EUROPEAN CENTRAL BANK

EUROSYSTEM

From laggard to leader? Closing the euro area's technology gap

16 February 2024

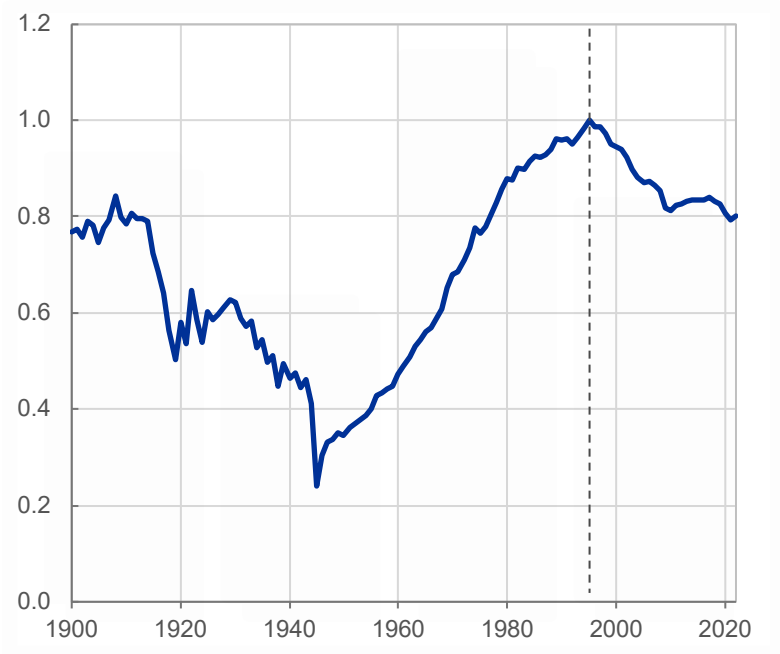
Isabel Schnabel, Member of the Executive Board of the ECB

Inauguration lecture, EMU Lab, European University Institute

Euro area started to lose competitiveness at the turn of the millennium

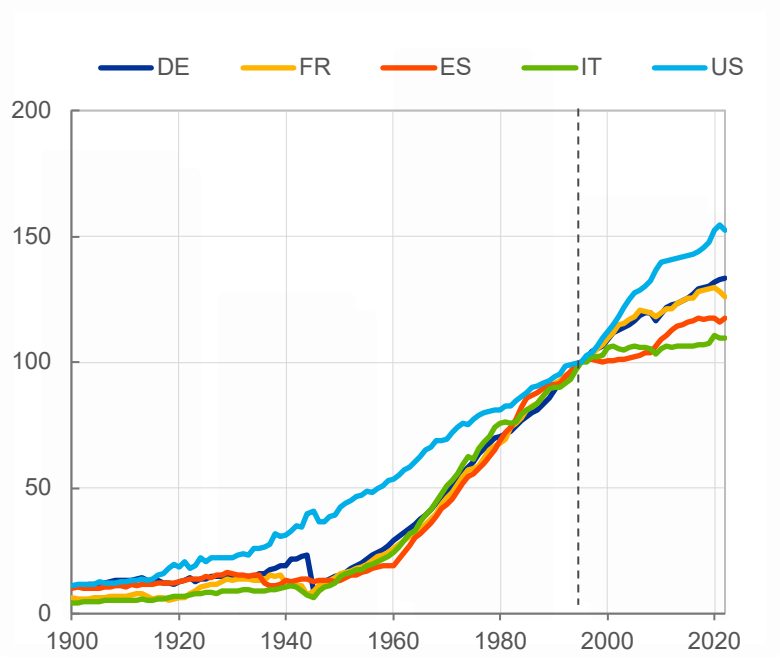
Long-term developments in productivity per hour worked

Ratio of EA-4 to US



Source: Long-Term Productivity Database and ECB calculations.
Notes: EA-4 is a weighted average of productivity developments in Germany, France, Italy and Spain.

Index: 1995 = 100



Source: Long-Term Productivity Database and ECB calculations.

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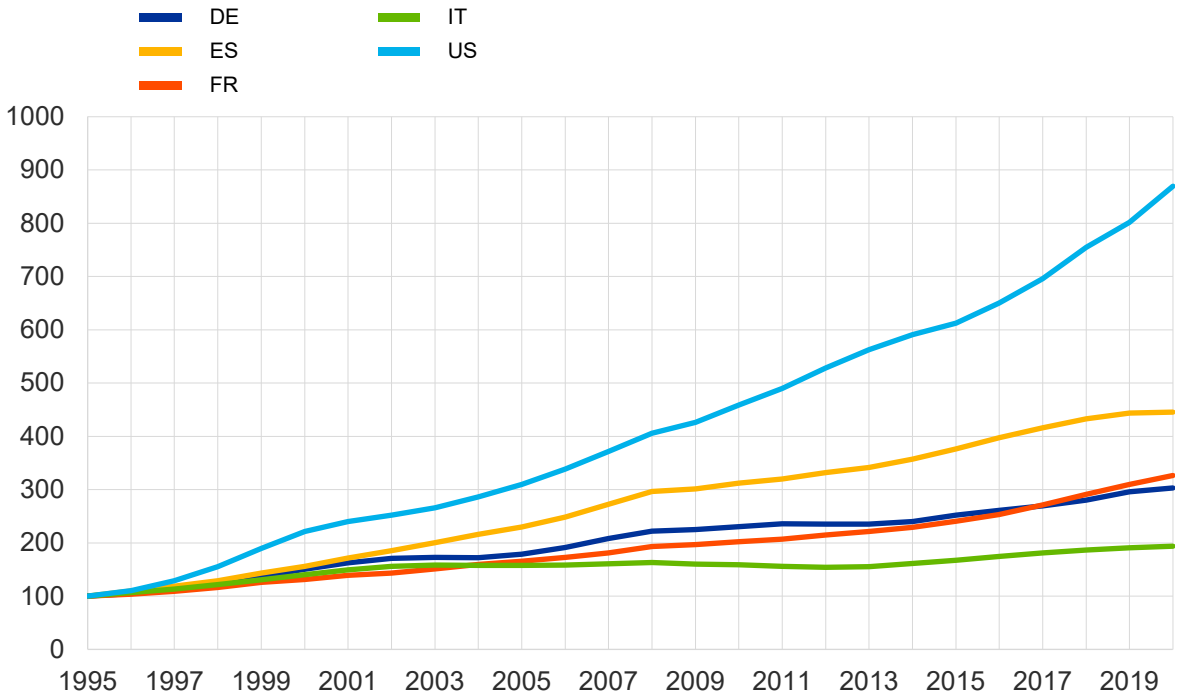
Rising gap in IT-related capital stock between euro area and United States

Real IT-related capital stock

(index: 1995 = 100)



Source: EUKLEMS.
Note: IT-related capital stock is the sum of computing equipment and computer software & databases for all NACE industries. See Schivardi, F. and Schmitz, T. (2020), "The IT Revolution and Southern Europe's Two Lost Decades", Journal of the European Economic Association, Vol. 18(5), pp. 2441–2486.

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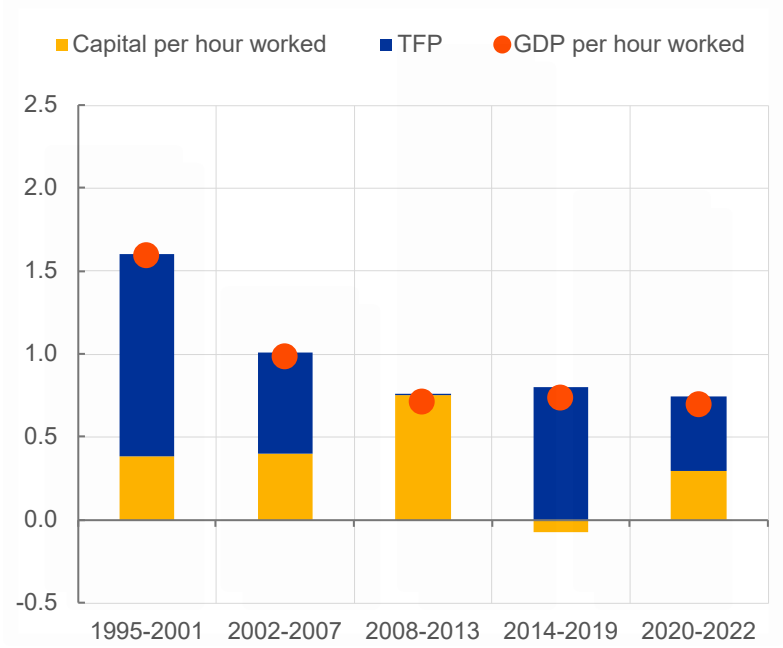
Global productivity growth has been subdued since the global financial crisis

Contributions to growth in GDP per hour worked

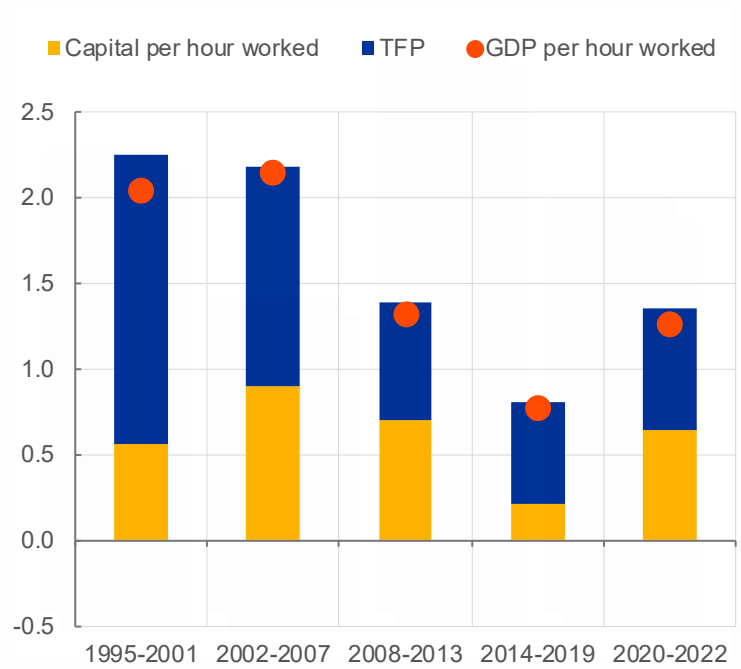
(%)

Euro Area



Source: AMECO data and ECB calculations.
Note: Refers to Euro Area 19.

United States



Source: AMECO data and ECB calculations.

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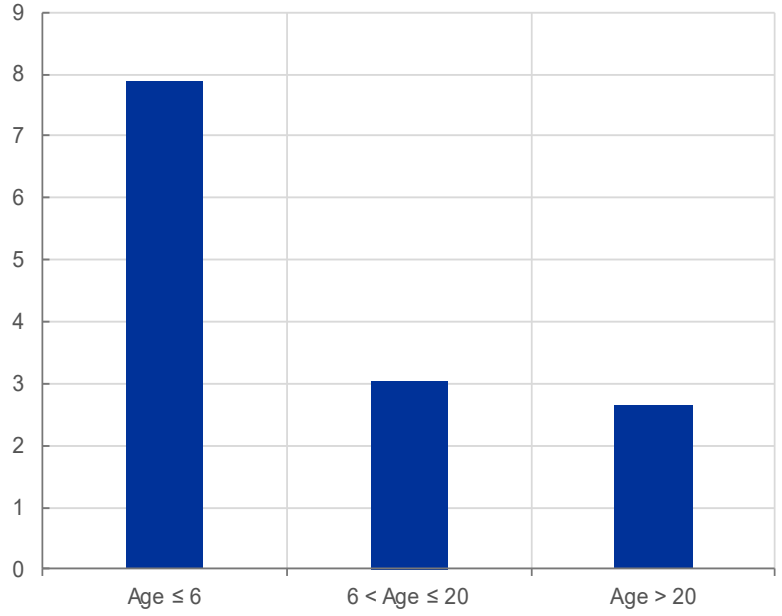
Lower barriers to entry and higher competition support rise of young superstar firms

Annual labour productivity growth of surviving firms by age group

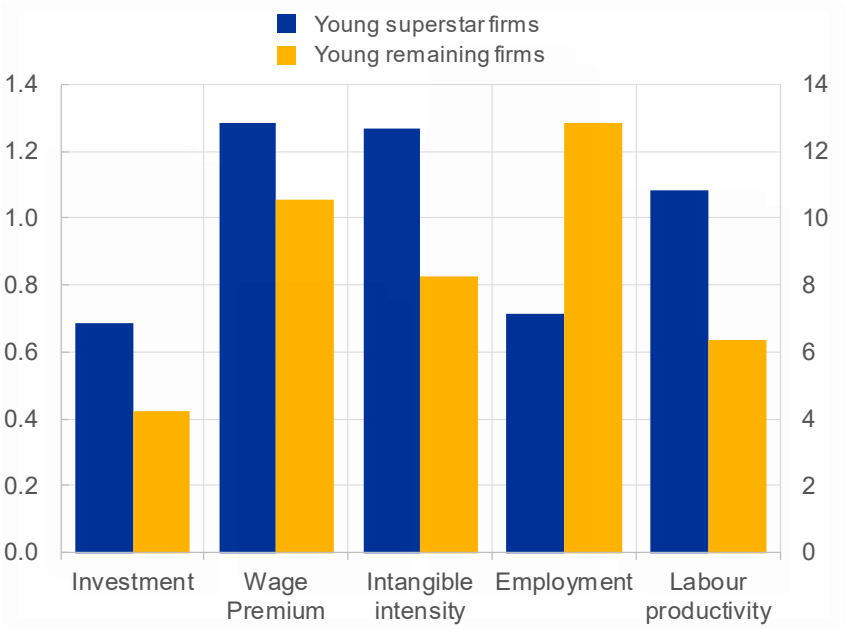
(mean, in %)



Source: ECB Economic Bulletin Issue 1(2022). Data from Bureau van Dijk Orbis, the Bank for the Accounts of Companies Harmonized (BACH) database and ECB staff calculations.

Average characteristics of young superstar firms and other young firms

(lhs: ratio; rhs: number of employees, intangible intensity in EUR thousands, labour productivity in EUR ten-thousands)



Notes: Each bar represents the coefficient from a regression of each variable listed in the x-axis on a dummy for the firm being a young superstar firm and a set of fixed effects controlling for the different countries, sectors and years. Productivity is computed as real value added per employee at the firm level. Intangible intensity is computed as the ratio of intangible capital to number of employees. Investment is computed as the change in real fixed tangible capital over the previous period's real fixed tangible capital. The period considered begins after the great financial crisis to avoid potential slumps.

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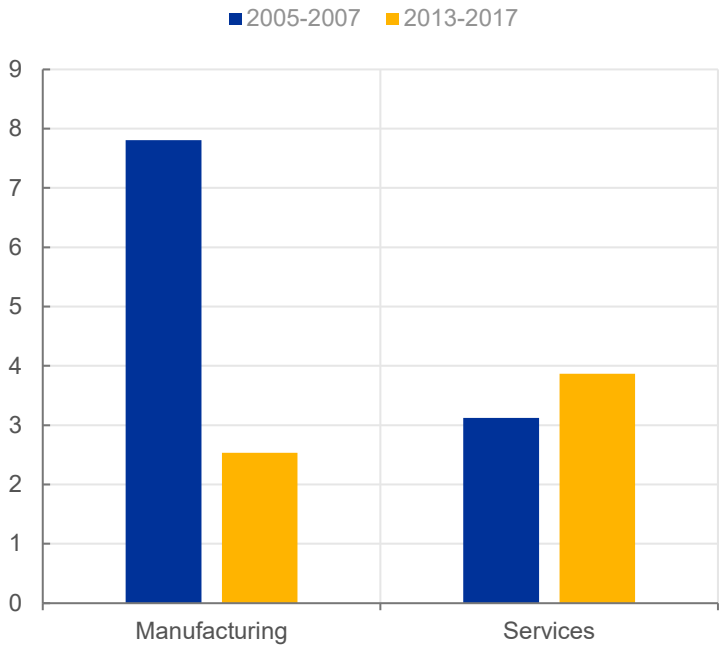
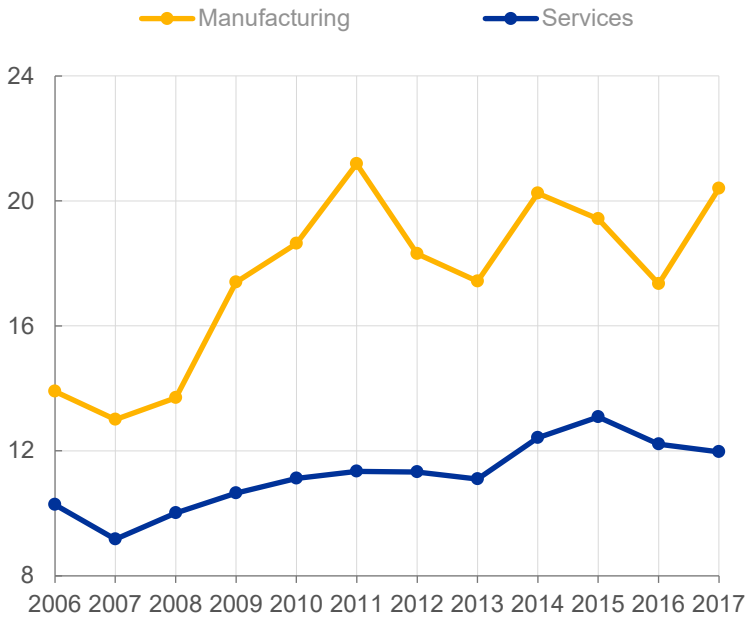
Decline in productivity growth in manufacturing coincided with lower business dynamics

TFP growth of high-tech frontier firms



Age of high-tech frontier firms

(years of activity)



Sources: Occasional Paper Series No. 268 (ECB). Own calculations using ECB iBACH-Orbis Database.
Notes: Weighted average annual TFP growth rates of the top 5% most productive firms in a given year in a 4-digit industry. Manufacturing industries are classified according to their R&D intensity (R&D by value added of the industry) into high-technology and medium high-technology on the one hand, and medium low-technology and low-technology on the other hand following the Eurostat classification. Service industries are classified into knowledge-intensive services and less knowledge-intensive services based on the share of tertiary educated persons at NACE 2-digit level, also following Eurostat standards.

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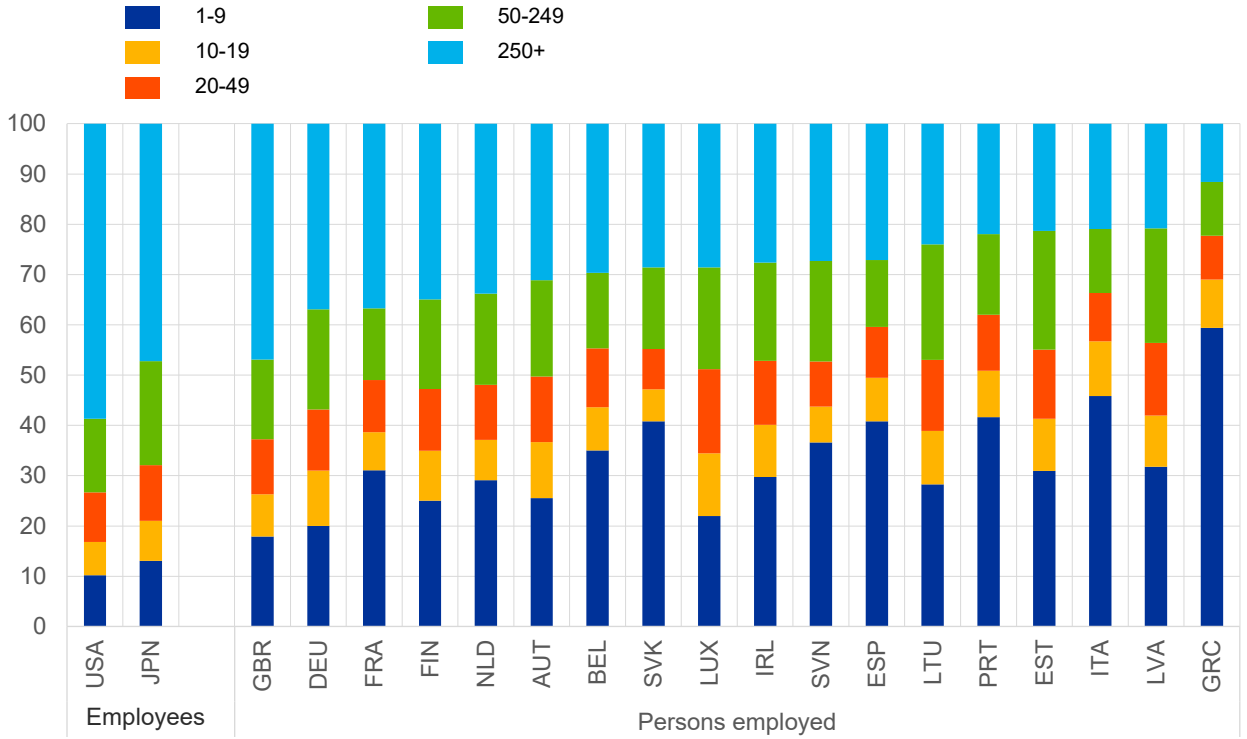
Large firms invest more in ICT, but most firms in the euro area are small

Employment by enterprise size, business economy

(percentage of total employment)



Source: OECD.
Notes: Legend refers to number of employees/ persons employed at firm level.

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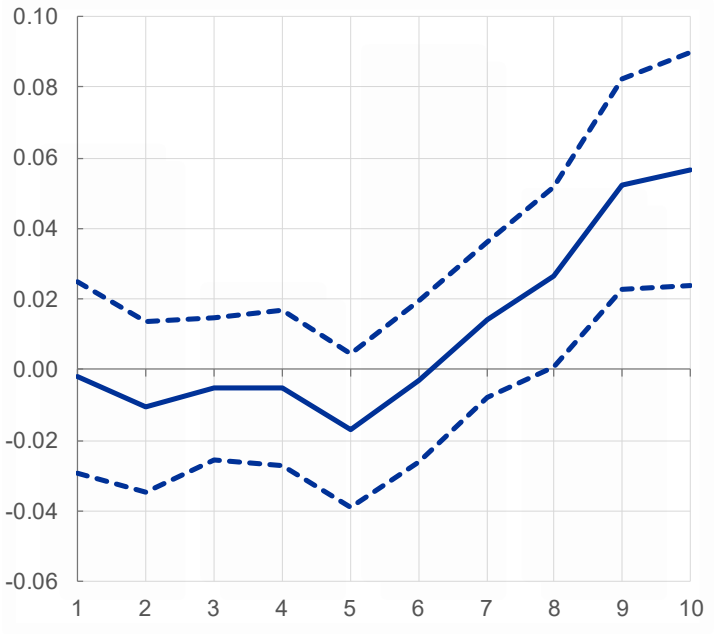
Few firms reap benefits from digitalisation, also reflecting shortages of skilled workers

Estimated impact of digitalisation on TFP growth of firms with different initial TFP levels

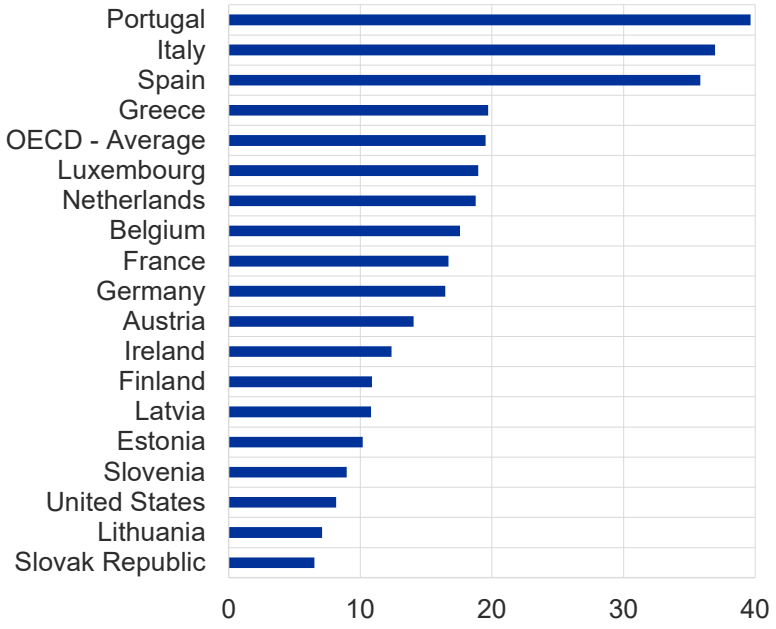
(digital investment intensity)



Source: Anderton, R., Botelho, V. and Reimers, P., "Digitalisation and productivity: gamechanger or sideshow?", Working Paper Series, No 2794, ECB, March 2023.
Note: x-axis: proximity to frontier (decile, lowest-highest). Dashed lines refer to confidence intervals.

Share of adults without upper secondary education

(% of 25-64 year-olds)



Source: OECD.
Notes: Data refer to 2022 or latest available.

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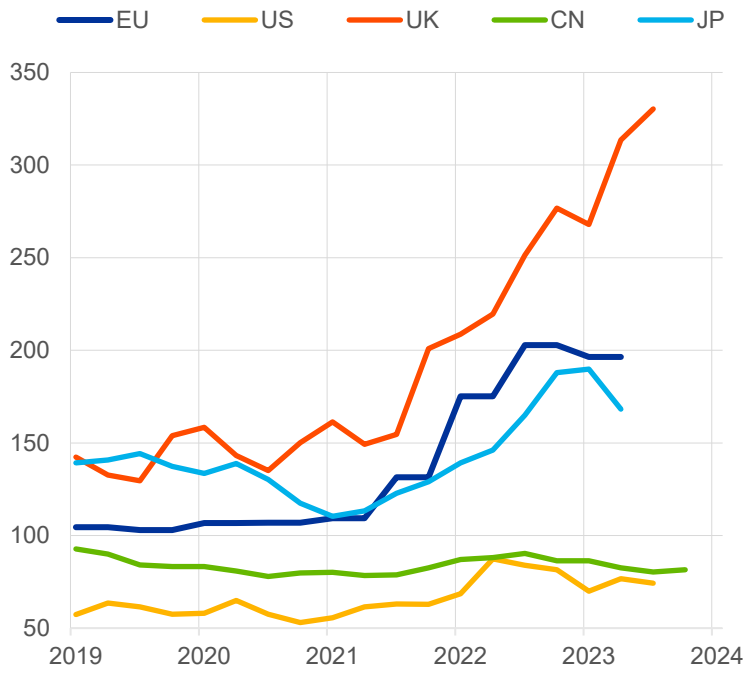
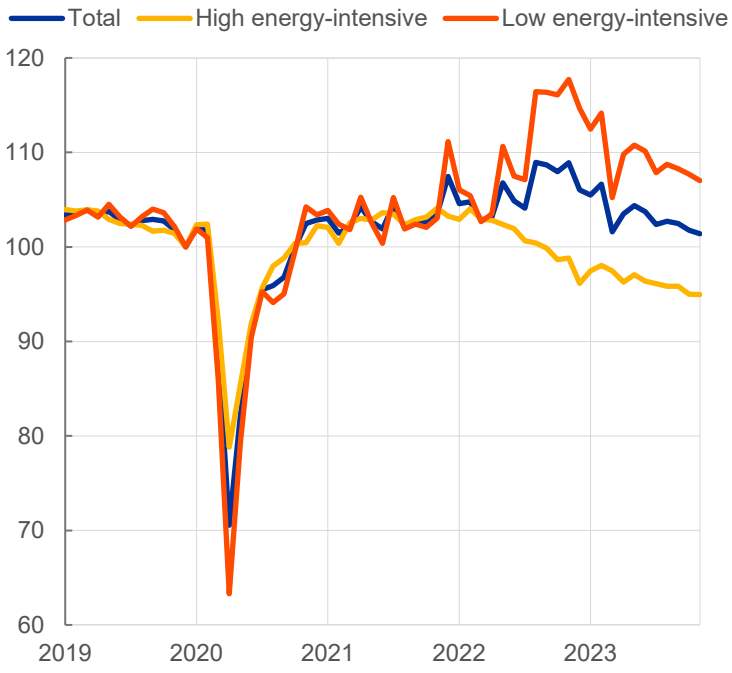
Higher electricity prices undermine price competitiveness and industrial production

Industrial retail electricity prices
(EUR/MWh)



Sources: Eurostat, EIA, DESNZ, CEIC, METI and ECB staff calculations.
Latest observation: Q2 2023 for EU and JP, Q3 2023 for US and UK and Q4 2023 for KR and CN.

Euro area industrial production
(index: December 2019 = 100)



Sources: Eurostat, Trade Data Monitor and ECB staff calculations.
Notes: Data are seasonally-adjusted. Industrial production indices for individual sectors are aggregated with value-added weights. Low (high) energy-intensity sectors are defined as those with an energy intensity lower (higher) than that of the median sector. For more details, see Chiacchio, De Santis, Gunnella and Lebastard (2023).
Latest observation: November 2023.

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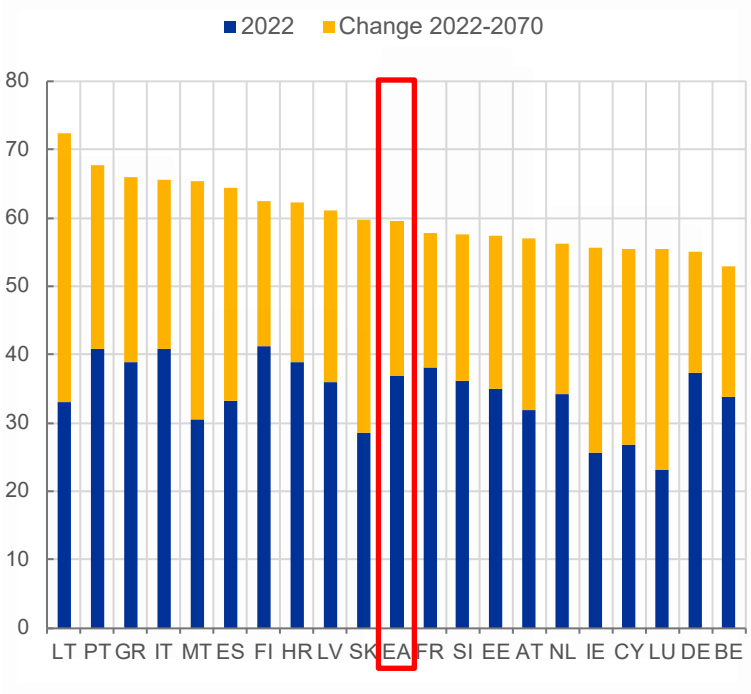
Ageing and preference shifts require higher productivity growth to sustain social system

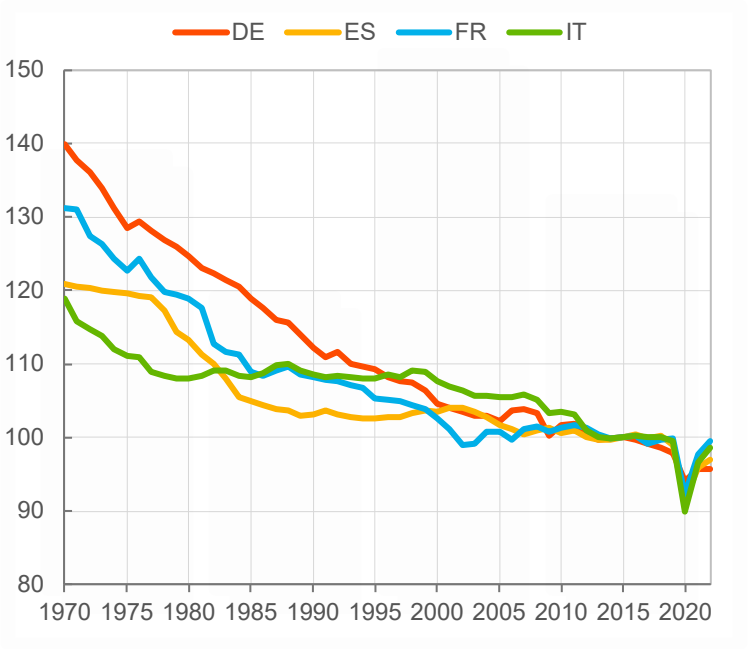
Old-age dependency ratio in 2022 and increase until 2070



Source: European Commission Europop 2023 population projections.
Note: The old-age dependency ratio is the population aged 65 and over as a % of the population aged 20-64. Data are shown as the proportion of dependents per 100 persons of working-age.

Average hours worked per person employed

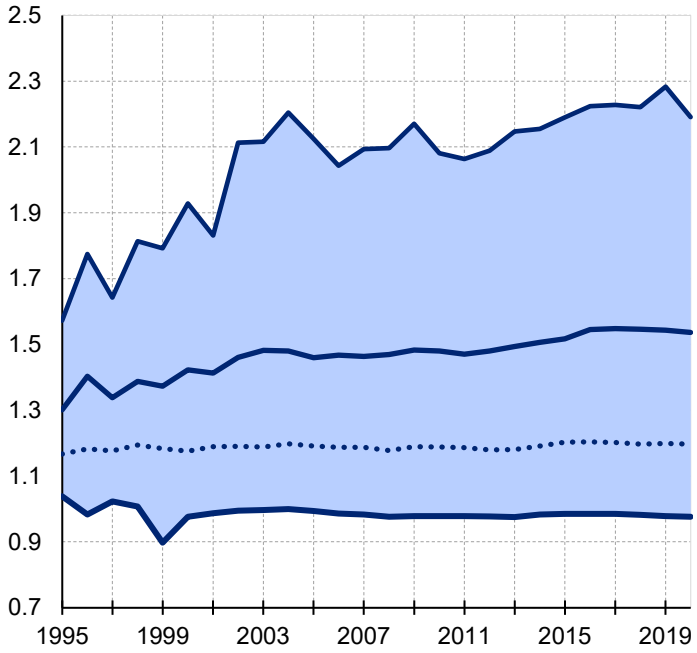
(index: 2015=100)



Source: OECD data.

Slow diffusion of technologies can give rise to “winner-takes-most” dynamics

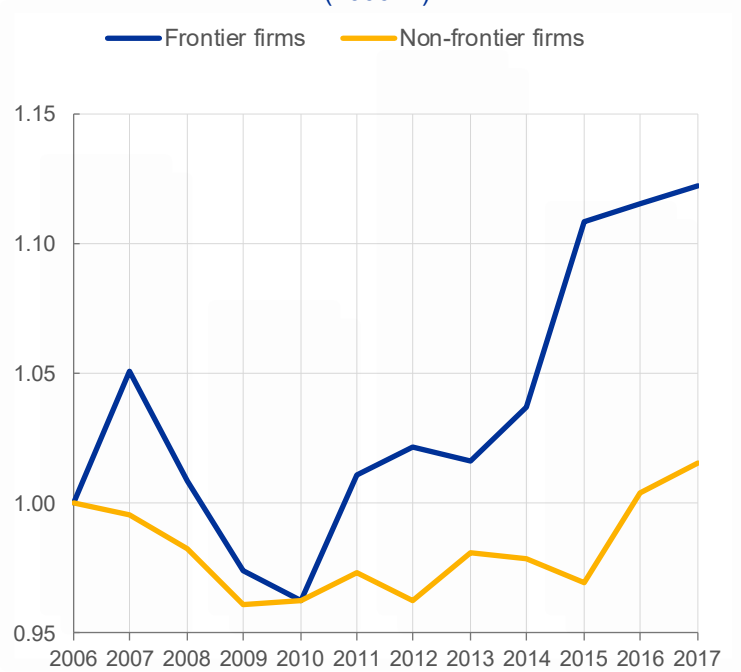
Euro area markup distribution



Sources: Kouvavas et al. (2021), “Markups and inflation cyclicality in the euro area”, ECB Working Paper No. 2671.
Notes: The dotted line shows the weighted median, the continuous line the weighted average, and the range is between the weighted 10th and 90th percentiles. See the paper for the calculation of markups using firm-level data.

TFP levels of frontier and non-frontier firms in the services sector

(2006=1)



Sources: Occasional Paper Series No. 268 (ECB). Own calculations using ECB iBACH-Orbis Database.
Notes: Frontier firms are defined as those at the top 5% of the TFP distribution in a given year in a 4-digit industry. Non-frontier firms are defined as the median firm in a given year in a 4-digit industry.

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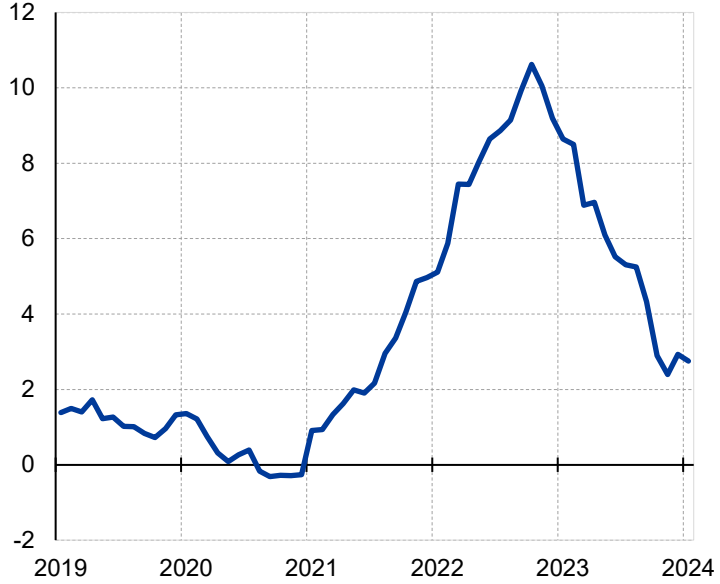
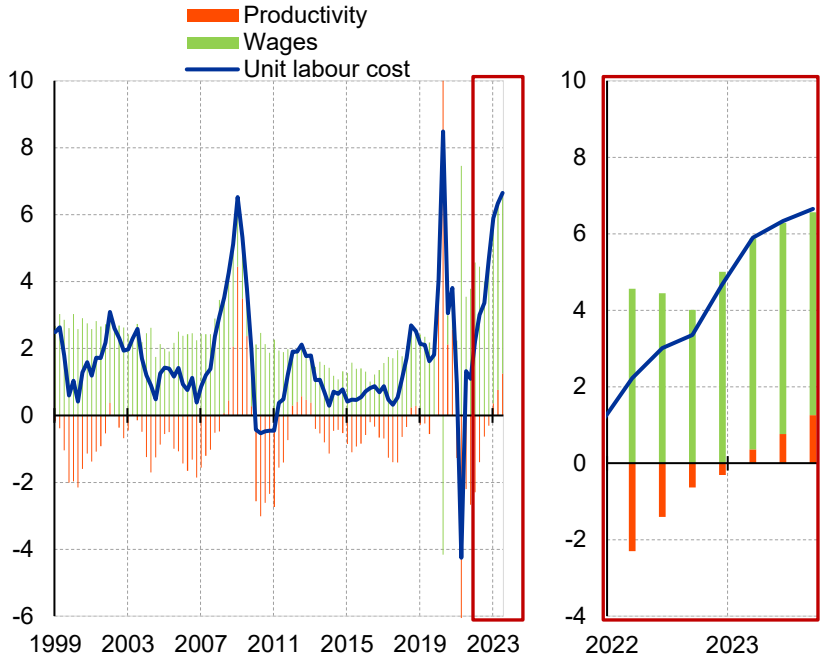
Restrictive monetary policy needed to contain pass-through of rising unit labour costs

Headline inflation in the euro area (HICP)
(annual percentage changes)



Source: Eurostat.
Last observation: January 2024 (flash).

Unit labour costs
(annual percentage changes)



Source: Eurostat and ECB calculations.
Note: A positive contribution of productivity to unit labour costs implies negative productivity growth.
Last observation 2023 Q3.

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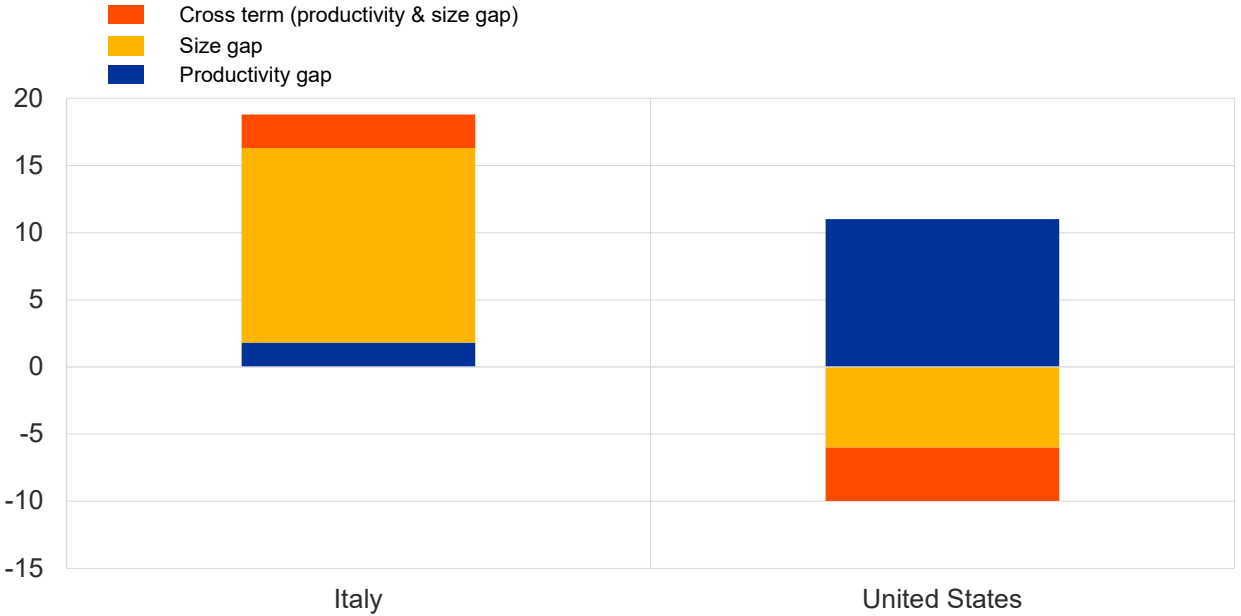
Reducing resource misallocation can measurably increase productivity growth

How much would overall manufacturing sector productivity rise if firms at the national frontier were as productive and large as firms at the global frontier?

(percentages)



Source: Andrews, D., Criscuolo, C. and Gal, P. (2015), "Frontier Firms, Technology Diffusion and Public Policy: Micro Evidence from OECD Countries," OECD Productivity Working Papers. Note: The productivity (size) gap shows how much higher manufacturing productivity would be relative to baseline if the national frontier firms (NF) were as productive (large) as the global frontier (GF) benchmark. The cross term shows the impact on aggregate productivity of simultaneously closing the productivity and size gaps. The estimates are constructed by taking the difference between counterfactual labour productivity and actual labour productivity. The counterfactual gaps are estimated by replacing the labour productivity (employment) of the top 10 NF firms with the labour productivity (employment) of the 10th most globally productive firm in each two-digit sector. The industry estimates are aggregated using US employment weights.

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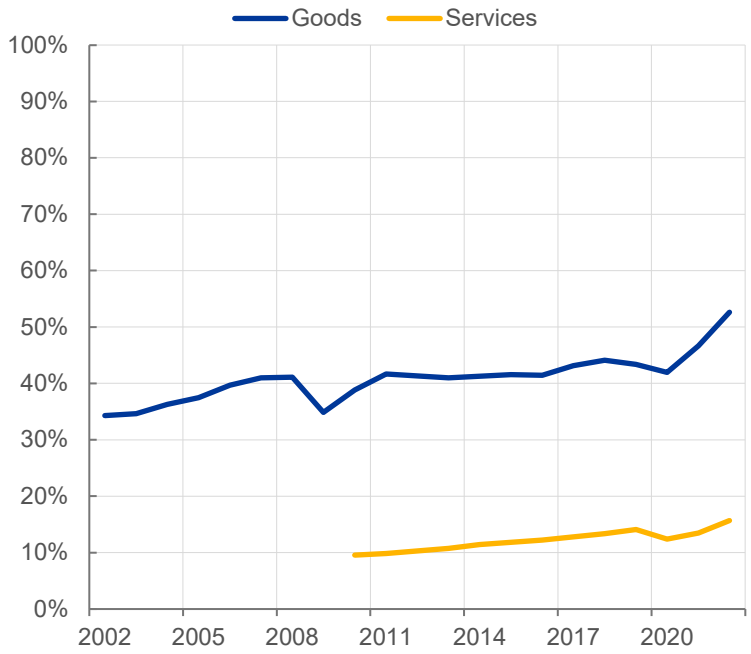
Limited progress in cross-border trade in services and in financial market integration

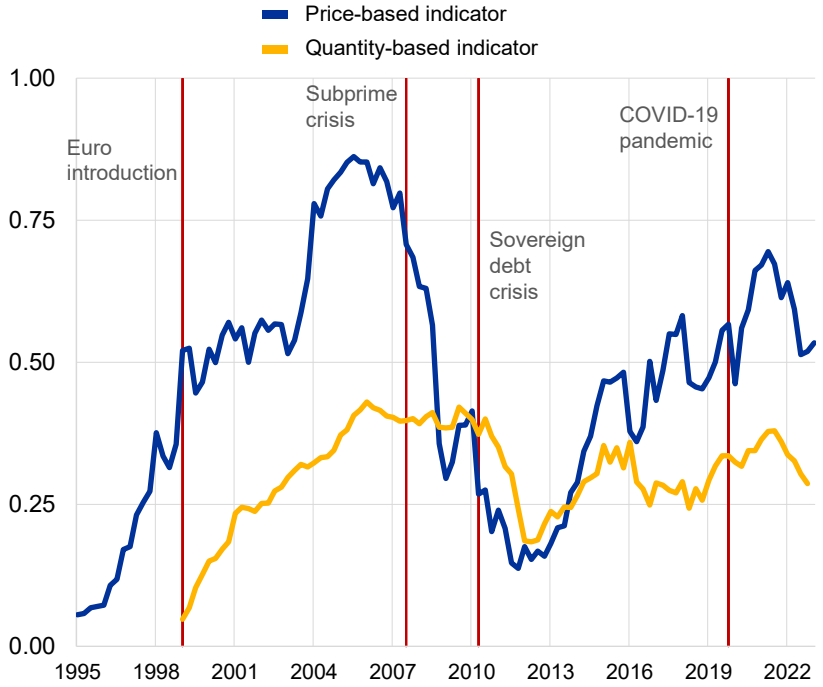
Intra-EU trade in goods and services

(annual, in percentage of GDP)



Source: Eurostat and ECB staff calculations.
Notes: Intra-EU trade is obtained by summing intra-exports and imports as a ratio of GDP, measured in euros.
Latest observation: 2022.

Price-based and quantity-based composite indicators of financial integration



Source: ECB staff calculations.
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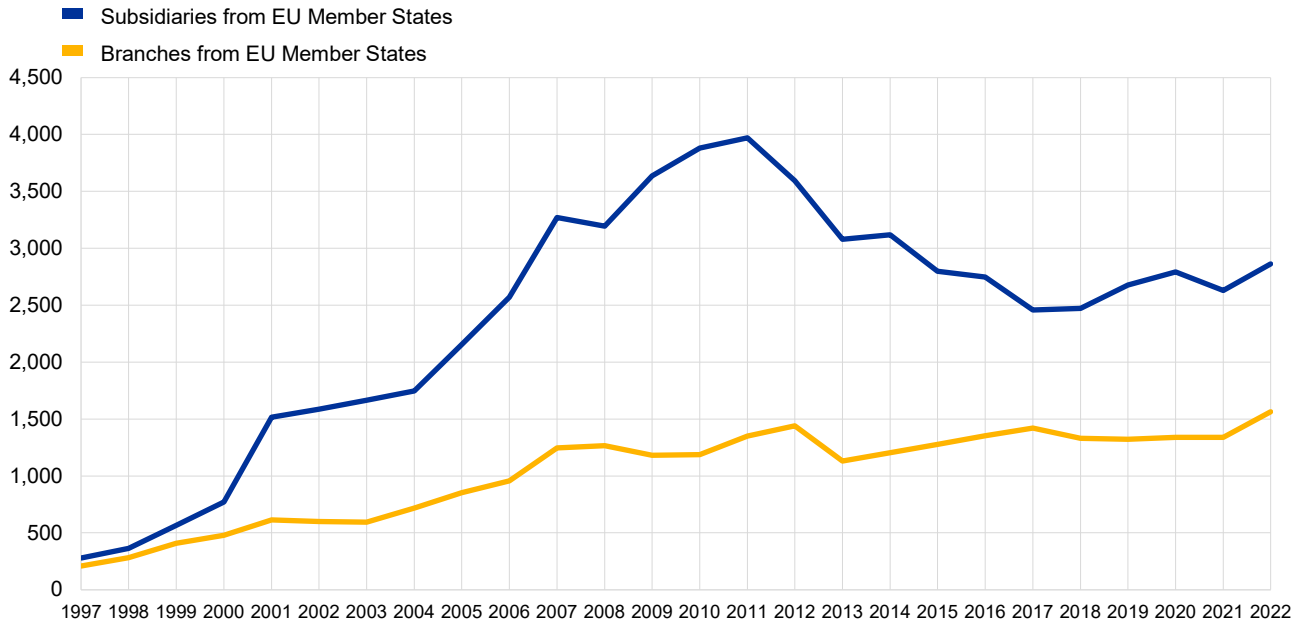
European banking sector remains segmented along national borders

Total EU cross-border assets in the euro area

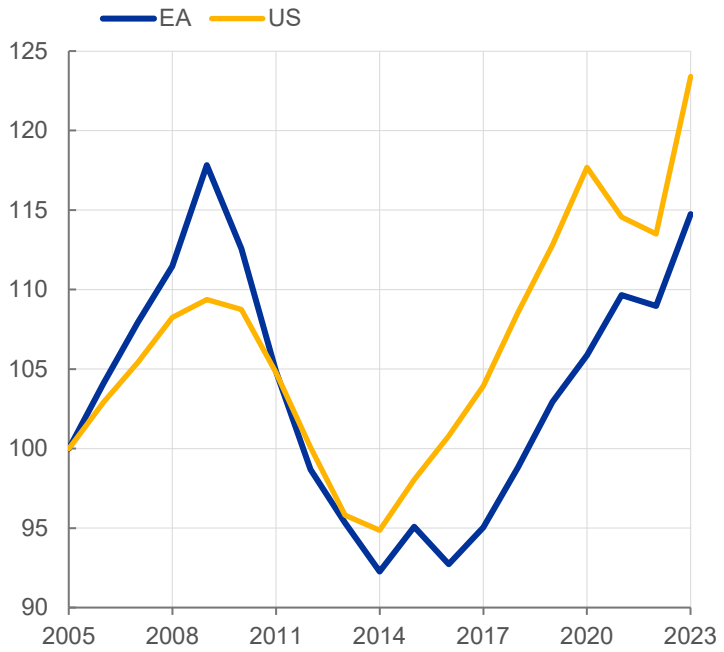
(Total assets, EUR billions)



Source: ECB Structural Financial Indicators.

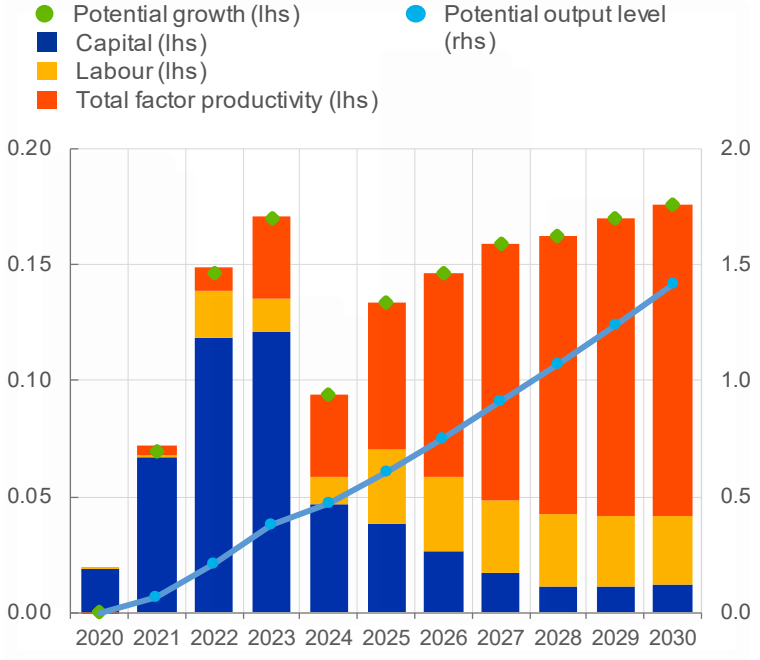
Public investment can boost productivity growth and potential output

Public investment
(index: 2005 = 100)



Sources: European Commission (AMECO), Bureau of Economic Analysis and ECB staff calculations. Notes: The 2023 figure for the Euro area is based on AMECO projections. Latest observations: 2023

Impact of NGEU on potential output and growth of seven euro area countries
(impact on level in percentages, on growth and contributions in percentage points)



Source: ESCB staff calculations (Bańkowski et al. 2022).
Note: Countries included: DE, ES, FR, GR, IT, MT and PT.
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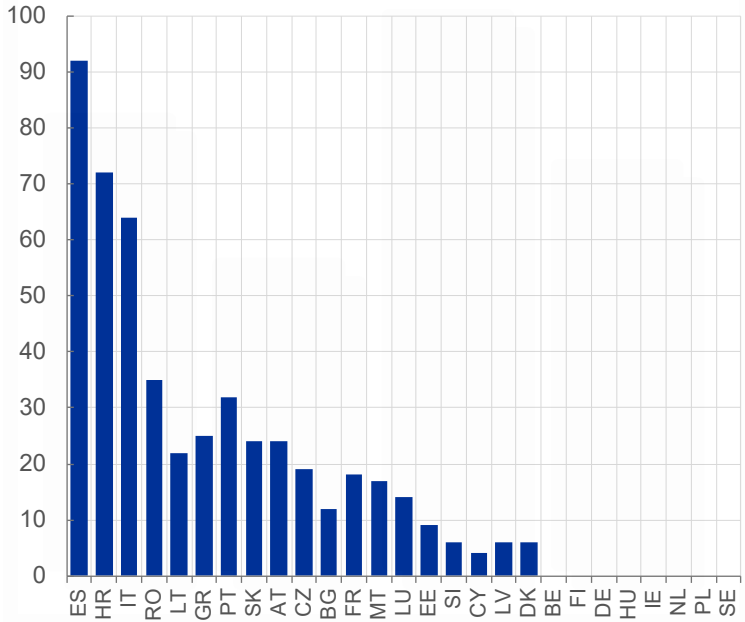
Significant number of reform-related RRF milestones and targets already fulfilled

RRF milestones and targets: breakdown by country

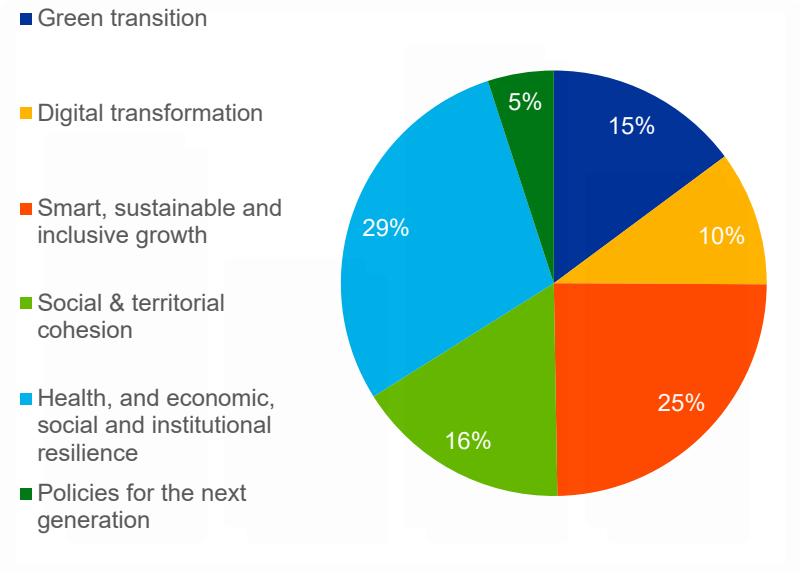
(total number)



Source: ECB illustration based on European Commission data.
Note: Database accessed on 6 December 2023. A Milestone or Target is counted as fulfilled if the Commission has assessed it as being satisfactorily fulfilled. All EU countries included.

RRF milestones and targets: breakdown by policy pillar

(percent)



Source: ECB illustration based on European Commission data.
Note: Database accessed on 6 December 2023. A Milestone or Target is counted as fulfilled if the Commission has assessed it as being satisfactorily fulfilled. All EU countries included.

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