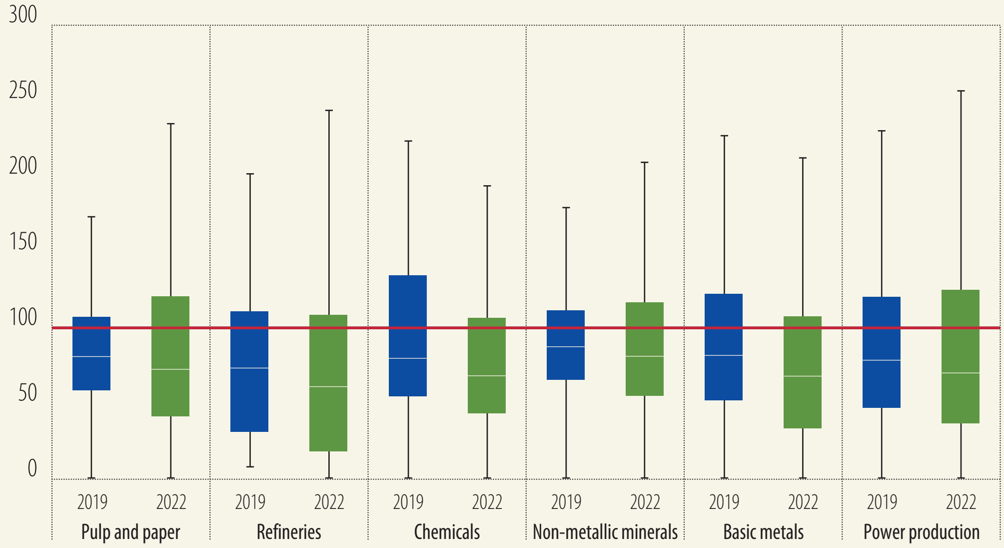
The EU Emissions Trading System (ETS) is one of the world's most ambitious market-based climate initiatives, and it is a keystone of the European Union's drive to reach net-zero emissions by 2050. Founded in 2005 and now covering around 15 000 installations (factories or plants) in climate-critical sectors like energy, manufacturing, aviation and maritime transport, the system covers nearly 40% of Europe's emissions. It applies a gradually tightening emissions cap to reduce the supply of free emissions allowances over time, thereby encouraging companies to cut emissions in a cost-effective manner. While progress has been substantial, there is a marked divide in the decarbonisation of different sectors and even within individual industries, with some firms leading in carbon efficiency while others lag behind.

The power-generation sector is a leading example of how carbon pricing can drive emissions reductions. Emissions from power installations have dropped by over 50% since 2013, largely thanks to the deployment of renewable energy sources and a shift away from coal. This substantial decline is evidence of the system's ability to reshape industry behaviour by providing price signals for carbon, pushing firms towards cleaner operations than are less reliant on volatile fossil fuels. While slower to adapt, the manufacturing sector has also shown significant improvements, particularly as the Emissions Trading System entered Phase IV in 2021. Here, many manufacturers reacted to the reduction of free allowances and increased carbon prices by adopting greener technologies.

Nevertheless, despite overall progress, many firms are still struggling to decarbonise. While more than 50% of firms reduced their dependency on carbon-based fuels in each of the industries covered from 2019 to 2022, every sector has a share of firms that are falling behind (Figure D.1). In fact, more than 25% firms in pulp and paper sector and non-metallic minerals sector seems to have increased their dependency on carbon-emitting processes since 2022 compared to 2019. Furthermore, more than one-quarter of firms in each of the sectors had higher carbon dependency in 2022 than in 2013. This suggests that many firms are limited by the availability of carbon-free solutions for their core processes, highlighting the need for innovation and sector-specific support to close the gap between high performers and those facing more complex decarbonisation challenges.

Figure D.1

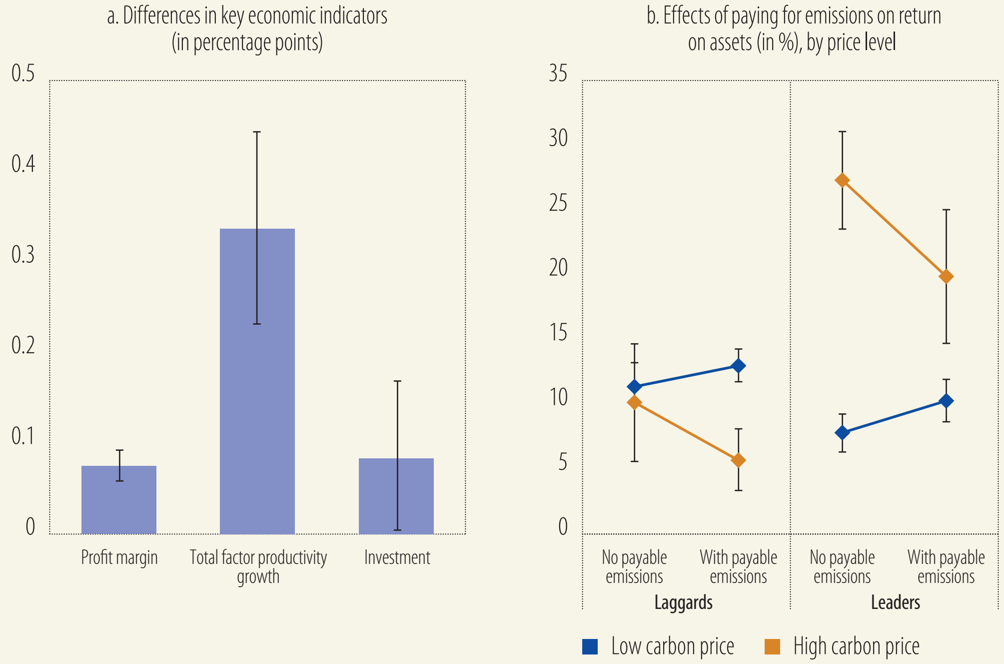
Distribution of the progress on decarbonisation (2013=100), **by sector 2019 vs. 2022**



Source: EU Emissions Trading System (ETS) and Bureau Van Dijk's Orbis database.
Note: Leaders are those in the 25th percentile of firms with the biggest drop in carbon intensity from 2013, while laggards are firms in the 75th percentile.

Figure D.2

Differences in economic performance, leaders vs. laggards



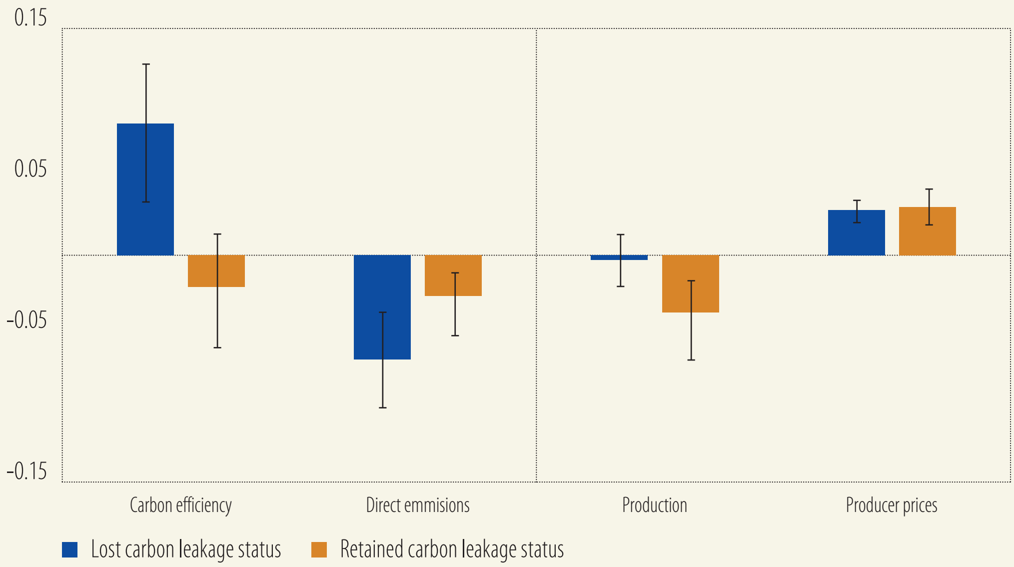
Source: EU ETS and Orbis.
Note: Panel a plots the average difference in variables between leaders and laggards, controlling for sectoral fixed effects. Panel b plots the marginal effects of a one euro increase in ETS prices on the return on assets, controlling for the firm-level fixed effects, the level of total assets, the sales-to-asset ratio and cash-to-asset ratio. Payable emissions are calculated as a difference between actual emissions and free allocations. The calculations refer to the EU manufacturing sector.

The divide between leading and laggard firms covered by the Emissions Trading System underscores the role of green technologies and the need to invest in them. Leading firms have consistently pursued cleaner production methods and energy-efficient systems, as reflected by higher investment ratios, positioning themselves at the forefront of emissions reduction. This commitment has not only decreased their carbon intensity, but also enhanced productivity (Figure D.2a). For instance, post-pandemic data show that leading firms, with stronger investment in capital assets, showed noticeable growth in total factor productivity, a measure of efficiency gains that signals modernisation efforts.

These leaders illustrate how proactive investment in decarbonisation technologies – whether in production equipment or operational processes – can yield dual benefits. By investing early and strategically, these firms improve their environmental footprint and their competitiveness. The shift to mandatory allowance purchases in Phase IV of the trading system[5] has only accelerated this trend (Figure D.3), as companies that previously received free allowances now have an incentive to reduce emissions to avoid rising costs (Hagerdon et al., 2024). The expansion of the trading system will spur more industries to transform, underscoring the system's ability to foster climate action and improved economic resilience (Kalantzis et al., 2024).

Figure D.3

Impact of ETS prices on the carbon and economic performance of sectors (a coefficient for marginal effects)**, based on carbon leakage status**



Source: *EIB staff calculations based on EIBIS 2023-2024.*
Note: *For the model specification, see Hagerdon et al. 2024. The figure below shows the changes in the allocation of free allowances for different sectors under the EU Emissions Trading System from Phase III (2013-2020) to Phase IV (2021-2030). The free allowances are granted to sectors that are exposed to a significant risk of carbon leakage, which means that they may relocate their production to countries with less stringent climate policies.*

While leaders forge ahead, a group of firms continue to fall behind in carbon efficiency. These laggards often face issues such as outdated technology and limited access to green production methods, and they struggle to meet ETS requirements at the same pace as their peers. Firms

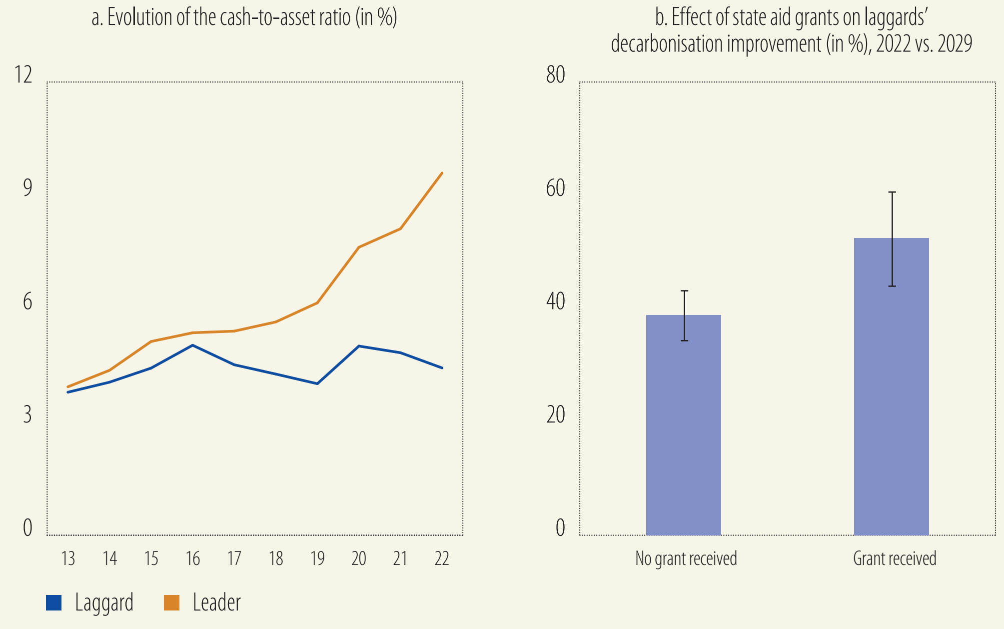
5 The EU Emissions Trading System (EU ETS) has evolved through four main phases since 2005. Phase 1 (2005-2007) was a pilot phase with free allowances, leading to overallocation issues. Phase 2 (2008-2012) aligned with the Kyoto Protocol, introduced some auctions and expanded coverage. Phase 3 (2013-2020) brought structural reforms like a single EU-wide cap and the Market Stability Reserve. Phase 4 (2021-2030) aims to reduce emissions 62% by 2030, with tighter caps and increased auctioning to align with the EU's climate goals. Each phase has progressively tightened the system to better achieve emissions reductions.

in sectors where carbon-intensive processes are integral (such as petrochemicals and lime production) often lack alternatives that would make significant emissions reductions feasible. This decarbonisation drag is not without consequences: as carbon prices rise, laggards find it harder to remain profitable. Unlike leaders, who have managed to offset carbon costs through efficiency gains or by passing them on through higher prices, laggards' profit margins are squeezed by high carbon costs (Figure D.2b). While on balance every incremental rise in the carbon prices cut into profits, laggards manage to keep moderate but stable cash reserves (Figure D.4a). Without major changes in operations or technology, these firms face the risk of becoming "brown zombies" – businesses unable to thrive in a greener economy, yet buoyed by considerable cash buffers and moderate state aid helping them to stay afloat.

Strategic policy support has proven essential to addressing these disparities. Some laggards have received state aid that has helped drive modest improvements in their carbon performance (Figure D.4b), especially during the challenging years of 2017 to 2019. For businesses with credible decarbonisation paths, such targeted financial aid can provide the funds and support they need to transition to more sustainable practices. However, policy needs to be applied with precision – untargeted aid risks subsidising firms that may lack the commitment or capability to green their business. While the share of emissions covered by free allowances has been steadily falling for industries with lagging firms, some 20% of those firms still received enough free allowances to completely cover their emissions in 2022, weakening the effectiveness of more stringent climate regulations.

Figure D.4

Cash buffers and the effect of state aid on carbon laggards and leaders



Source: *EU ETS, Orbis and the European Commission's state aid database.*
Note: *For panel b, the grant component is calculated as a sum of all grant-related support declared as state aid from 2017 to 2019. The calculations refer to the EU manufacturing sector.*

To sum up, the importance of fostering investment in carbon-reducing technologies cannot be overstated. Green investments act as catalysts, enabling companies to not only meet immediate ETS requirements, but also to position themselves competitively in a low carbon future. Many laggards will require a combination of tailored incentives, access to green financing and continued support for innovation if they are to overcome structural and technological barriers.

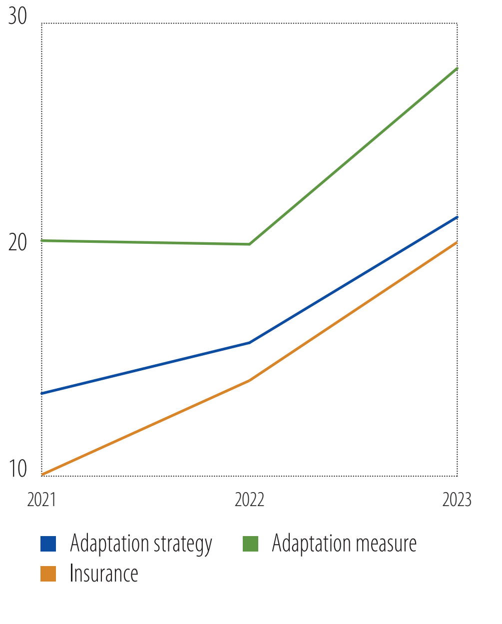
Adaptation is still overlooked in climate action

This section examines how firms and municipalities are responding to the growing need for climate adaptation. It highlights disparities in the characteristics of firms and municipalities, identifying barriers such as financial constraints, technical gaps and unclear regulations. Drawing on the EIBIS and the EIB Municipalities Survey 2024, it explores these challenges and connects them to concrete policies for building a more climate-resilient future.

Firms are making little progress on adapting to climate change, despite high awareness

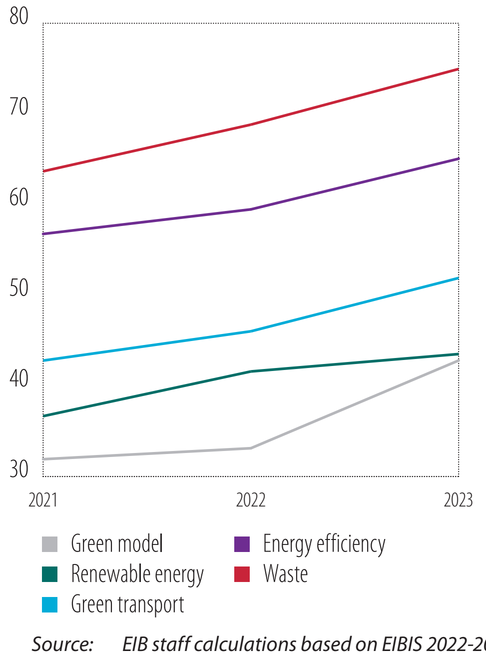
As the climate crisis intensifies, firms are increasingly aware of the need to address both mitigation (reducing greenhouse gas emissions) and adaptation (preparing for climate effects like extreme weather). However, data from the EIBIS reveal a clear imbalance: while a larger share of firms focus on mitigation, fewer are preparing for immediate climate risks. Figures 23 and 24 illustrate this disparity, showing that emissions-reduction measures are more widely adopted than preparations for climate-related disruptions. This imbalance exposes many firms to significant vulnerabilities from the intensifying physical impact of climate change. The analysis below explores critical trends, barriers and enablers shaping firms' adaptation efforts and emphasises the need for a more integrated approach that will help build Europe's resilience.

Figure 23
Investment in adaptation measures
(% of firms)



Source: EIB staff calculations based on EIBIS 2022-2024.
Question: Has your company developed or invested in any of the following measures to build resilience to the physical risks to your company caused by climate change?

Figure 24
Investment in mitigation measures
(% of firms)

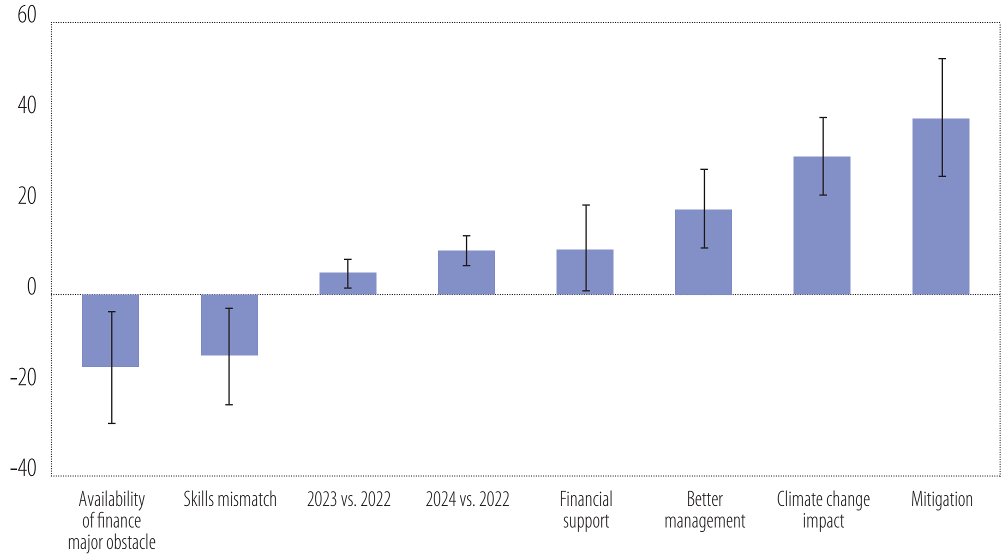


Source: EIB staff calculations based on EIBIS 2022-2024.
Question: Has your company invested in or implemented the following, to reduce greenhouse gas (GHG) emissions?

Encouragingly, firms' shifting perceptions reflect a growing but moderate commitment to adaptation. Evidence from the EIBIS 2023 and 2024 shows an increase in the willingness of firms to invest in adaptation compared to 2022 (Figure 25). This upward trend signals a growing recognition of the systemic risks posed by climate change and the role of preparedness in ensuring long-term business continuity. While the adaptation investments of different regions and firms are still uneven, estimated coefficients suggest that adaptation is increasingly seen as a vital component of climate resilience. This positive shift reflects an evolving corporate understanding of the need to protect operations against immediate and long-term risks.

Figure 25

Factors affecting the probability of investing in adaptation (in percentage points)



Source: *EIB staff calculations based on EIBIS 2020-2024.*

Note: *The marginal effects of investing in adaptation, taking into account the availability of finance as a major obstacle, employee skills mismatch, the change compared to 2022, receiving financial support, having better management practices, having been affected by extreme weather events and having invested in mitigation. The results are based on a panel logit regression that takes into account the estimated weighted average of the above factors by country, year and sector, after excluding the data points that equal either 0 or 1.*

Firms tend to prioritise adaptation investments in response to direct, tangible climate risks, such as extreme weather. The econometric analysis reveals a strong association between prior exposure to physical risks and adaptation efforts, in line with existing literature that suggests adaptation is often reactive in nature (Berkhout et al., 2006). However, this reactive approach creates vulnerabilities for firms in less-affected regions or sectors, where the absence of damaging events may delay them from becoming proactive. The findings underscore the importance of encouraging pre-emptive adaptation strategies to mitigate future risks.

Despite increasing awareness, adaptation remains constrained by financial and skill-related barriers. Effective adaptation requires expertise in areas such as assessing climate risks and planning for worst-case scenarios, and this is not always readily available. Unlike mitigation, which often relies on standardised technological solutions, adaptation requires tailored, context-specific interventions. Without access to the necessary human capital, many firms struggle to design and implement effective adaptation strategies (Hallegatte et al., 2011).

Financial constraints also pose a challenge. Firms that engage in adaptation are more likely to report being finance-constrained, reflecting the significant upfront costs associated with measures such as infrastructure upgrades or climate-risk modelling. This finding is consistent with studies highlighting the financial burden of adaptation on smaller firms or those with limited resources. To this end, financial support can play a role in overcoming financial barriers to adaptation. The econometric analysis demonstrates a significant positive relationship between access to finance with favourable conditions and grants, and how likely firms are to adopt adaptation measures.

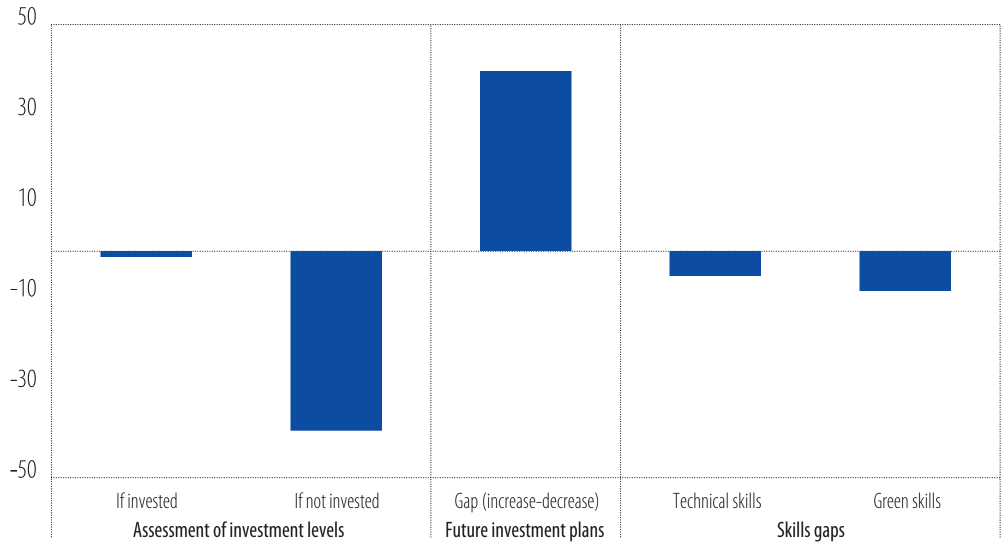
Finally, adaptation and mitigation are mutually supportive strategies for resilience. The findings highlight how adaptation and mitigation can work in tandem to foster true resilience. Adaptation addresses immediate vulnerabilities, while mitigation tackles the underlying drivers of climate risks by reducing greenhouse gas emissions. Together, these strategies equip firms to ensure short-term operational continuity and long-term sustainability. By combining adaptation measures (such as flood-resilient infrastructure) with mitigation actions (such as energy efficiency improvements), firms can create synergies that enhance their overall resilience to climate challenges.

Resource constraints hinder municipalities' ability to adapt to climate change

Municipalities across the European Union are also grappling with the pressing challenge of climate adaptation. They are striving to mitigate risks while addressing persistent gaps in green infrastructure investment. Insights from the EIB Municipalities Survey 2024 show that adaptation projects face unique obstacles – ranging from funding shortages to systemic coordination issues – that hinder progress, even as a growing number of municipalities (63%) recognise climate change as a significant challenge (EIB, forthcoming).

Figure 26

Local investment and skills mismatch (in %)

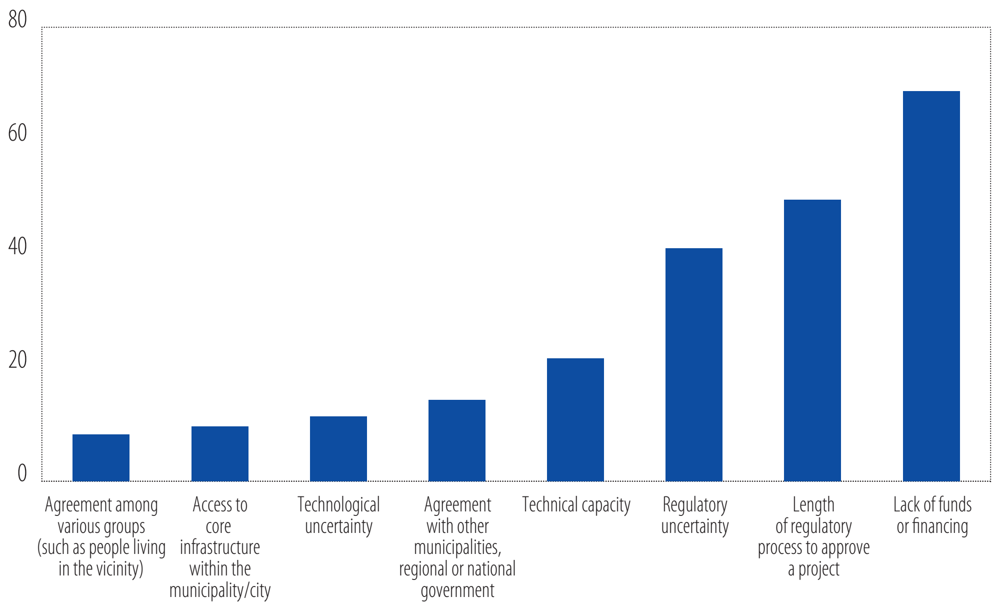


Source: *EIB Municipalities Survey 2024, EIB staff calculations.*
Note: *The gap in the level of investment is calculated as a difference of answers to Part a of the survey question: broadly adequate – sum of lacking (slight lacking and substantially lacking). The gap in future investment is calculated as a difference of answers to Part b of the survey question: increase and decrease in future average annual investment in the two areas compared to the previous three years. The skills gap refers to Part c of the survey question. Technical skills refer to engineering (technical) skills, while green skills refer to environmental and climate assessment skills.*
Question: *(a) In the last three years, that is, between the start of 2021 and the end of 2023, would you say that within your "municipality"/"city" the level of investment in infrastructure projects was broadly adequate, slightly lacking or substantially lacking in each of the following areas? (b) For each of the following areas, if you compare the average annual infrastructure investment you are planning for the 2024-2028 period vs. the average annual infrastructure investment recorded in 2021-2023, does your "municipality"/"city" expect to increase, decrease or have around the same level of spending on infrastructure investment? (c) For each of the following areas, to what extent, if at all, is access to experts a problem to the delivery of your "municipalities"/"cities" investment programme.*

One striking observation is how previous investments influence perceptions of whether adaptation efforts are adequate. Among municipalities that had invested in adaptation infrastructure from 2021 to 2023, a slightly larger share viewed infrastructure as inadequate than adequate. However, the picture was starkly different for those without prior investments, with about 70% of firms viewing investments as inadequate vs. about 30% seeing them as adequate (Figure 26), underscoring critical shortfalls in adaptation capacity.

Looking ahead, municipalities say they intend to scale up adaptation investments. Of municipalities that did not previously invest in adaptation, about 40 percentage points more of them plan to increase this type of investment in 2024-2028. Municipalities increasingly recognise the urgent need for climate resilience. However, the path ahead is fraught with challenges. A lack of funding remains the most significant obstacle (Figure 27), compounded by regulatory complexities and difficulties in coordinating different groups (stakeholders). The nature of adaptation projects means they require systemic approaches and collaborative planning, making these barriers particularly acute.

Figure 27
Obstacles preventing municipalities from investing in climate adaptation (% of municipalities)



Source: *EIB Municipalities Survey 2024, EIB staff calculations.*
Question: *To what extent is each of the following an obstacle to the implementation of your infrastructure investment activities? Is it a major obstacle, that is, it prevents the "municipality"/"city" from realising a particular project, a minor obstacle, that is, it delays a particular project since it requires additional resources (time, money, approvals, etc.), or not an obstacle at all?*

A lack of access to technical expertise further exacerbates these challenges. Municipalities without prior adaptation investments frequently cite difficulties in finding the right engineering and environmental skills, highlighting a critical bottleneck for projects. However, those with prior investments report fewer difficulties, being 6 to 10 percentage points less likely to identify skill shortages as a major obstacle. This finding underscores the importance of targeted efforts to improve the ability of municipalities to carry out adaptation projects.

Financing structures play a pivotal role in municipalities' ability to close funding gaps. Municipalities that rely on their own resources face have difficulty finding the external funding needed for adaptation projects. By contrast, those receiving capital transfers report more positive financing outcomes, while municipalities with balanced budget structures have fewer issues. This suggests that financing models must be adapted to address the unique funding needs of adaptation projects, ensuring all municipalities can access the resources they need.

Cooperation between firms and municipalities must be encouraged – by working together they can apply their joint strengths to closing the adaptation gap. Public-private partnerships can magnify the impact of adaptation investments, enabling firms to enhance competitiveness while municipalities deliver large-scale, climate-resilient infrastructure. Addressing skill shortages and financial barriers with targeted policies will empower these entities to adopt proactive and context-specific adaptation measures.

Embedding adaptation into long-term planning and risk management frameworks is essential. Firms must transition from reactive to proactive approaches, and municipalities should align their adaptation initiatives with broader sustainability objectives. By harmonising adaptation and mitigation efforts, the European Union can ensure its businesses and cities are well-prepared to navigate the escalating challenges of climate change. This integrated approach not only fortifies resilience, but also establishes a foundation for sustainable growth and competitiveness in an increasingly volatile climate landscape.

Conclusion and policy implications

Europe's journey to a sustainable future presents a dual challenge: advancing the transition to clean energy while limiting carbon emissions. While the power sector has been heavily invested in transforming since the energy shock, the transformation taking place in other economic areas has created leading and laggard firms in all sectors and regions. These differences highlight the need for targeted policies that can enable all parts of the European Union to achieve their climate objectives while enhancing long-term economic resilience. Closing these gaps will not only help Europe reach its climate targets, but also bolster its competitiveness and reduce dependency on volatile energy markets, supporting a more unified industrial landscape across the continent.

Clean energy investments in Europe – particularly in energy-efficient technologies and electrification – remain pivotal to narrowing disparities. Europe has made progress in electrifying transport (such as electric vehicles) and other end-uses of energy (such as heat pump installations). However, investments in hard-to-abate sectors including freight, aviation and shipping remain limited, largely because of technological and financial risks. Across the European Union, it is important to harmonise financing frameworks, reduce market fragmentation and foster cooperation. Those efforts are critical to scaling up innovation and accelerating the development and adoption of technologies to address challenges posed by the transition. Providing financial support and incentives for less mature technologies will enable firms to take advantage of state-of-the-art technologies, reducing inefficiencies and pushing up productivity in all sectors. These efforts will be key to achieving a more integrated and cohesive industrial strategy that combines environmental and economic objectives.

Stricter environmental policies serve as a catalyst that pushes businesses to adopt sustainable practices, which in turn unlock economic benefits. Regulatory stringency drives transformation in all sectors, but targeted incentives are often necessary to maximise impact. As the European Union tightens emissions caps and free carbon allowances become increasingly scarce, it is vital to create an environment that encourages green investment across the economy. This push for transformation affects energy-intensive and non-energy-intensive industries, and the ability of firms to adopt new technologies and reduce their reliance on energy and carbon-emitting activities will play a pivotal role in building resilience. Stringent regulation will help drive the transformation of firms in sectors that continue to rely on less advanced technologies or face operational challenges, while targeted support could help alleviate the financial constraints blocking the transition. These efforts will enhance productivity and promote energy efficiency, particularly in sectors and regions where progress has been slow.

While European firms are making strides in emissions reduction, a significant gap remains in their preparedness for the impact of climate change, leaving many vulnerable to immediate risks like extreme weather. Mitigation efforts driven by strong regulatory and financial incentives dominate, while adaptation investments are weighed down by higher upfront costs, limited immediate returns and skill mismatches. This imbalance is particularly pronounced in resource-constrained small businesses and regions with less supportive regulatory frameworks. To address these issues, adaptation must be integrated into broader clean energy and technology strategies, supported by dedicated funding, tax incentives and targeted training initiatives. Bridging the mitigation-adaptation gap will ensure that firms reduce emissions while also building resilience against climate risks.

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Data annex

The availability and quality of the data on investment are critical to supporting effective policymaking. In addition to national accounts, economists need to rely on other sources of macroeconomic data to analyse important aspects of investment, including infrastructure investment and intangible investment, and they increasingly make use of firm-level data.

This annex outlines these datasets and provides references to detailed methodological notes.

EIB Investment Survey

General module

The EIB carries out an annual survey of firms in the European Union (EIBIS General Module) with the aim of monitoring investment and investment finance activities and capturing potential barriers to investment. The survey covers approximately 12 000 companies across the European Union and slightly more than 800 firms in the United States. It is administered by telephone (in the local language) and takes an average of 25 minutes to complete. The first wave of the survey took place in 2016 and the survey completed its ninth wave in 2024, with interviews held between April and July 2024.

Using a stratified sampling methodology, the EIBIS General Module is representative for all 27 Member States of the European Union and the United States. It is representative at the level of four firm size classes (micro, small, medium and large) and four sector groupings (manufacturing, services, construction and infrastructure) for most countries.

Firms must have a minimum of five employees to be interviewed, with full-time and part-time employees counted as one and employees working less than 12 hours per week excluded. Eligible respondents are employees in senior positions with responsibility for investment decisions.

The survey is designed to build a panel of observations over time and is set up in such a way that survey data can be linked to firms' reported balance sheet and profit-and-loss data (see EIBIS-Orbis matched dataset below). Approximately 40% of the companies interviewed in each wave are companies that have already taken part in the survey in the previous wave.

The EIBIS General Module complements pre-existing information on investment activities in the European Union. It adds a firm-level dimension to the macroeconomic data available and thus facilitates a more fine-grained analysis of firm investment patterns. It also adds to existing firm-level surveys at a national level by providing full comparability of results across countries. The survey complements the European Commission investment survey by asking a much wider set of qualitative and quantitative questions on firm investment activities. It rounds out the European Central Bank/European Commission SAFE survey by focusing on the link between firm investment and investment finance decisions.

Table 1
EIBIS at a glance

27	EU Member States are all consistently represented by the survey – more specifically, non-financial enterprises with at least five employees and belonging to NACE categories C to J.
4	industry groupings and size classes determine the representativeness of the data within almost every member country.
12 033	firms in the European Union participated in the last wave of the survey.
800	US firms participated in the last wave of the survey.
44%	of all firms participating in the last wave responded in at least two consecutive waves.
79%	of firms surveyed in 2024 agreed to be contacted again for next year's survey.

The EIBIS is a very powerful instrument built according to the highest scientific standards. To guarantee top quality, every step of the survey process is executed and closely monitored by experts in the field. All steps – sampling and weighting, questionnaire development and translation, the fieldwork, and quality control and data processing – are also subject to strict controls and validation. More information on these technical aspects can be found in the technical report produced by the market research company conducting the survey (Ipsos, 2020). Table 1 presents key numbers about the EIBIS.

All aggregated data using the EIBIS General Module in this report are weighted by value added to reflect the contribution of different firms to economic output more closely. More information about the survey is available at www.eib.org/eibis.

Representativeness of the general module

The EIB Investment Survey is designed to be representative for the European Union and the United States at a country level and for most countries at a country-industry-group and country-size-class level.

In an EIB working paper (Brutscher et al., 2020), we assessed the data quality of the EIBIS in three steps. First, we benchmarked the sampling frame from which all survey respondents are drawn, the Bureau van Dijk Orbis database, against official statistics to see how well our sampling frame captures the relevant business population.

Second, we compared the final EIBIS sample against firms drawn at random from the same sampling frame and compared statistics constructed from the financial information included in that sampling frame. The purpose of this exercise was to assess whether and to what extent firms' willingness or unwillingness to participate in the survey may have led to a selection bias.

Last, we compared aggregate statistics calculated from the final EIBIS sample to corresponding statistics from Eurostat and the Organisation for Economic Co-operation and Development (OECD). In addition, we compared statistics based on financial information calculated from the EIBIS to the counterpart data obtained from the CompNet database. This purpose of this exercise was to evaluate both the level and dynamics of the financial information calculated from firm-level data.

Overall, the results from all three steps are very positive. First, the assessment of the sampling frame (a comparison of the Bureau van Dijk Orbis dataset with the Eurostat Structural Business Statistics (SBS) for the European Union and the United Kingdom[1] for the relevant sector/size classes) showed coverage ratios (number of firms in Orbis/number of firms in the SBS database) between 75% and 100% for the majority of countries. The ratio is between 50% and 75% in a few countries, and in only four – Cyprus, Greece, Luxembourg and Poland – does the coverage ratio fall below 50%.[2]

The sampling frame must cover a high percentage of the population of interest for the EIBIS survey results to reflect what is happening in the non-financial corporate sector in the European Union. However, this condition alone is not sufficient because, like any other survey, the EIBIS runs the risk of selection bias if there are systematic differences between firms that are willing to participate in the survey and firms that are not.

Secondly, to test whether (and if so, to what extent) the EIBIS sample is subject to such selection issues, we compared the distribution of a set of financial ratios in the final EIBIS sample against those of five samples drawn at random from the same sampling frame. The financial ratios were calculated using information in Orbis. The idea was that statistically identical distributions between the EIBIS sample and the random samples would provide evidence that selection bias does not pose a major issue for representativeness and vice versa.

1 For the United States, the statistics were compiled from the US Census Bureau and the Bureau of Economic Analysis.

2 An important driver of the positive coverage ratio is that the EIBIS samples firms with five or more employees. Coverage ratios tend to be higher for larger firms, so excluding the smallest firms from sampling significantly boosts coverage.

Using a Kolmogorov-Smirnov approach to compare the two samples, we find that for almost all countries, the percentage of variables for which the null hypothesis of equal distribution in the EIBIS and random samples is rejected is very low, suggesting a high degree of resemblance between EIBIS and the random sample.[3] In other words, comparing the final EIBIS sample with a series of random samples from the same sampling frame provides little evidence of sampling bias in our data.

Finally, a comparison of the financial information from Orbis for firms in the final EIBIS sample to CompNet data also suggests good coverage of both EIBIS and Orbis information. The CompNet data are based on a distributed micro-data approach. Relevant data are extracted from often-confidential firm-level datasets available within national central banks or national statistical institutes and aggregated so that the confidentiality of firm data is preserved. The outcome of CompNet is a wide range of indicators at the country-sector-size-class level.

To assess the final EIBIS sample, we reproduced the same country-sector-size-class level indicators using the Orbis information for firms in the EIBIS (where possible) and compared them to those in the CompNet dataset. What we found is a very close match between the two datasets, with the financial variables in the EIBIS and the CompNet database showing very similar trends.

More information on both the general module and the add-on module in the EIB Investment Survey is available upon request by email to eibis@eib.org.

EIB Municipalities Survey 2024

In 2024, the EIB Municipalities Survey polled 1 002 municipalities in the European Union on their infrastructure investment activities and associated barriers.

The survey was administered by telephone (in the local language) among mayors, treasurers and/or municipalities' chief civil engineers. It took a median average of about 23 minutes to complete. Fieldwork took place between June and September 2024. As part of the survey, 1 002 municipalities were interviewed in all 27 EU Member States.

The sample frame from which municipalities were randomly selected was a comprehensive list of European municipalities. All larger municipalities (above 2 000 inhabitants) were eligible to be included in the exercise.

Regional and European Union-wide figures are weighted based on the urban population in each country to take size differences into account.

More information on the EIB Municipalities Survey is available upon request by email to municipality_survey@eib.org.

EIBIS-Orbis matched dataset

This report includes analysis based on a dataset that combines firm-level information from Bureau van Dijk's Orbis with the EIBIS – the EIBIS-Orbis matched dataset. The matching was carried out by the current survey provider Ipsos until the 2022 survey wave, while since 2023 this has been done by the EIB. Orbis is a proprietary dataset that contains firm-level accounting information and ownership data, gathered and standardised according to a global format that makes accounting data comparable across jurisdictions. Items from the balance sheet and profit-and-loss accounts have been used to construct standard financial

3 The Kolmogorov-Smirnov (KS) test is a nonparametric statistical test for the equality of probability distribution between two samples. Unlike a t-test, KS does not just compare the means of a variable, but also tests the null hypothesis that two samples are drawn from the same distribution by quantifying the distance between the empirical distribution functions of two samples. It therefore compares the shapes of the two distributions and evaluates whether the vertical differences between them are statistically significant.

ratios for firms that reflect financing activity and financial health. All data were reviewed following standard cleaning procedures to eliminate outliers and inconsistencies. Negative values for fixed assets, total assets and other stock variables were removed and all ratios have been winsorised at 1%. Starting in 2024, the matching has also been updated with Orbis Intellectual Property, which features a rich dataset on the patenting activities of companies listed in Orbis.

The matched dataset complements the cross-sectional perspective of the EIBIS with time series information starting in 2000. Custom panel datasets used in several analyses in this report were constructed thanks to this dataset.

ETS-Orbis matched dataset

To identify the firms behind the operator accounts in the EU Emissions Trading System, we rely on the correspondence table provided by the Joint Research Centre of the European Commission (Letout, 2021). We use the following procedure to purge the file of possible duplicates or false-positive links. First, we drop all records with missing account or firm identifiers. Second, we drop all records that assign multiple firm identifiers to the same account holder. We then drop duplicate records to allow for many-to-one matching with the emission file (one company may have multiple accounts in the EU Emissions Trading System). The last step is to collapse the installation level information by firm. We keep track of the number of installations owned by a firm over time and the sum of all the verified emissions and emission allowances attributed to them. We also assign an Emissions Trading System subsector to each firm, based on which two-digit sector was responsible for the majority of a firm's emissions over the years.

State aid and its relationship with national accounts and EU funding

Various measures of financial support for corporates are used throughout the report. These measures use different sources and are not directly comparable. This section aims to clarify their relationship with each other.

What is state aid?

State aid encompasses all forms of government-controlled financial resources that may be transferred or granted to undertakings, companies and industries on a discretionary basis. For a public measure to constitute state aid, it must satisfy all of the cumulative criteria of Article 107(1) of the Treaty of Functioning of the European Union – it should constitute an intervention by the state or through state resources giving a selective advantage to the recipient that distorts or potentially distorts competition and affects trade between EU countries. State aid is therefore recognised by the treaty as an advantage that is in principle incompatible with the internal market and is in general prohibited.

Despite the general prohibition, there are policy objectives, defined by the treaty, for which state aid interventions can be justified as necessary to ensure the economy functions properly and equitably. These objectives include social and regional cohesion, employment, research and development, sustainable development, services of general economic interest, etc. State aid may also be compatible with the treaty if the measure in question corrects specific market failures. In response to exceptional circumstances (such as the COVID-19 pandemic or the energy crisis), the state aid framework can be relaxed to include more diversified forms of aid, higher ceilings and extended time frames.

The European Commission must have been informed of and have approved state aid measures before they are activated, although there are exceptions to this notification obligation to reduce the administrative burden on authorities and to encourage aid to be channelled into economic growth without giving recipients an unfair competitive advantage. This is the case for measures covered by the General Block Exemption Regulation, de minimis aid measures (not exceeding €200 000 per undertaking over any period of three fiscal years) and interventions that fall under a scheme already approved by the Commission.

State aid and national accounts

State aid refers to the transfer of wealth to recipients, while the associated part of national accounts refers to monetary transactions between institutional units. State aid instruments take the form of grants, interest rate subsidies, tax advantages, guarantees, the provision of goods and services on preferential terms, debt write-offs, loan advances, etc. In addition, multiple instruments often coexist in the same state aid provision (for example, a grant may appear together with an interest rate subsidy). The closest relationship that can be established between state aid and national accounts is in the monetary transaction portion of wealth transfer.

Financial support for corporates appears in national accounts, providing insights into transfers from the general government and the rest of the world (including EU funds) to various institutional sectors, including corporates. Transfers can be current (affecting disposable income) or capital (linked to fixed assets). Current transfers include subsidies and social contributions, while capital transfers include investment grants, for example. There is no one-to-one link between state aid financial instruments and national accounts categories.

National accounts categories (provided as financial support for non-financial corporations) that can be associated with state aid instruments are subsidies on production (D39) and investment grants (D92). Subsidies on production are payments from the government or EU institutions to resident producers without a direct return, classified as current transfers because they affect disposable income (such as subsidies to reduce pollution). Investment grants are considered capital transfers, as they are linked to the acquisition or disposal of fixed assets to support specific investment projects and might be transfers from the rest of the world, including EU funds. Subsidies and investment grants are recorded in national accounts when the related transaction occurs, and grants in kind are recorded when asset ownership is transferred.

The partial overlap between state aid and national accounts is due to the different nature and coverage of the data. Using a grant as a state aid instrument is a clear example of a monetary transaction registered between the state and the recipient, meaning that it is also recorded in national accounts. For tax rate reductions (another state aid instrument), the amount of tax collected will be lower, but without monetary transactions taking place between the state and the beneficiary, meaning that there is no record of it in national accounts. In addition, while aggregate statistics on state aid provided are available from the State Aid Scoreboard, disaggregated data are only available from the Transparency database above the reporting threshold (EUR 500 000 per beneficiary and year before 2020 and gradually lowered to EUR 100 000 from 2020 onwards) or from national databases (where these exist).

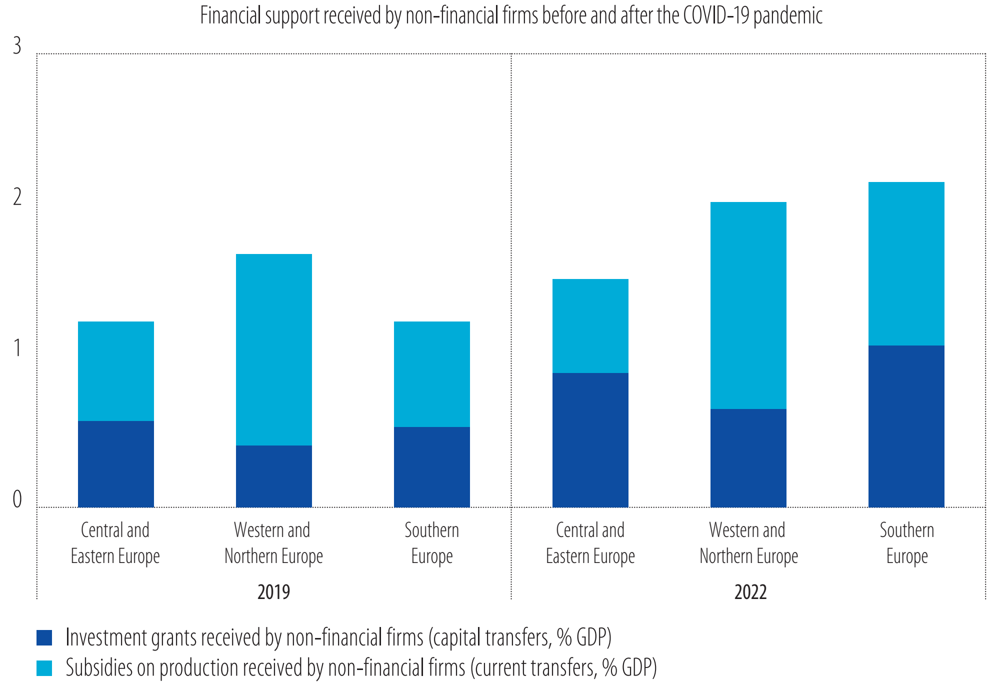
State aid and EU funding resources used for supporting corporates

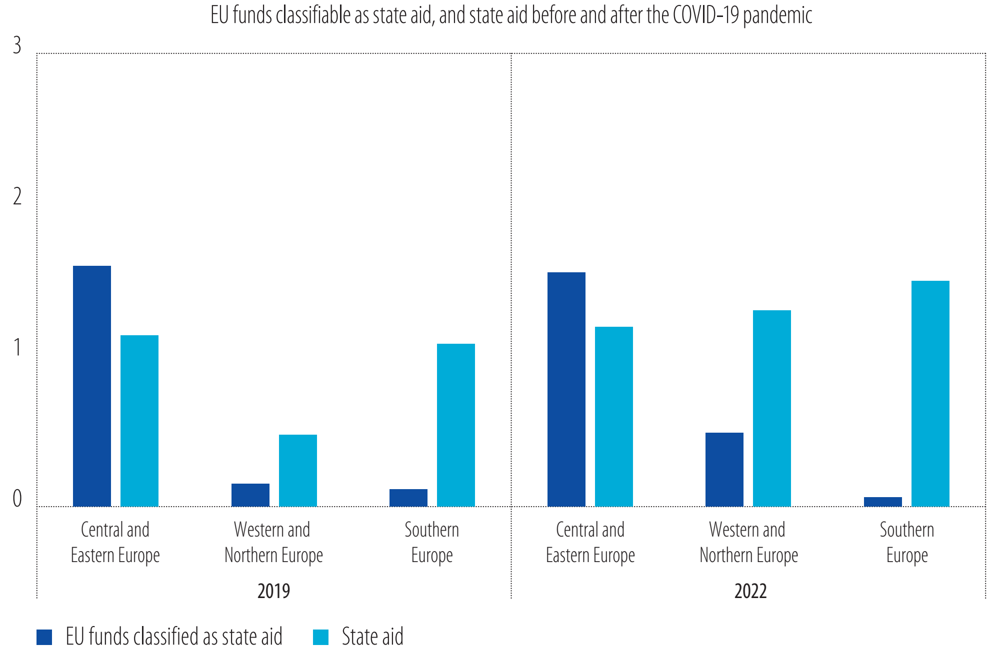
Control concept criteria are used to decide what part of EU funding can be considered state aid; whenever EU funds are managed by national authorities, state aid rules apply provided that other state aid criteria defined by the treaty are satisfied. Funds that are directly managed by the European Union do not count as state aid. In addition, not all EU funds managed nationally have firms as beneficiaries (a prerequisite for being considered state aid). EU funds such as the Innovation Fund, InvestEU, HorizonEU and funds under the Common Agricultural Policy are not under state aid control (for example, the Innovation Fund is directly managed by the European Union). Conversely, the Recovery and Resilience Facility, EU Structural and Investment Funds and the Just Transition Fund may fall under state aid control (Member States are responsible for selecting the project and setting grant amounts under the Recovery and Resilience Facility, subject to the Commission’s approval of the corresponding recovery and resilience plan).

State aid accounts for a smaller share of gross domestic product (GDP) than financial support received by non-financial corporations. Figure 1 illustrates the relative dimensions of three items expressed as a share of GDP: subsidies on production and investment grants received by non-financial corporations (registered in national accounts), the amount of EU funds that may constitute state aid, and state aid. Financial support increased in all macro regions from 2019 to 2022, with the highest growth seen in

Southern Europe (0.9 percentage points). State aid has also been on an upward trajectory, with Western and Northern Europe displaying the most dynamic growth pattern.

Figure 1
Distribution of population across age groups (millions of people, UN population forecasts)





Source: EIB staff calculations based on UN Population forecasts, 2024 edition.
Note: Values for 2044 are UN forecasts assuming zero immigration.

Both before and after the COVID-19 pandemic, the EU financing share of state aid seems to have been highest in Central and Eastern Europe, followed by Western and Northern Europe and lastly Southern Europe. It is important to keep in mind that the EU financing share of state aid does not include all EU fund payments, only those potentially compatible with state aid rules. Many EU funding programmes – such as those managed by the European Investment Bank, the European Investment Fund and InvestEU – are not considered. In Central and Eastern Europe, the amount received from EU funds classifiable as state aid is relatively high compared to the financial support received by non-financial corporations in the same year (0.4 and 0.04 percentage points higher than financial support for non-financial corporations in 2019 and 2022, respectively). This is not surprising, given that EU funds are not only allocated to the corporate sector, but also support various other projects such as educational programmes and public research initiatives.

Calculating the share of government investment financed with European Structural and Investment Funds

There are limited data on the use and amount of EU resources deployed in different EU Member States. The European Commission refers to the projects that are financed using Multiannual Financial Framework resources as investment. However, this does not hold for all projects conceptually or from an accounting point of view, with these projects not being recorded as government gross fixed capital formation under the Eurostat classification. Similarly, only some Recovery and Resilience Facility-related spending can be regarded as public gross fixed capital formation.

To bridge this data gap, we approximate the contribution of EU funds to public investment over the current programming period (2021-2027) using the data from projects implemented under the Multiannual Financial Framework 2014-2020. Both the Recovery and Resilience Facility and European Structural and Investment Funds (including cohesion funds) finance projects that support private spending on increasing tangible and intangible capital stock, classifiable as capital transfers. Using data from the Kohesio database covering EU Structural and Investment Funds for 2014 to 2021, we classify projects as public investment, capital transfer, current expenditure or other spending. This classification makes it possible to estimate the contribution of the Multiannual Financial Framework 2014-2020 to government investment in each EU Member State. Finally, by using the same proportion as a best guess for the future share of EU funds, we can project their contribution to public investment in the next Multiannual Financial Framework period.

Using the Regulatory Indicators for Sustainable Energy (RISE) as the regulatory environment for firms' energy efficiency investments

The World Bank Group's Regulatory Indicators for Sustainable Energy (RISE) evaluate the policy and regulatory landscape for energy efficiency across 140 countries, including 20 of the 27 EU Member States. The RISE Energy Efficiency (EE) score offers a comprehensive measure making it possible examine the relationship between a country's policy environment and how likely firms are to invest in energy efficiency.

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Glossary of terms and acronyms

Adaptation	Addresses the risks posed by climate change rather than the underlying causes (as in "climate change adaptation").
AFME	The Association for Financial Markets in Europe.
AI	Artificial intelligence. A system's ability to correctly interpret external data, to learn from such data, and to use such learning to achieve specific goals and tasks through flexible adaptation.
ALMP	Active labour market policy.
AMECO	The annual macroeconomic database of the European Commission's Directorate-General for Economic and Financial Affairs.
Automation	Substitution of human labour with work performed by machines, to achieve higher quality and quantity of output at lower costs.
Big data	Extremely large data sets that may be analysed computationally to reveal patterns, trends and associations, especially relating to human behaviour and interactions.
Biotech	Biotechnology. The manipulation of living organisms or their components to produce useful, usually commercial products.
BLS	Bank lending survey. The euro area bank lending survey provides information on bank lending conditions in the euro area. It supplements existing statistics with information on the supply of, and demand for, loans to enterprises and households. The BLS provides input for monetary and economic assessments carried out by the Governing Council of the European Central Bank (ECB), which feed into the monetary policy decision-making process.
bn	Billion (1 000 million).
Bureau van Dijk's Orbis database	Database of private and listed company information from around the world that includes, among others, companies' financial accounts, ownership structures and mergers and acquisitions activity.
CCPI	The Climate Change Performance Index developed by Germanwatch. Climate Policy is one of the sub-indicators of the CCPI. The Climate Policy indicator evaluates recent developments in national climate policies and frameworks, as well as performance in international climate policy. It focuses on both the content of policy and its implementation. Data are collected through a comprehensive survey of some 450 national experts. The questions include an assessment of the content and implementation of national decarbonisation strategies, and energy supply and demand strategies, as well as national performance in international climate negotiations and fora.
CEE	Central and Eastern Europe, including Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
Climate change adaptation	Describes measures to deal with the impact of changing weather patterns or extreme weather events.
Climate change mitigation	Describes measures to address the underlying causes of climate change.

Cohesion regions	Regions are grouped based on the 2021-2027 cohesion policy. Transition regions and less developed regions, together referred to as cohesion priority regions, have more extensive options for co-financing. More developed regions, also referred to as non-cohesion (priority) regions, have more limited options for co-financing.
Corporate Vulnerability Index	A synthetic aggregate based on around 24 series reported at sectoral level for the corporate sector.
Digital	A firm is identified as having adopted an advanced digital technology if at least one digital technology specific to its sector was implemented in parts of the business and/or if the entire business is organised around at least one digital technology.
Drones	Powered, unmanned aerial vehicles that can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or non-lethal payload.
DG FISMA	Directorate-General for Financial Sustainability, Financial Services and Capital Markets Union of the European Commission.
DG REGIO	Directorate-General for Regional and Urban Policy of the European Commission.
EBA	European Banking Authority.
ECB	European Central Bank.
EIB	European Investment Bank.
EIBIS	EIB Investment Survey.
EIC	European Innovation Council.
EIF	European Investment Fund.
EIF SME Access to Finance index	A composite indicator that summarises the state of SME financing for each of the EU Member States and covers different aspects of SME access to finance.
Energy intensity	Energy consumption divided by activity, such as energy/GDP.
EPO	European Patent Office.
ESIF	European Structural and Investment Funds. These are the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund.
European Green Deal	A set of policy initiatives by the European Commission with the overarching aim of making the European Union climate neutral by 2050.
European Union	The 27 Member States of the European Union (taken as a whole when used for data comparison with other groups).
Eurostat	The statistical office of the European Union.
EU-SILC	The EU statistics on income and living conditions collects current and comparable household and individual data on income, poverty, social exclusion and living conditions in the European Union. EU-SILC is a cross-sectional and longitudinal sample survey, coordinated by Eurostat, based on data from the Member States.

EXPY	the index is the weighted average of the producers' income level (PRODY index, see below) associated with each product of a country's export basket, where the weights are simply the value shares of the products in the country's total exports.
External finance	In the EIB Investment Survey, this consists of
Finance constrained	In the EIB Investment Survey, a firm is considered finance constrained if it was
GBARD	Government budget allocations for R&D.
GDP	Gross domestic product. The total value of goods produced and services provided in a country over one year.
GERD	Gross expenditure on R&D.
GFCF	Gross fixed capital formation. The net increase in physical assets (investment minus disposals) within the measurement period. It does not account for the consumption (depreciation) of fixed capital, and also does not include land purchases. It is a component of the expenditure approach to calculating GDP.
Global financial crisis	The worldwide financial crisis of 2007-2008.
Harmonized System	This is an international product nomenclature developed by the World Customs Organization that comprises more than 5 000 commodity groups, each identified by a six digit code, arranged in a logical structure.
Human capital	The knowledge, skills, competencies and other attributes embodied in individuals or groups of individuals acquired during their lives and used to produce goods, services or ideas in market circumstances.
IEA	International Energy Agency.
IMF	International Monetary Fund.
Infrastructure	As defined for the EIB Infrastructure Database, infrastructure includes the following sectors for macroanalysis
Infrastructure sector	Based on the NACE classification of economic activities, this includes firms in groups D and E (utilities), group H (transportation and storage) and group J (information and communication).
Institutional sectors	The general government, corporations and households are the three institutional sectors in this report.
Intangible investment	In the EIB Investment Survey, intangible investment consists of investment in research and development (including the acquisition of intellectual property); software, data, IT networks and website activities; employee training; and improvements to organisation and business processes (including restructuring and streamlining).
Intellectual property products	In the European System of Accounts, intellectual property products include fixed assets (intended to be used for more than one year) such as findings from research and development, or from mineral exploration and evaluation; computer software and databases; or entertainment and literary or artistic originals.
Internal finance	In the EIB Investment Survey, internal finance consists of internal funds or retained earnings (such as cash or profits).
IPCC	Intergovernmental Panel on Climate Change.

IPO	Initial public offering. A process through which a private firm makes its shares available to the public for the first time, in a new stock issuance.
IRENA	International Renewable Energy Agency.
Large companies	Firms with at least 250 employees.
Low-carbon economy	An economy based on low-carbon power sources (not based on fossil fuels).
M&A	Mergers and acquisitions. Business transactions in which ownership of a company is transferred to or consolidated with another company.
Medium-sized firms	Firms with between 50 and 250 employees.
Micro firms	Firms with fewer than ten employees.
MWh	Megawatt hour.
NACE	"Nomenclature statistique des activités économiques dans la Communauté européenne" (Statistical Classification of Economic Activities in the European Community). The industry standard classification system used in the European Union.
Non-digital	Firms that have not yet implemented (or have not heard of) any of four sector-specific advanced digital technologies from recent years (see also: "Digital").
NUTS	"Nomenclature des unités territoriales statistiques" (Nomenclature of territorial units for statistics). A hierarchical system for dividing up the economic territory of the European Union.
OECD	Organisation for Economic Co-operation and Development.
Patent	Documents issued by an authorised agency, granting exclusive right to the applicant to produce or use a specific new device, apparatus or process for a limited period. The protection conferred by a patent gives its owner the right to exclude others from making, using, selling, offering for sale or importing the patented invention for the term of the patent (usually 20 years from the filing date) in the country or countries concerned by the protection.
PATSTAT	EPO Worldwide Patent Statistical Database. Contains bibliographical data relating to more than 100 million patent documents from leading industrialised and developing countries.
PCT	Patent Cooperation Treaty. Provides a unified procedure for filing patent applications to protect inventions in each of its contracting states.
Private equity	A form of equity investment in private companies not listed on the stock exchange.
Percentile	Each of the 100 equal groups into which a population or other data can be divided according to the distribution of values of a particular variable.
Physical risks	Typically defined as risks arising from the physical effects of climate change and environmental degradation. They can be categorised as either acute (if they arise from climate and weather-related events and acute destruction of the environment) or chronic (if they arise from progressive shifts in climate and weather patterns or a gradual loss of ecosystem services).
Platform technologies	Technologies that connect customers with businesses, or customers with other customers.

PPP	Refers to either: (i) public-private partnership or (ii) purchasing power parity.
Production processes	Processes related to actual production, such as those performed by machinery and equipment.
PRODY	This index is a weighted average of the per capita GDPs of countries exporting a given product, where the weights reflect the revealed comparative advantage of each country in that product; thus it represents the average producers' income level associated with that product.
R&D	Research and development.
Recovery plan for Europe	A European Union economic recovery package, boosted by the NextGenerationEU fund, to support Member States adversely impacted by the COVID-19 pandemic.
Recovery and Resilience Facility	A large grant and loan facility offered by the European Union to Member States. Part of the recovery plan for Europe.
SAFE	Survey on Access to Finance for Enterprises. A survey on the access to finance of small and medium-sized enterprises conducted by the ECB and the European Commission.
SE	Southern Europe, including Cyprus, Greece, Italy, Malta, Portugal and Spain.
Securitisation	The conversion of an asset, especially a loan, into marketable securities, typically in order to raise cash by selling it to other investors.
Services sector	Based on the NACE classification of economic activities, this includes firms in group G (wholesale and retail trade) and group I (accommodation and food service activities).
SFA	Stochastic frontier analysis.
Small firms	Firms with between ten and 49 employees.
Smart grids	Electricity supply networks that use digital communications technology to detect and react to local changes in usage.
SMEs	Small and medium-sized enterprises. Firms with fewer than 250 employees.
SME securitisation	Transactions backed by SME loans, leases and other products.
Sovereign debt crisis	Also known as the European sovereign debt crisis. A multi-year debt crisis in the European Union that began in 2009.
STEM	Science, technology, engineering and mathematics.
Tangible investment	As defined in the EIB Investment Survey, tangible investment includes investment in land, business buildings and infrastructure, or machinery and equipment, for example.
TFEU	Treaty on the Functioning of the European Union.
Total factor productivity	The efficiency in combining production factors to create added value.
Transition risks	Risks that arise from the potential for loss resulting from a shift towards a lower-carbon economy, driven by policy, regulations, low-carbon technology advancement, consumer sentiment and preferences, and liability risks, impacting the value of certain assets.
UNDP	United Nations Development Programme.

UNFCCC	United Nations Framework Convention on Climate Change.
Upstream	an industry or industries that provide inputs to production.
Upstreamness	A measure of average production stages a product has to go through before reaching the final consumer. Value one signifies ready to consume, a higher value indicates that the product is used as inputs in products that themselves are used in the production of a consumer good.
US (or USA)	United States of America.
VAT	Value added tax.
Venture capital	A type of private equity focused on startup companies with high growth potential.
WNE	Western and Northern Europe, including Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands and Sweden.

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