STUDY

Requested by the ECON committee

European Parliament

Coordination for EU competitiveness

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Directorate-General for Internal Policies
PE 747.838 - March 2024

EN

Coordination for EU competitiveness

Abstract

This paper reviews the state of EU competitiveness and introduces a strategy to improve it, based on medium-term, sector-level coordination of Member State reform policies and/or investments. The idea is illustrated with two examples: an investment and reform programme to create a single EU electricity market and an Advanced Research Projects Agency (EU-ARPA).

This document was provided/prepared by the Economic Governance and EMU Scrutiny Unit at the request of the ECON Committee.

This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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LINGUISTIC VERSIONS
Original: EN

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Manuscript completed in February 2024

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LIST OF ABBREVIATIONS

ARIA	Advanced Research and Invention Agency
ARPA	Advanced Research Projects Agency
ARPA-E	Advanced Research Projects Agency-Energy
ARPA-H	Advanced Research Projects Agency for Health
ARPA-I	Advanced Research Projects Agency-Infrastructure
DARPA	Defense Advanced Research Projects Agency
DG COMP	Directorate-General Competition
DOE	Department of Energy
ECB	European Central Bank
EIB	European Investment Bank
EIC	European Innovation Council
EIT	European Institute of Innovation and Technology
ERC	European Research Council
ETS	Emissions Trading System
EU	European Union
GDP	Gross domestic product
ICT	Information and communication technology
IPCEI	Important Projects of Common European Interest
ISIC	International Standard Industrial Classification
IT	Information technology
JEDI	Joint European Disruptive Initiative
KIC	Knowledge and Innovation Communitie
LNG	Liquefied Natural Gas

NIH	National Institutes of Health
PCT	Patent Cooperation Treaty
PPP	Purchasing power parity
R&D	Research and development
SPRIN-D	Federal Agency for Disruptive Innovation
TFP	Total factor productivity
UNDP	United Nations Development Programme
US	United States

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EXECUTIVE SUMMARY

- **This papers offers a rough diagnosis of the European Union's competitiveness problem**, defined as its failure to grow as vigorously, in productivity terms, as countries in its peer group, particularly the United States. It discusses one approach to address the problem, which we call 'coordination for competitiveness', and illustrates it using two specific examples.
- While EU GDP *per capita* has remained stable at two-thirds of the US level (with Eastern Europe catching up and Southern Europe in relative decline), **labour productivity and total factor productivity growth have trailed the US since the 1990s**. Some of this is attributable to slower IT adoption and lower IT capital. Private R&D expenditure in the EU is far lower than in the US. This is mostly attributable to the smaller number of large firms rather than to R&D intensity. The EU also trails the US and, increasingly, China in patents in frontier technologies. It still leads the US, but lags China, on green technology market share.
- **The EU faces two supply-side disadvantages relative to the US: higher energy costs and a fragmented internal market**. The latter is likely one reason why growth funding by venture capital is significantly inferior to US and Chinese levels. The energy price gap has recently widened and there is no likelihood of it declining in the foreseeable future.
- **Against this background, two strategies should be pursued to strengthen EU competitiveness: (a) deepen the single market; (b) cooperate in areas that offer the greatest gains on a sector-by-sector basis, supported by some EU-level funding**. Energy policy coordination and an EU Advanced Research Projects Agency (ARPA) are two examples.
- The rationale for **energy policy coordination** has strengthened in the new context of high energy prices, the heightened need to speed up the elimination of fossil fuels, and accelerated electrification. Comparative advantage in the production of renewable electricity, resilience and mutual insurance against production shortfalls are strong arguments in favour of a diversified electricity system. Such a system would be compatible with the principle of energy policy sovereignty. It could be built gradually by creating trust through establishing a common fund for cross-border lines and other common infrastructure;
- An **EU-ARPA** would help foster innovation and diversify risk at country level. Funds are available through EU programmes, including the new Innovation Fund financed by emissions trading system revenues, and through the pooling of national initiatives. The problem has less to do with limitations on common funding than with risk aversion and poor governance. By contrast, the US ARPA has been instrumental in mobilising resources and investing them in high-risk, high-reward projects. Europe should emulate the US example as far as principles, governance and management are concerned. The agency in charge should have its objectives set by the Council of the EU and the European Parliament, but must be autonomous in the implementation of the agreed policy. Member States' distributional concerns should be addressed through linked cohesion funding and by insuring countries against losses incurred through their participation in ARPA projects with national funds.

1. INTRODUCTION[*]

The energy price shock following the Russian invasion of Ukraine, the deployment of large-scale industrial subsidies in China and the United States, and the challenge of reconciling decarbonisation, deficit reduction and higher defence spending have reignited a debate about EU competitiveness. One side of this debate implores EU policymakers to finally address long-standing weaknesses of the single market, including reducing remaining barriers to cross-border trade, completing banking union and finally getting serious about capital markets union. The other side calls for a change in paradigm, toward a more interventionist EU on clean-tech industrial policy, looser state-aid rules, and a mild form of protectionism via public procurement and tariffs. The authors of this paper have been primarily in the first camp, while also supporting industrial policy at EU level, provided it is well governed[1].

The purpose of this paper is to argue for a third approach, which we view as complementary to the first, and an alternative to the second. We call it 'coordination for competitiveness'.

Single market reform involving a large transfer of authority and money to the EU level, as would be the case with full banking union or a much larger EU budget, is clearly not currently viable. What may be both feasible and effective, however, is to seek coordination of policies and spending at national level (or joint spending in support of coordinated policies), in specific areas, provided that this can be structured to trigger large competitiveness gains over the medium term. In many cases, the gains from this type of coordination will not be driven primarily by spending *per se*, but by common or coordinated policy action, investment and reform. Joint spending plays a role by creating incentives and lubricating coordination, including through ensuring that there are no significant losers. The paper is primarily intended to make the case for this type of coordination, bolstered by two specific examples.

The paper proceeds in three steps. Section 2 explains what we mean by competitiveness and gives a snapshot of EU relative performance, relying both on comparisons with the US and with Asian trading partners, including China. Section 3 makes the general argument for coordination or delegation, supported by some common funding, as a part of a broader strategy for competitiveness. Section 4 develops two concrete applications of this idea: a multi-year investment and reform programme to create a single EU electricity market and an EU-level ARPA (Advanced Research Projects Agency). Section 5 concludes.

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[*] All authors are affiliated with Bruegel. Pisani-Ferry is additionally affiliated with Sciences Po and the Peterson Institute for International Economics (PIIE); Pinkus with Copenhagen Business School; and Veugelers with KU Leuven and PIIE. We are grateful to Lucrezia Reichlin for discussions that influenced the concept and organisation of the paper, to Rebecca Christie, Uri Dadush, Zsolt Darvas, Maria Demertzis, Conor Maccaffrey, Ben McWilliams, Francesco Papadia, Andre Sapir, Fiona Scott Morton and Nicolas Véron for helpful comments and suggestions, and to Nina Ruer for outstanding research assistance.

[1] Kleimann *et al* (2023), Sapir, Tagliapietra and Zettelmeyer (2023), Tagliapietra, Veugelers and Zettelmeyer (2023), Tagliapietra and Veugelers (2023) and Tagliapietra, Veugelers and Zettelmeyer (2024).

2. A ROUGH GUIDE TO EU COMPETITIVENESS

The term competitiveness is ubiquitous in European policy debates, particularly in times when EU companies are losing ground to foreign competition because of higher input costs and foreign subsidies. The statement *"the EU is losing competitiveness"* seems to be an obvious characterisation of the problem, and the objective of regaining competitiveness a natural way to organise a policy discussion.

Economists nevertheless tend to be suspicious of the term because the success of firms competing in the same market is zero sum, while growth and prosperity – the objectives that governments should care about – are not. Countries do not compete in the same way that firms do, because one country's success, in terms of economic growth, is normally good for its trading partners. Policies that seek to raise the market shares of domestic firms at home or internationally are not necessarily good for growth and can be detrimental to welfare[2]. Some of these policies could be counterproductive, by reducing international trade and the economic gains that go with it, or by pouring disproportionate resources into promoting specific firms or industries at the expense of other firms, industries and consumers. The best example of the latter is China under Xi Jinping, which has done very well in gaining market share and winning technology races, but very poorly in terms of productivity growth (see below).

But worrying about competitiveness can also be helpful. Struggling domestic industry may reflect a broader problem. Understanding why domestic firms struggle may help identify policy changes that both make firms more competitive and are good for growth. Furthermore, there is nothing wrong with governments attempting to outperform each other in creating the best possible conditions for innovation, entrepreneurship, investment, growth and ultimately prosperity. A case in point is when such actions target global commons such as decarbonisation.

In the remainder of this paper, we hence follow the convention of applying the term 'competitiveness' to the EU and its Member States rather than just EU firms, but define it differently from firm competitiveness. Firms are competitive if they can make a profit while selling at lower prices than competing firms, hence expanding their market shares. Economies are competitive if their supply-side conditions and policies lead to high productivity growth relative to their peers (countries at roughly the same level of *per-capita* income), in a sustainable fashion[3].

The remainder of this section tries to answer the question of whether the EU is competitive or not, and whether its competitiveness has declined, by briefly showing comparisons at three levels: aggregate performance, sector and firm-level performance, and supply-side conditions underpinning that performance.

2.1. Growth and prosperity

US growth has been more vigorous than EU growth in recent years, reflecting faster population growth, greater fiscal stimulus since 2020, and the fact that, on aggregate, the 2022 energy price shock benefited the US as an energy exporter, while it hurt the EU. Over a longer period, however, and on a

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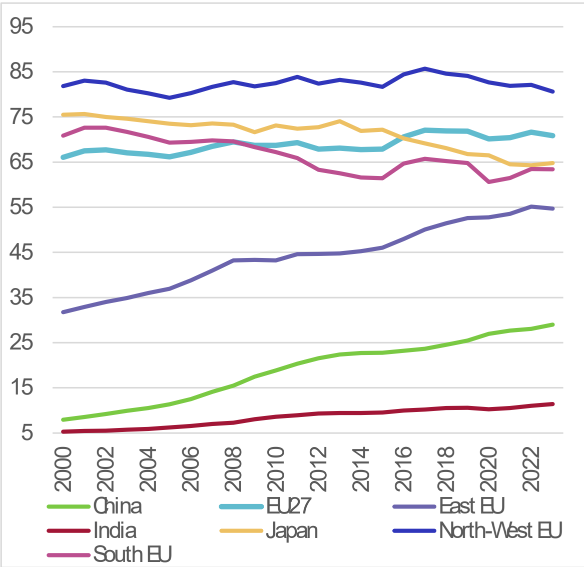
[2] For forceful arguments along these lines, see Adam Smith (1771, book IV) and Krugman (1994).

[3] This definition is very close to that of the World Economic Forum (2017), which defines *"competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country."* The distinction between productivity levels and productivity growth is not important, since increasing productivity levels requires growth. We prefer a growth-based definition because it is a bit more demanding: in our definition a country would be called uncompetitive if its productivity growth stops, even if it remains a richer (for a while) than peers that continue to grow. The sustainability requirement requires a form of external balance. While competitiveness does not require persistent (let alone growing) current account surpluses, a country whose growth leads to unsustainable current account deficits is not competitive.

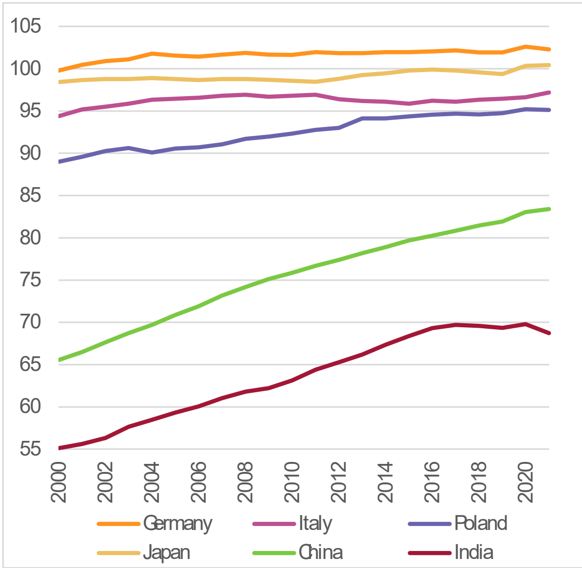
per-capita basis, US and EU growth do not look very different (Figure 1.1; see also Darvas, 2023). *Per-capita* income in the EU is about 70% of the US, but has been on a slow upward trend, driven by the EU's poorer but faster-growing members in the east. *Per-capita* growth in the north and north-west of the EU (which includes the largest Member States, France and Germany) has been in line with the US over the 2000-2022 period, but has stagnated in relative terms since 2017. The south of Europe has fallen further behind since 2000, but recently performed better. Figure 1.1 also shows the fast catching up of China, although this has recently tailed off. India's catching-up has been less impressive, as its fast growth is in part attributable to population growth.

Figure 1: Prosperity measures

1.1. PPP-adjusted GDP *per capita* relative to US (US = 100)



1.2. Human Development Index relative to US (US = 100)



Sources: Figure 1.1: October 2023 World Economic Outlook; Figure 1.2: UNDP.
Notes: PPP stands for purchasing power parity-adjusted. North-west EU includes Austria, Belgium, Denmark Germany, Finland, France, Luxembourg, the Netherlands and Sweden; South EU is Cyprus, Italy, Malta, Portugal and Spain; East EU is Bulgaria, Czechia, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. EU27 reflects aggregate as defined in the source data.

Figure 1.2 shows a broader measure of prosperity: the UNDP Human Development Index, which encompasses *per-capita* income but also schooling and life expectancy at birth. In northern European countries such as Germany, this surpasses the US and has continued to improve slightly in relative terms. In Poland, it remains below the US, but the gap has been shrinking. China's human development has caught up fast with US and EU levels, and is now at about 85% of the US, while India's human development appears to have been stuck at 70% of the US since 2016, following a long period of catching-up.

Prosperity in Europe tends to be more equally shared than in other economies. The Gini coefficient of disposable income has been stable at about 0.33 in the EU since the late 2010s. Inequality in the US, China and India is much higher, with Gini coefficients of around 0.38 (US) – 0.41 (China)[4].

[4] The Gini coefficient is a measure of income inequality ranging from zero (all people have the same income) to one (one person earns all income). Source: Bruegel dataset 'Global and regional Gini coefficients of income inequality' (aggregate Gini for the EU27) and the Standardised World Income Inequality Database (SWIID) version 9.6 (US and China)

2.2. Productivity

Figure 2 shows two measures of productivity growth: labour productivity growth (growth in real GDP per hour worked), and total factor productivity (TFP) growth (growth in real GDP that cannot be attributed to either increases in hours worked or capital accumulation)[5]. By both metrics, the EU as a whole has done consistently worse than the US since 2000 (Figure 2.1 and 2.2), with the exception of labour productivity growth during 2013-2019, where the EU did slightly better. However, according to OECD data, the US pulled has pulled far ahead of the EU during the most recent, 2020-2022 period, with average labour productivity growth of 1.41 compared to 0.77, reflecting its more vigorous recovery from Covid (not shown in the chart).[6] China had extraordinarily fast productivity growth prior to the Global Financial Crisis, but this has been declining, with TFP growth becoming negative in the Xi Jinping era. India's productivity growth, in contrast, has been rising both in labour productivity and TFP terms.

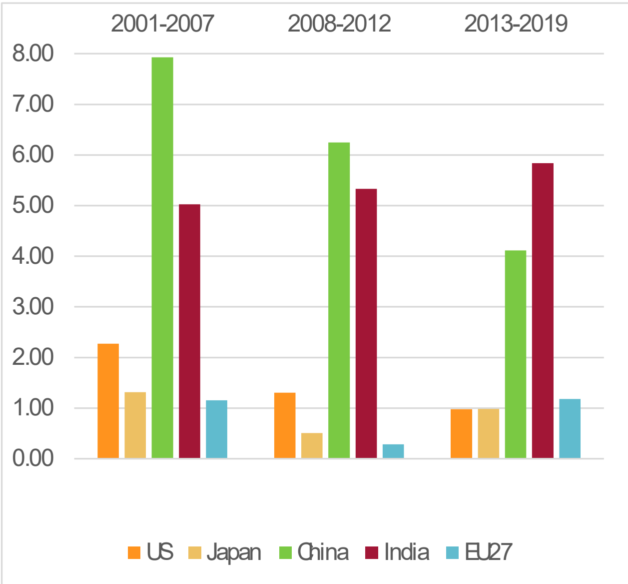
Figures 2.3 and 2.4 show that there has been huge variation in productivity growth within the EU, roughly aligned with the three groups of EU Member States shown in Figure 1.1. The formerly communist eastern EU Members, in catch-up mode, have enjoyed much higher productivity growth than both the EU average and the United States. Some southern European countries, notably Italy and Greece, have experienced very low average and cumulative growth rates since 2000 (in the case of Greece, reflecting a long boom-bust cycle punctuated by the sovereign debt crisis). Most high-income, 'old' EU Members have done better, but with the exception of Sweden, all had cumulative productivity growth below that of the United States (Figure 2.4).

[5] The Penn World Tables estimate TFP growth as the residual in a regression of real GDP growth on the growth of real capital and quality-adjusted labour, based on a translog production function (Feenstra, Inklaar and Timmer, 2015). Real capital is measured using the capital services methodology (Inklaar, Woltjer and Gallardo Albarrán, 2019). Labour is calculated by multiplying total hours worked multiplied with a human capital index based on average years of schooling and an (assumed) rate of return to schooling.

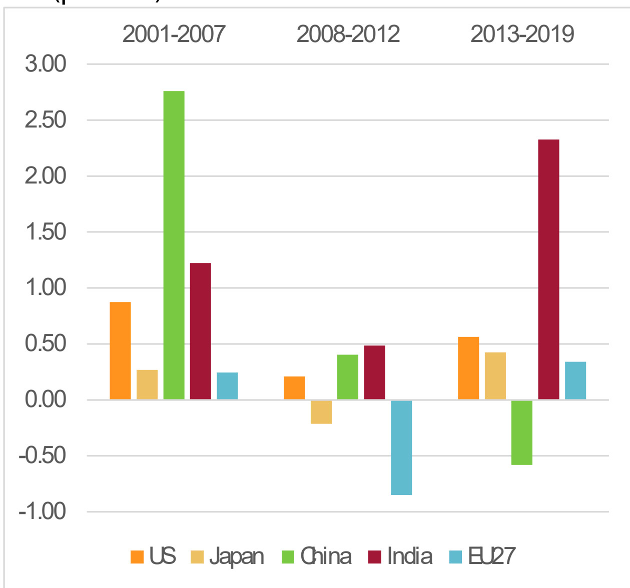
[6] The Figures 2.1 and 2.2 are based on Penn World Tables 10.1 data, which ends in 2019, to enable us to compare productivity growth in the EU, Japan and US to that in China and India, which is not available in the OECD data.

Figure 2: Productivity growth

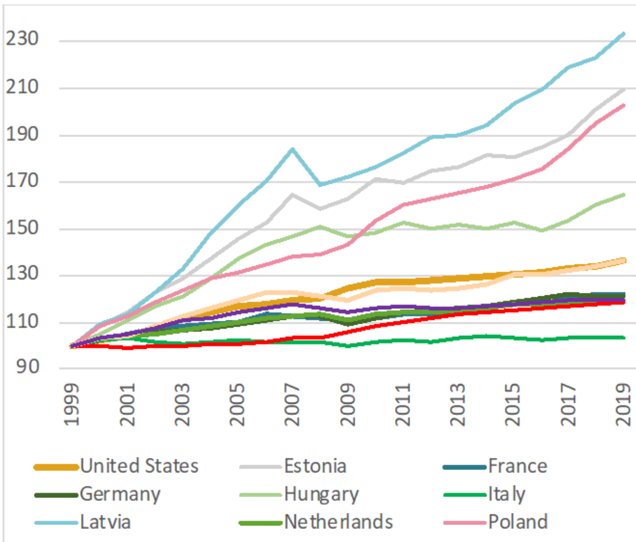
2.1 Average labour productivity growth (percent)



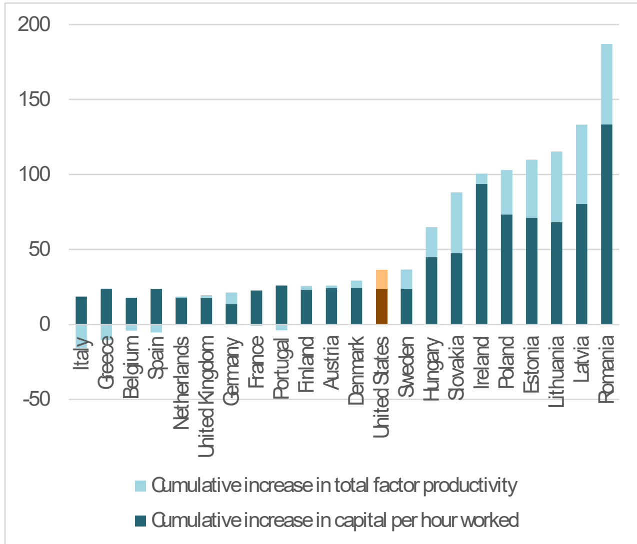
2.2 Average total factor productivity (TFP) growth (percent)



2.3 Labour productivity index, 1999=100



2.4 Labour productivity gains, 1999-2019 (percent)

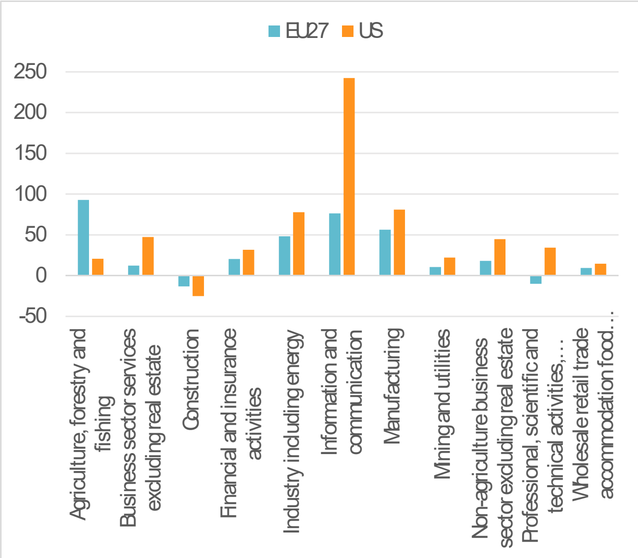


Sources: Penn World Table 10.01. Note: Labour productivity growth refers to growth in GDP in constant national prices divided by hours worked. TFP growth based on the Penn World Table's variable $RTFP^{NA}$ (TFP at constant national prices). EU27 averages weighed by GDP at purchasing power parity.

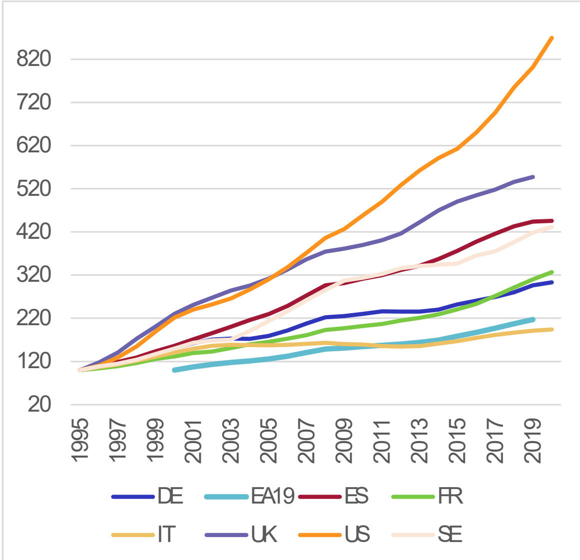
An extensive study by the European Central Bank (ECB, 2021) analysed the sector-level drivers of EU productivity growth and compared them to the US. In both the EU and the US, labour productivity growth has been fastest in the manufacturing and information and communication technology (ICT) sectors, but the former sector has driven the EU productivity performance, whereas the latter has driven the US performance. Moreover, the EU has lagged in both – dramatically so in the information and communication sector (Figure 3.1). It has also accumulated IT capital at a much slower pace than the United States (Figure 3.2).

Figure 3: Sectoral productivity growth and capital stock

3.1. Cumulative labour productivity growth by sector, 2000-2021 (percent)



3.2. Real IT-related capital stock (index, 1995=100)



Sources: Figure 3.1: Bruegel based on OECD; Figure 3.2: EU KLEMS.
Notes: Figure 3.1: Labour productivity is defined as gross value added per person employed (at constant prices). Sectors are defined according to the ISIC Rev.4 classification. Figure 3.2: EA19 (index, 2000=100).

A potential explanation for these differences is better technology adoption in the US. Differences in advanced technology adoption between the US and EU are also supported by data from the European Investment Bank (EIB) Investment Survey (EIB, 2023). Criscuolo (2021) pointed out that the productivity divergence between high- and low-productivity firms in Europe has widened more in digital-intensive sectors than in sectors where digitalisation plays a lesser role. This suggests that EU firms at the productivity frontier absorb digital technology as well as their US counterparts, but less-productive EU firms have a harder time keeping up with digitalisation.

While this evidence is strongly suggestive of a link between IT adoption and productivity growth, Figure 3.2 also suggests that differences in productivity growth cannot be fully explained by differences in IT investment. With respect to the latter, the best performer among the EU, Norway, Switzerland and the UK is the United Kingdom, which is also one of the worst performers on overall productivity growth (Figure 2.4). And the only economy in this group of 30 where productivity growth matches that of the US is Sweden, although its IT capital stock accumulation (while respectable by European standards) is much lower than that of the US.

2.3. Innovation and technology

Figure 4.1 shows research and development (R&D) spending among the 2,500 firms with the highest spending on R&D globally in 2022. US firms far outspent others in this sample, reflecting enormous volumes of R&D in three sectors that account for the bulk of the difference with other economies: pharma/biotech, software and IT. Despite their relatively modest shares of total value added or employment, these three sectors largely explain the R&D gap between the US, the EU and China.

These numbers could either reflect the larger number of US firms in the sample, the higher R&D intensity of US firms, or simply the fact that US firms in the sample are larger on average. Figure 4.2

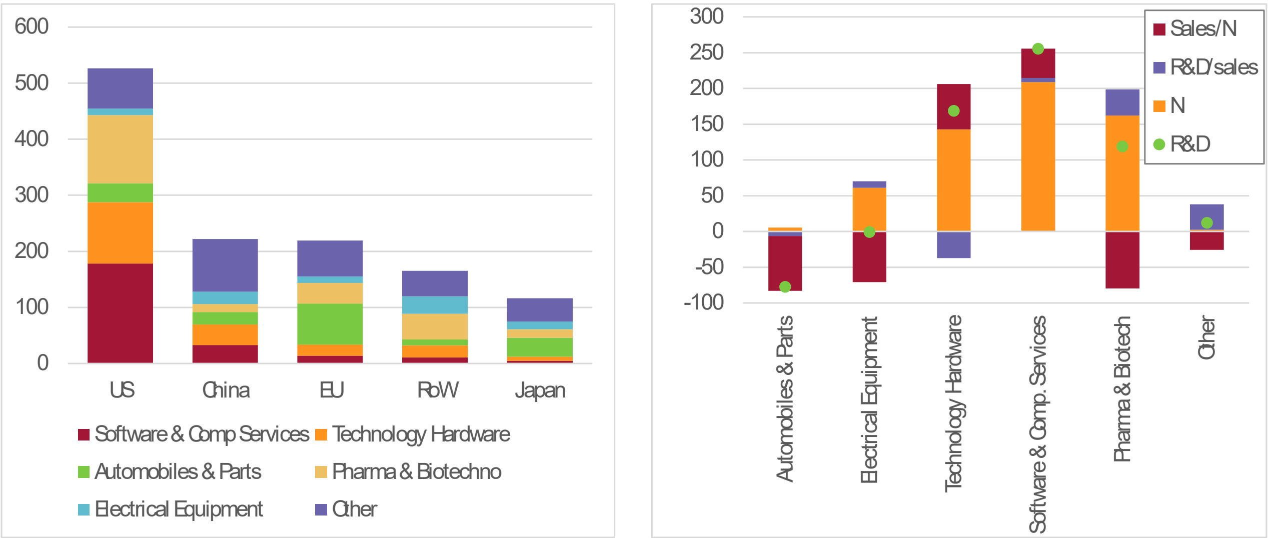
decomposes the percentage difference between US and EU R&D into these three factors, by sector. The main result is that the higher aggregate R&D in the US is mostly driven by the number of large firms (N) rather than scale (Sales/N) or R&D intensity (R&D/sales).

There is one important exception, however: the tech sector (both hardware and software), where higher US R&D is also explained by the greater scale of US firms. The prime example of course is the big US tech giants. Europe has no firm among the five biggest R&D spenders in the IT sectors worldwide, neither in 'software and computer services', nor in 'technology, hardware and equipment,' which are all either US (4) or Chinese (1) firms. Not being among the superstars matters in a 'winner-takes-most' innovation landscape, dominated by a few firms. The big five in software represent 45% of worldwide sectoral R&D and 42% of sales; while the biggest five firms in hardware represent 40% of world sectoral R&D and 28% of sales.

Figure 4: R&D spending by large companies

4.1. Sector and total R&D spending (€ billion)

4.2. Drivers of US-EU differences in R&D (percent)



Sources: 2023 EU Industrial R&D Investment Scoreboard European Commission, JRC/DG R&D.
Notes: Figure 4.2 decomposes the percentage difference in R&D spending between the US and the EU in the indicated sectors into the contributions of the number of firms in the sample (N), the scale of firms(R&D/sales) and the average scale of firms[7]. Values greater than zero mean that the US driver is larger than the EU driver.

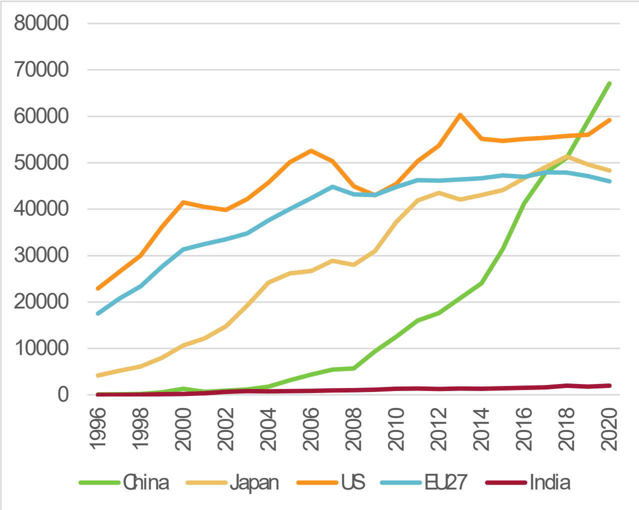
Figure 5 presents patenting trends (5.1) and recent patenting in frontier technologies (5.2). Chinese patents have undergone a stunning rise in volume, and now exceed those of the US, Japan and the EU. Patenting in the EU has fallen behind both China and the US and is on about a par with Japan, despite the EU's much higher GDP and population. Figure 5.2 shows that the EU is far behind the US and/or China in most frontier technologies identified by a 2022 McKinsey Global Institute report, although it does relatively well in the areas of automation and robotics, nanomaterials and biotech[8].

7 This uses the identity $\ln\{R\&D_i\} \equiv \ln\{R\&D_i * N_i/N_i * sales_i/sales_i\} \equiv \ln\{N_i\} + \ln\{R\&D_i/sales_i\} + \ln\{sales_i/N_i\}, i \in \{US - EU\}$.

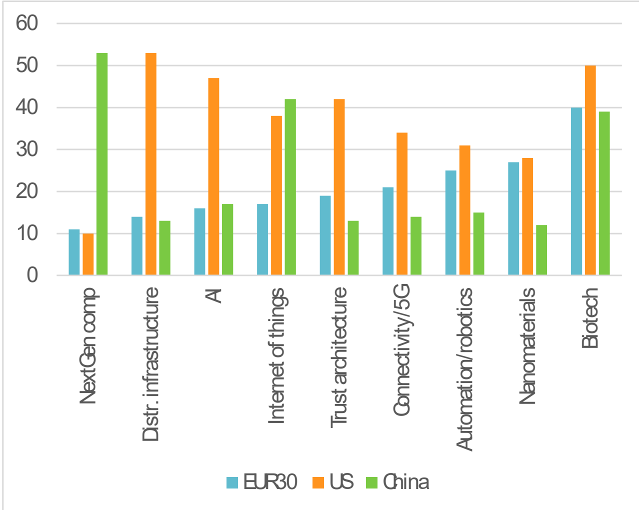
8 McKinsey Global Institute (2022) also showed that Europe does better when it comes to the *adoption* of the same set of frontier technologies. But even with respect to adoption, it is still behind the US and China, except in the areas of automation/robotics and nanomaterials.

Figure 5: Patents

5.1. Total number of patents



5.2. Patents in frontier technologies (percent of 'world class' patents filed)



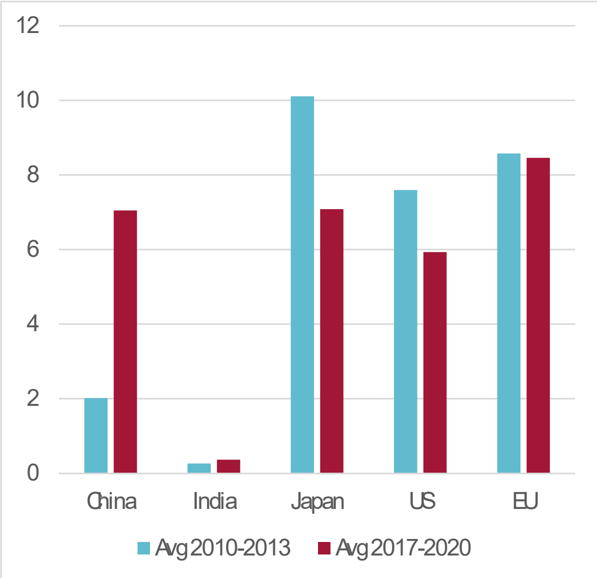
Sources: Figure 5.1: OECD STI Scoreboard; Figure 5.2: McKinsey Global Institute (2022) based on Breitinger, Dierks, and Rausch (2020).

Notes: Patent data in Figure 5.1 refer to patents filed under the Patent Cooperation Treaty (PCT). Patent data in Figure 5.2 refer to *"world class patents"* as identified by Breitinger *et al* (2020), expressed in percent of world class patents filed in 2019 in the technology area indicated, except for Internet of things and biotech, where the data refer to thousands of patents filed in 2010-20 and 2015-20, respectively. 'NextGen comp' refers to next generation computing, including quantum computing and neuromorphic software; 'Distr. Infrastructure' refers to distributional infrastructure, including cloud and edge computing. EUR30 includes EU, UK, Switzerland and Norway.

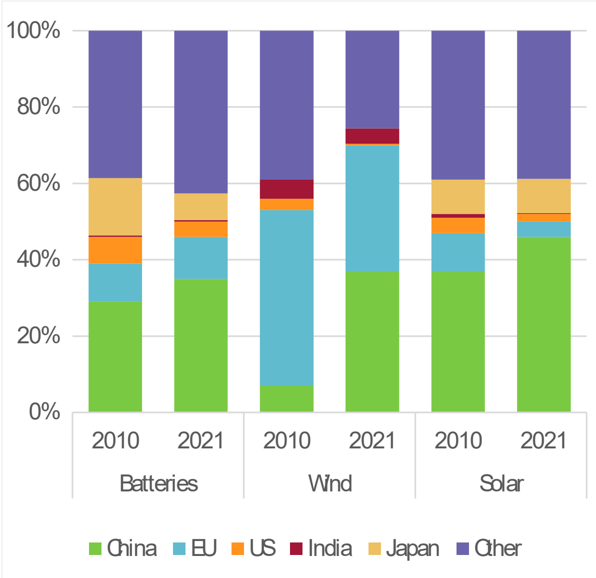
Figure 6 examines innovation and competitiveness indicators in clean tech – technologies essential to lowering emissions. The EU should have a comparative advantage in this area, as its policies create stronger incentives for decarbonisation and hence demand for clean tech. The skills and capital needed are close to those required in other manufacturing sectors in which Europe has traditionally had high shares of the world market. Figure 6.1 shows the EU remains a leader on green patents. While its share of world green patents declined slightly in 2017-2020 relative to 2010-13 – reflecting the rapid catching-up of China – it declined by much less than the low-carbon patent shares of Japan and the US, and it remains somewhat larger than that of China. With respect to clean-tech exports (Figure 6.2), however, China has long since overtaken the EU and is now the dominant exporter in all three product categories shown in the figure. This said, the EU has eked out an increase in its share of battery exports, and remains the second largest exporter of wind technologies.

Figure 6: Clean tech indicators

6.1. Distribution of green patents



6.2. Global clean tech export shares



Sources: Figure 6.1: OECD; Figure 6.2: UN Comtrade.
Notes: Figure 6.1: share of global low-carbon patents in percent. Data refer to families of patent applications filed under the Patent Cooperation Treaty (PCT). Low-carbon patenting refers to climate change mitigation technologies related to buildings, ICT, production or processing of goods, transportation, wastewater treatment, waste management; and reduction of greenhouse gas emissions related to energy generation, transmission and greenhouse gas capture and storage. Right panel: refers to imports of the top sixty economies by GDP in the world. Intra-EU trade is excluded.

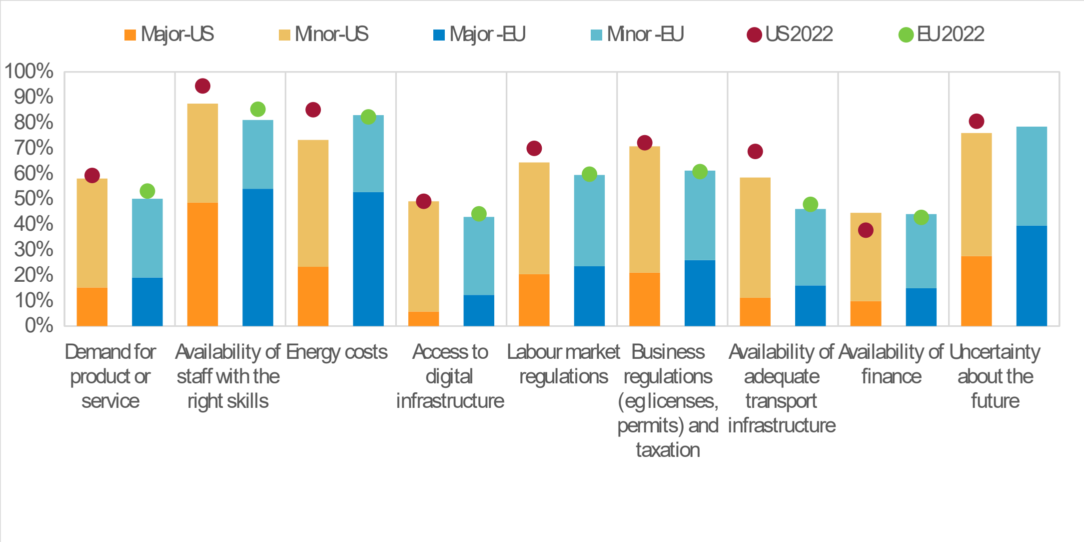
2.4. Supply-side conditions

One way to measure supply side conditions is to ask firms what prevents them from investing. Figure 7.1 summarises the main differences in the answers given by EU and US firms to questions posed in the latest EIB Investment Survey about investment obstacles, and compares them to the results for 2022. The share of EU firms that see an element of the business environment as a *"major obstacle"* is higher in *every* category. While the differences between the shares of EU and US respondents that identify a particular element of the business environment as a major obstacle tends to be small, there is one exception: in 2023, energy costs were identified as a major obstacle by 53% of EU respondents, but only by 23% of US respondents[9]. Figure 7.2 shows that the share of respondents that identified energy costs as a *"major obstacle"* to investment was significantly higher in the EU – by about 10 percentage points – even before the 2022 energy crisis. The share of firms identifying energy costs as a major or minor obstacle has declined in the US but not in the EU. The share declined in 2023 relative to 2022 (along with energy prices), but remains historically high.

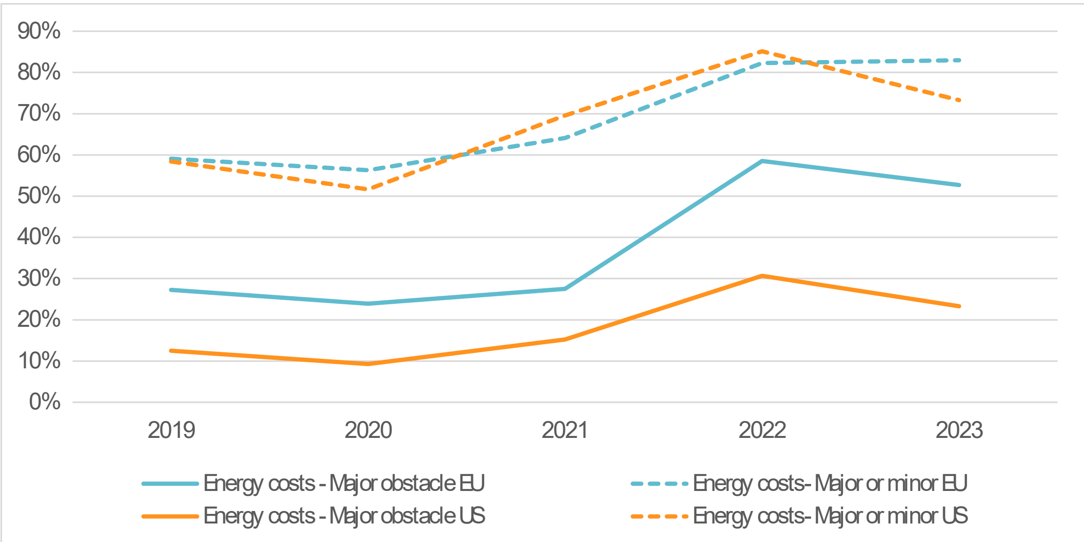
[9] The figure also shows that the share of EU firms reporting energy costs as an obstacle is matched only by that of firms identifying the availability of skilled staff as an obstacle. In this respect, there is very little difference with respect to US firms, for which skills are by far the number one named obstacle.

Figure 7: Obstacles to investment according to the EIB investment survey

7.1 EU-US comparison across all potential obstacles to investment, 2023



7.2. Share of respondents identifying energy costs as an obstacle, 2019-2023



Sources: Figure 7.1: EIB Investment Survey 2023; Figure 7.2: EIB Investment Survey Database.
Notes: The questions asked for Figure 7.1 are: Thinking about your investment activities, to what extent is each of the following an obstacle? Is it a major obstacle, a minor obstacle or not an obstacle at all?

Another way to measure supply-side conditions is to look at indicators that influence costs and innovation directly. Figure 8 presents four indicators of factor costs and market contestability: industrial energy prices, a product market regulation index that seeks to measure barriers to market entry, average hourly labour costs and the average tax wedge, which measures the average difference between labour costs from the perspective of businesses and take-home pay of employees. The results are mostly unsurprising:

- European (EU and UK) industrial electricity retail prices have been much higher, since 2021, than prices in the US, China and Korea (Figure 8.1). While the price of electricity has long been lower in the US, reflecting the availability of cheap primary energy, the gap has widened since

2021 and it remains elevated. Before the COVID-19 pandemic, electricity prices for business were 60% higher in the EU than in the US.

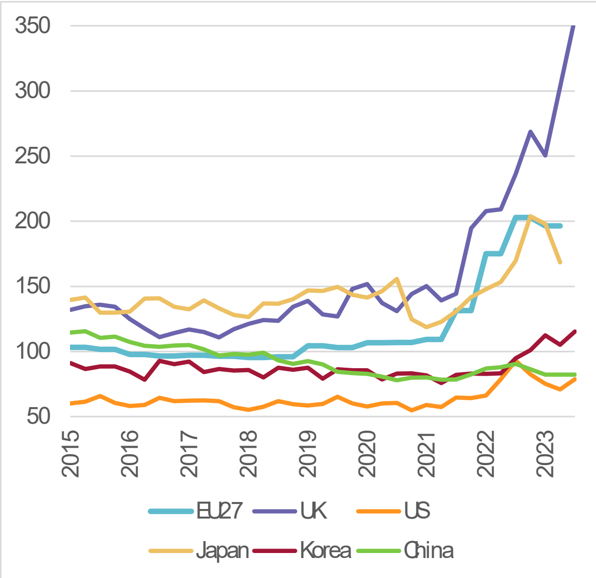
- Barriers to product market entry are lower in most EU countries (and the UK) than in the US and particularly in China, suggesting that European markets are more competitive and contestable than US markets. This is consistent with the findings of Gutierrez and Philippon (2019) and Philippon (2019), who found lower mark-ups over cost in the EU than in the US, and attributed this in part to product market deregulation in the EU, and in part to greater tolerance for concentration (mergers) in the US since the 2000s (Figure 8.2).
- Hourly labour costs per employee are higher in the EU than in the US, Canada or New Zealand. This reflects the average of North-west EU labour costs (which are much higher than in the US) and Southern and Eastern labour costs (which are somewhat lower or much lower than in the US, see Figure 8.3).
- Finally, EU tax wedges are the highest in the world (Figure 8.4). This said, it is also true that this tax wedge buys EU employees decent social security – in particular, healthcare – which in the US has to be mostly provided by businesses, and as such is a cost that comes on top of the tax wedge. Furthermore, US healthcare costs are the highest in the world (17% of GDP in 2019, compared to about 10% in the EU, UK and Japan). It is hence unclear whether the EU tax wedge reflects a competitive disadvantage with respect to the US or an advantage. However, it is likely a competitive disadvantage relative to countries like Japan or Korea, which have both comprehensive public healthcare systems and lower tax wedges.

Figure 9 examines another aspect of the business environment which is often cited as a competitive disadvantage for Europe: access to equity finance[10]. Figure 9.1 shows that the cost of equity funding in France, Germany and the UK is typically 0.5 to 2 percentage points higher than in the US. Figure 9.2 documents the well-known fact that the volume of venture capital funding is much higher in the US – at least twice as high as a share of GDP – than in European or Asian countries. Within the EU, Sweden is again the leading country, followed by Spain. Figure 9.3 shows that frontier technologies have attracted much less venture capital funding in Europe than in the US or China. To find out whether this reflects funding constraints or simply the fact that there were fewer attractive funding opportunities in Europe, Figure 9.4 compares European venture capital shares (as a proportion of venture capital received by EU/Norway/Switzerland/UK, US and Chinese firms) with European patent shares, and finds that with only one exception, patent shares are higher (usually much higher) than venture capital shares. This supports the view that young European firms are indeed more risk-capital constrained than their US counterparts.

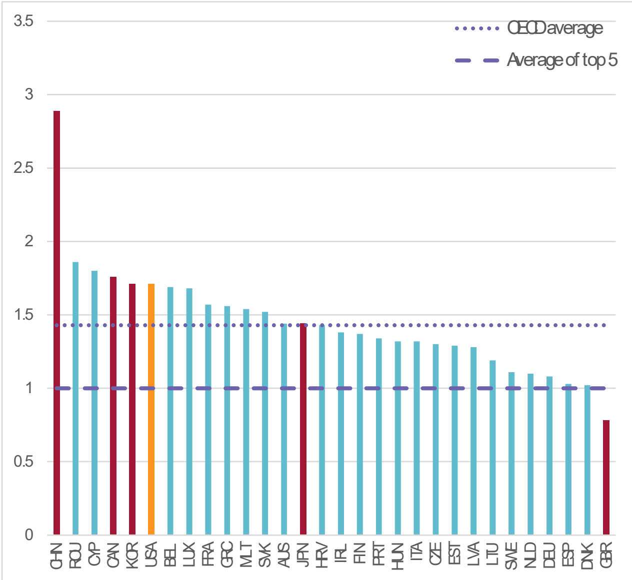
[10] Access to loans is not very different in Europe and the US, explaining why access to finance as a whole is only cited by a slightly higher fraction of EU respondents as an obstacle to investment than US respondents, see Figure 7.1.

Figure 8: Business environment indicators

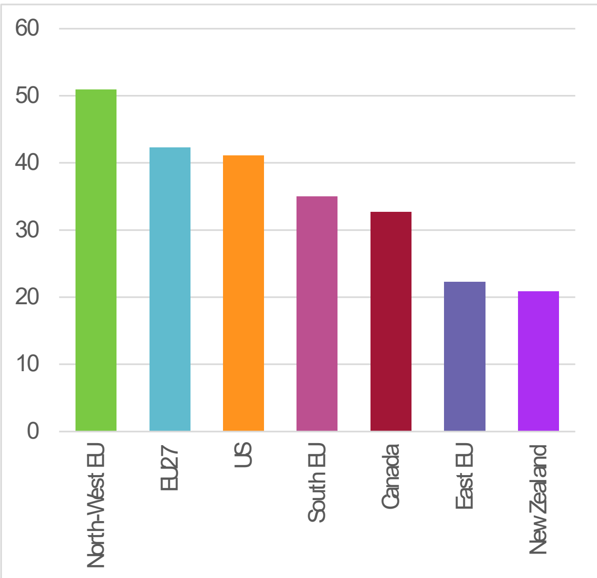
8.1. Electricity industrial retail prices, 2015-2023 (quarterly averages)



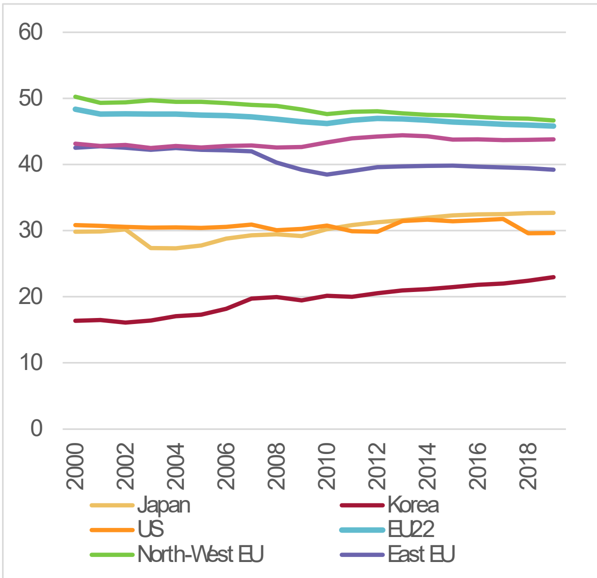
8.2. Regulatory barriers to product market entry (Index, 0 = lowest, 6 = highest)



8.3 Mean hourly labour cost per employee (in 2017 PPP-adjusted US$)



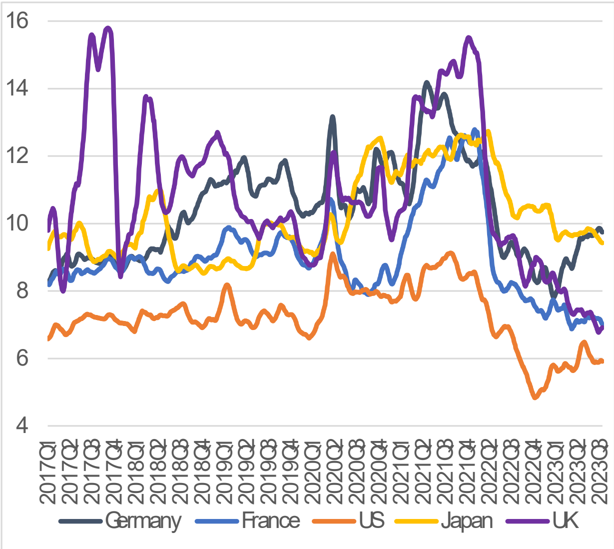
8.4. Tax wedges (in percent of total labour costs)



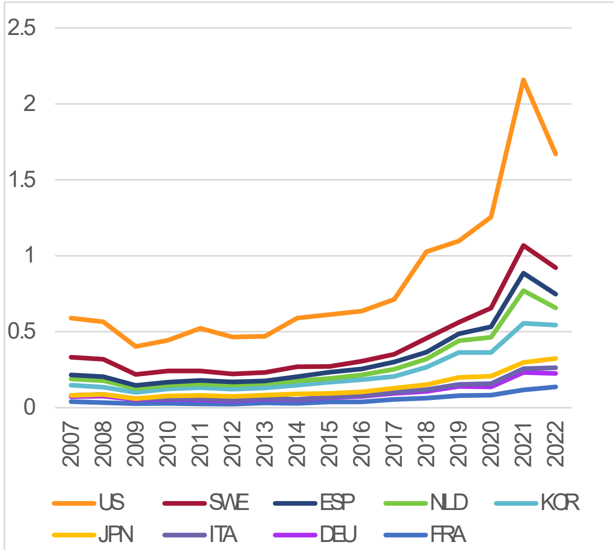
Sources: Figure 8.1. Chief Economist Team, DG ENER, European Commission, based on: Eurostat (EU), Energy Information Administration (US), Department for Energy Security and Net Zero (UK), International Energy Agency (Japan and Korea), CEIC (China); Figure 8.2: OECD; Figure 8.3: ILO; Figure 8.4: OECD. Notes: Figure 8.1: European Central Bank conversion rates. Industrial prices in the EU are represented by the ID consumption band for the purposes of international comparison. Figure 8.2. shows the 2018 OECD product market regulation index. Top 5 refers to the five best performing OECD countries (the UK, Denmark, Spain, Germany and the Netherlands). Average tax wedge refers to single person at 100% of average earnings, without child.

Figure 9: Cost and availability of equity finance

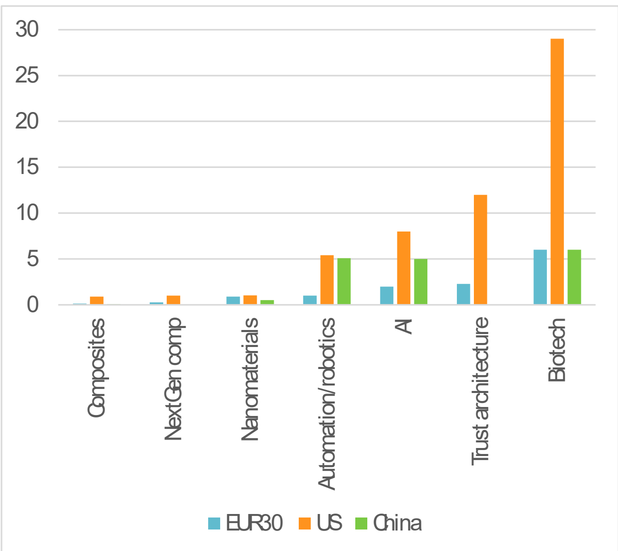
9.1 Equity risk premium



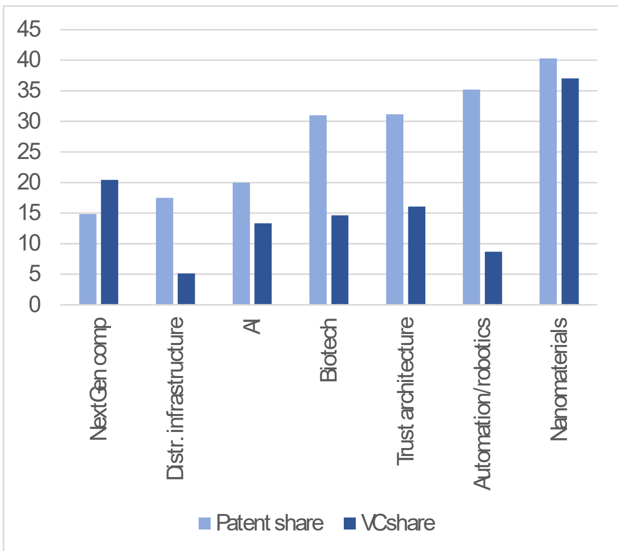
9.2 Venture capital funding (% of GDP)



9.3. Venture capital funding in frontier technologies (in billions of US$)



9.4. European patent shares and venture capital shares in frontier technologies (in percent)



Sources: Figure 9.1: Bloomberg; Figure 9.2: OECD; Figure 9.3 and Figure 9.4: McKinsey Global Institute (2022).
Notes: Figure 9.1 shows 21-trading-days moving averages of the equity risk premium, i.e. is the additional risk associated with investing in an international company (calculated as: market return minus risk-free rate, where the market return is the internal rate of return weighted by the market cap of each equity index member, and the risk-free rate is the yield on a local 10-year treasury security). In Figure 9.3, funding refers to 2015-2020 except for NexGen comp (2010-20), AI and trust architecture (2020) and Biotech (2018-20). In Figure 9.4, shares refer to European patents (or funding) divided by the sum of patents (or funding) in the US, Europe and China.

The greater difficulty of accessing risk capital in Europe compared to the US is often attributed to a smaller market scale and/or higher costs of obtaining scale for European firms. This view is consistent with evidence that significant barriers continue to exist within the EU. Using freight survey data, Santamaría *et al* (2021) found that, other things being equal, trade between regions across EU countries is only 18% of trade between regions in the same Member State. Santamaría *et al* (2023) showed that a border inside the EU reduces trade to 9.2% of the volume predicted without a border, controlling for distance. Even two regions sharing the same language and currency would trade four times more if they were not separated by a national border. The former effect is comparable in magnitude to the finding of Anderson and Van Wincoop (2003) that provinces in Canada trade five times more with each other than with neighbouring states in the US.

Despite decades of effort to build a single market, EU trade is still mostly undertaken between entities within the same Member State, and borders inside the EU still have a significant negative effect on trade.

3. A STRATEGY FOR RAISING EU COMPETITIVENESS

The analysis in the previous section suggests that the EU's competitive disadvantage, particularly compared to the US, has worsened in recent years. The cost of not having an integrated energy market has increased with the discontinuation of Russian gas shipments and the declining share of easily tradable fossil fuels in the future EU energy mix.

The cost of not having an integrated labour market has increased in a world in which productivity relies on the mobilisation of skills. The cost of not having a single market for services has increased in a world dominated by digital giants. The cost of not having a unified capital market has increased in a winner-takes-most world in which fast-growing firms can quickly acquire world dominance. The enumeration could go on, and lead to the conclusion that the cost of non-Europe is much higher nowadays than it was forty years ago[11].

The problem is that except for energy, the fragmentation argument is very old. Integration has been the mantra of the EU and its predecessors since the creation of the European Coal and Steel Community, and increasingly since the Lisbon Treaty. The fragmentation of the EU and the imperfections of the single market remain despite massive past efforts, sometimes in the wake of crises, to improve them – and notwithstanding step-by-step successes. Market integration is in a way the EU's Sisyphean rock.

The advocacy of closer integration within the single market (call it Plan A) should be pursued. It is still worth going back to the drawing board to identify which reforms Member States need to implement to make it happen. The focus should be on identifying the political economy impediments to energy union, financial union and innovation union. Political capital should be mobilised to make the case that overcoming these constraints has become more existential than in the past, because of (1) the need to ensure efficient investment in the electrified energy system of the future; (2) the increasing importance of scale in the digital economy; (3) reduced fiscal space; (4) last but not least, the insurance effect provided by the single market in the face of greater external security threats. In a fundamentally different geopolitical environment, the traditional gains from integration must be seen in a new light.

But Plan A is unlikely to constitute a sufficient strategy. Across-the board integration is being resisted for a mixture of good and bad reasons, some of which are very hard to argue against. Because Europe consists of sovereign countries with no or limited direct federal resources, it is harder to fund projects irrespective of which country benefits from common public spending, harder to cooperate on regulatory alignment, harder to maintain a level playing field for firms, and harder to coordinate public investment with cross-border spillovers. The results are higher trade barriers, lower access to growth finance and also higher energy costs. It also makes for less-nimble responses in the face of new opportunities and threats, which can be a competitiveness disadvantage in its own right.

This reality must be acknowledged. In complement to Plan A, Plan B should focus on specific high-return integration projects and pursue a strategy that we call *Coordination for competitiveness*. To this end, medium-term coordination opportunities should be identified that have the potential to deliver the greatest common gains. These must be sufficiently large that collective action becomes possible even in presence of the constraints that have prevented faster progress on the single market. To have a structural impact, these coordination areas – which would not necessarily involve all Member States

11 We do not bring up the EU's comparatively expensive social model here, because it is linked to social cohesion and buys government services that otherwise may have to be provided by firms, with ambiguous effects on competitiveness. Neither do we want to exclude additional causes, such as the family ownership structure of many SMEs, or the lack of a US-style management culture, which may be one of the reasons behind slower IT adoption; see Schnabel (2024) and references cited in her speech.

– should be institutionalised as far as possible, i.e. reflected in permanent or at least longer-term arrangements[12].

Joint action will typically (though not always) involve the use of public funds, either at EU level or through a common vehicle, for two reasons.

First, some policy instruments, such as investments or industrial policy, intrinsically require money, and the use of subsidies at national level creates an adverse externality across borders because it distorts competition. This is the reason for state-aid rules. The trade-off between the good and bad (distortive) effects of national fiscal instruments can be removed through EU-level spending. Of course, this may create other problems, in particular, with how to finance this spending, and how to create appropriate accountability. This is why coordination for competitiveness will probably require innovative instruments that blend EU budgetary instruments and additional Member-State support. Such instruments exist already, as exemplified by European Peace Facility through which military support has been provided to Ukraine, thanks to the combined provision of funds by the EU and Member States. Another example is provided by the 'Auctions as a service' initiative launched by the European Commission in November 2023, which blends money from the EU Innovation Fund and national contributions that top them up[13].

Second, while coordination may lead to large efficiency gains, it may not make every Member State better off. To convince countries that would end up worse off to take part, or to at least not to veto a particular initiative, they will need to be compensated. As a result, it may be easier to get consensus on a common venture when this intrinsically requires funding (e.g. for public investment), or when policy coordination and common funding can be linked.

The remainder of this paper offers two concrete ideas for coordination that would achieve significant medium-term gains. These are not the only ideas (see Claeys and Steinbach, 2024, for a methodology and additional examples). For example, substantial efficiency gains may arise from better coordination of EU defence procurement, helping to contain costs at a time when defence spending will need to rise to protect vital European security interests. However, this topic is beyond the scope of this paper.

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12 Several such arrangements exist already or have existed in the past, until they were eventually absorbed by the EU. A recent example is the European Stability Mechanism. Alternative arrangements, which are not necessarily permanent are conceivable; see Claeys and Steinbach (forthcoming).

13 See Auctions-as-a-Service for Member States, Concept Note, DG Clima https://climate.ec.europa.eu/document/download/6a0fb0a3-bfb3-4b89-b180-c2933551ae0c_en?filename=policy_funding_innovation_conceptpaper_auctionsasaservice.pdf.

4. COORDINATION FOR COMPETITIVENESS: TWO IDEAS

In what follows we focus on two reform avenues: energy policy coordination and the redesign of EU innovation policy. This choice of priorities is dictated by the importance of these issues, the urgency of a response and the relatively direct connection between policy action and results. Neither of these reforms would require a fundamental overhaul of the EU Treaty architecture. Rather, they imply that the EU and the Member States should focus their attention on deficiencies in the current policy system and on ways to address them.

4.1. Energy policy coordination

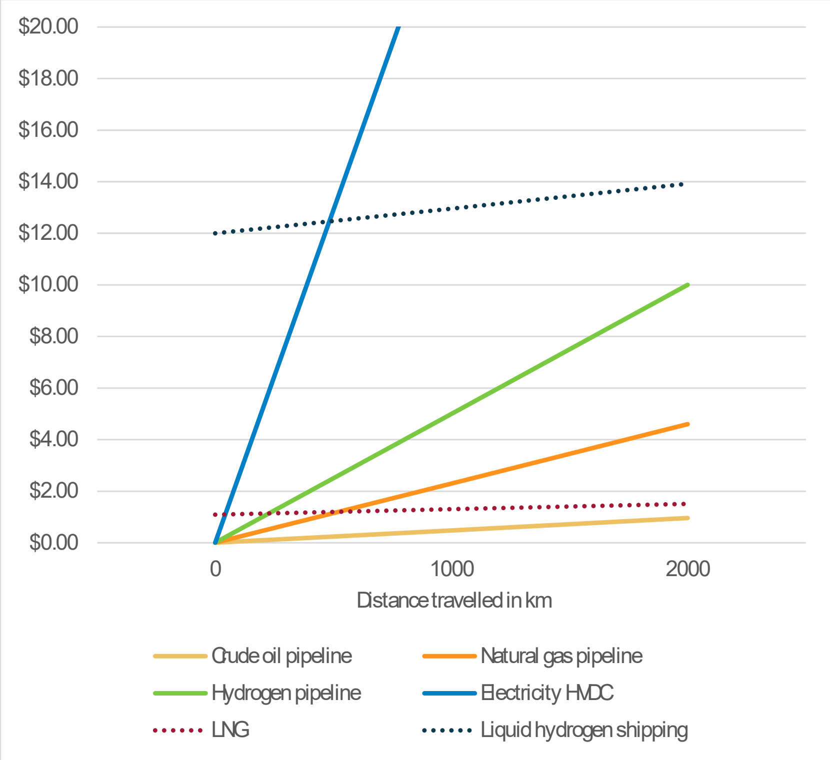
Over the past decades, Europe has increasingly met its growing energy demands with energy imports. In 1990, domestic nuclear and hydropower, as well as domestically produced coal, oil and gas, covered more than half of the EU's primary energy demand. By 2019 this share had declined to 37.5%. Underlying this drop was a decline in domestic fossil-fuel extraction and a hope that mutual dependencies and some degree of diversification would ensure energy security at low cost. This hope has been severely shattered. Energy imports from Russia[14] have had to be largely replaced. Global oil and gas market volatility threatens EU security and economic competitiveness. Where natural gas needs to be burnt to produce electricity, this will spill over into electricity prices.

The only way forward for Europe is to speed up the transition to a decarbonised energy system. While decarbonisation was a priority in its own right until 2022, it is now the only available way to secure energy supplies and hedge the cost of energy for the European economy. This will take time, however. In the meantime, imbalances between supply investments and demand-developments will drive energy prices in the EU. In addition, the energy price consumers face will depend strongly on the degree to which the needed investment wave is financed through immediate rate hikes, spread out over time, or taken up by taxpayers.

If decarbonisation proceeds as expected, in two decades virtually all sectors will be dependent on electricity. Consequently, the cost of electricity will become the single most important variable for the cost competitiveness of all energy-intensive sectors. Regions with favourable clean-energy potential will gain in competitiveness, while regions with substantial energy-intensive industries built on the nearby availability of fossil fuels might lose out. Since clean energy (electricity, green hydrogen) is generally much more expensive to transport than coal and oil (Figure 10), production based on domestic renewable energy (e.g. wind) or imported energy-intensive pre-products (e.g. green steel) will generally be cheaper than if it is based on imported energy (e.g. green hydrogen). As a result, the transition to a carbon-free economy has the potential to redraw the global and the European competitiveness map.

[14] In 2021, 44% of the EU's gas supplies, 25% of its oil supplies and 52% of its coal supplies.

Figure 10: Approximate cost of transporting 1 MWh of energy



Sources: Bruegel. Notes: There is a significant degree of uncertainty especially for hydrogen pipelines and shipborne liquefied hydrogen transport, which are emerging sectors without established benchmarks. We do not intend for the figure to be read as providing a comprehensive overview of the different costs, but rather as illustrative that when using reasonable assumptions, the transportation of future clean fuels is typically more expensive than the transportion of fossil fuels currently.

European energy supply is already undergoing a rapid and profound transformation. In less than twenty years, the EU will have shifted from a fossil fuel-dominated system to a clean electricity-dominated system. The cost-effectiveness of this transformation will play a fundamental role in determining if Europe is competitive on the world stage.

For the EU as a whole, it is not clear whether accelerated decarbonisation will reduce or increase the total cost of energy. Depending on the (highly volatile) prices of fossil fuels and on the (only somewhat less volatile) cost of financing and amortising capital-intensive equipment, the cost of carbon-free electricity may be higher or lower than that of electricity in a system dominated by fossil fuels.

However, we *do* know that the current cost structure is far from optimal. Because decarbonisation will rely essentially on substituting capital for fossil fuels, the main costs in a clean electricity system will be capital costs. Hence, the allocation of capital will determine whether the system is well-tailored to minimise costs.

This insight forces us to revisit the gains from integrating electricity markets. Once the transition is completed, virtually *all* primary energy will be used to produce electricity. As a result, electricity production in the EU will have to double from 2,600 TWh in 2023 to 5,200 TWh in 2040, and the importance of the electricity sector for overall competitiveness will increase accordingly. This transformation will magnify the gains that arise from coordinating electricity system investment and from integrating European electricity markets, through five channels.

***First*, exploiting geographic comparative advantage**. Reaping the sweet spots of solar generation (south), wind generation (coast), hydro generation (mountains) and nuclear generation (sparsely populated areas) will save significant cost. If grids were unlimited, replacing German solar with Spanish solar would save some 60% of the cost of solar electricity production. Italy by contrast might save 50% of investments if it installed its wind turbines at the Baltic Sea. The reality is more complex, as geographic averaging of renewables in different regions increases the value of cooperation, while the cost of transmission constrains it. The challenge for energy policy coordination will be to find ways to exploit comparative advantages while minimising transportation costs. Adequate pricing would help provide the right incentives to the many players in the energy field.

***Second*, reducing volatility – and hence backup capacity requirements**. Reliance on neighbours in situations of supply shortfall reduces the need for backup capacity at European level by almost 20% (compared to a situation in which each country maintains its own backup). The same holds for investments in flexibility, such as batteries. Here, the heterogeneity in the generation mix and in demand across the integrated market can help absorb substantial individual shocks and improve overall resilience. This also applies to the decorrelation of renewable energy supplies triggered by diversification (as at each point in time, wind speeds vary across Europe), as well as to possible shortfalls, such as the 2022 drop in French nuclear generation that was compensated for by electricity imports from neighbours.

***Third*, reducing fuel consumption during the energy transition**. By optimally importing electricity from neighbours in times of excess domestic demand, a country would need a lower average power capacity. This, in turn, would reduce the amount of fuel burned and CO_2 emitted for power generation (until the transition to a carbon-free power system is complete).

***Fourth*, lowering capital costs through a more reliable market framework**. More certainty about supply, demand and policy reduces capital costs. Less-credible countries especially will benefit from more stable policy conditions, allowing investment in their abundant resources to the benefit of the entire system.

***Fifth*, cost savings through better sequencing of investment.** While complete decarbonisation will require the elimination of all fossil fuel-dependent energy sources, the path to decarbonisation will have an influence on the cost of the energy transition. For a given EU-wide emissions target pathway, taking an EU-wide approach would give more flexibility to start with the investments with the lowest abatement costs.

Overall, the gains from coordinating decarbonisation efforts to minimise the associated costs will likely be significant. A well-designed electricity market buttressed by sound principles for risk reduction and risk sharing will bring major benefits in terms of efficiency, safety and resilience.

In the short term it might look more attractive to reduce electricity prices for certain types of consumers – often energy-intensive industry – to help their competitiveness (McWilliams *et al*, 2024). This can be done in very different ways, which all have in common that some other market participants would have to shoulder a higher share of the system cost. One way is to let the state pay a part of the energy cost. This can be done via direct subsidies to specific consumers, by running deficient state-owned energy companies, by letting the state pay for certain energy infrastructure[15], or by state guarantees. In the end the cost will show up as higher taxes or more debt – a disguised cost perhaps, but a cost nevertheless. Specific consumers can also be relieved from paying some of the system cost, by putting more cost on the shoulders of other consumers. This regularly happens in Europe[16], for example through differentiated network costs, renewables levies or other forms of market-design choices that

[15] For some infrastructure, especially grids, a case can be made that cost-covering tariffs are inefficiently high from a social planner's perspective, and that letting the state co-fund this leads to more efficient energy consumption decisions.

[16] The ratio between household tariffs and industry tariffs is very different across countries.

shift cost between consumer groups. Finally, lower prices for some consumers can also come from giving less money to producers. This is the essence of ideas to uncouple electricity and gas prices. Here, producers do not obtain the marginal price. This will typically mute future investments – and if badly designed will also make the use of the existing system more inefficient.

Common to all such cost-shifting solutions is that they reduce the incentive for the beneficiaries to count the true cost they are imposing on the system. Hence, they invest/behave in a less system-friendly way, leading to a higher structural system cost. Given that the transition is about efficiently matching new demand and supply patterns, cost-shifting driven by the desire to improve the competitiveness of individual sectors is not a sustainable strategy.

The only sustainable way to improve energy competitiveness is to contain energy system cost through stronger coordination of energy policies and energy-market integration. This could happen to various degrees of ambition:

- A **gradual way forward** would be to let a trusted public institution conduct electricity system planning scenarios for Europe, against which national plans and policies are scrutinised (e.g. in state-aid cases). Concretely, such an institution (a European Energy Agency?) could assess redundancies and gaps in the entirety of the national energy and climate plans and the national network development plans. Existing policy processes, such as the European scrutiny of national investment incentives and market design choices, and European support mechanisms such as the Connecting Europe Facility, as well as new policy processes such as European investment incentives and funds, could help address the observed shortcomings. This should be accompanied by some degree of harmonisation of national investment incentives (such as contracts for difference – CfDs and capacity mechanisms) and credible oversight over any national tools that have disproportionate adverse effects on investors in other EU countries. At best it will give rise to competitive European incentives for investments (e.g. a European capacity mechanism).
  A common fund for cross-border lines and other common infrastructure would help fill crucial gaps (and might also entail some compensation for those who benefit less). It could be established as a common institution that would lend on a long-term basis to network operators, or a consortium of them, and would favour cross-border interconnection investments.
- A **more radical approach** would be to undertake a market reform that envisions a truly borderless market. Such a market would have rules that limit national interventions on the one hand, and efficient European system development and system management institutions on the other. For example, a European system manager (Independent system operator) could run the short-term electricity market throughout Europe, with granularity reflecting local demand-and-supply conditions. This would be overseen by the European regulator (Pisani-Ferry, Tagliapietra and Zachmann, 2023). This would result in a future-proof system that overcomes many of the complexities, inefficiencies and reduce the unpredictability of the current patchwork of inconsistent instruments. It would also require a governance system that ensures Member-State governments know they can still exert control in case of dramatic events.

4.2. An EU-ARPA

Europe does not compare well to the US in terms of firm demographics. On average, European firms are older, less productive and less innovative than their US counterparts (Schnabel, 2024). As discussed in section 2, these handicaps are particularly pronounced in the IT and pharmaceutical sectors. Without policy initiatives, there is a distinct risk that Europe will continue losing ground to both the US and China.

This calls for a strong industrial policy that promotes innovation, demonstration and commercialisation at the technology frontier, even at the price of disrupting and displacing incumbent strengths. And there are good reasons for undertaking it at EU level:

i) Competitiveness requires sustainable comparative advantages across the whole value chain/ecosystem, which is more likely to be found at EU level rather than in individual countries. Action at EU level also internalises the cross-country externalities that are highly likely to arise with individual Member-State investments.
ii) Countries might be individually tempted to each subsidise commercially unviable projects promoted by national incumbents, at the detriment of efficiency and, ultimately, of their own prosperity;
iii) Some Member States may lack the fiscal space needed to provide public support, in which case national action would distort competition within the single market. Beyond the policing of national state aids by the European Commission , this may motivate the elevation of the corresponding policy action to EU level.

The question, however, is not if there is a case for initiatives at European level. Rather, it is whether the EU has the will and the capacity to design and implement policies with the potential to remedy its economic illnesses.

The observation that, because EU-level funding has particular value for expenditures programmes with high cross-border externalities, the EU should spend more on research and development, is not new. It was for example already highlighted in the Sapir Report (Sapir, 2004). Action has followed, with the share of R&D expenditures in the EU budget (as reflected by the Framework Programme budget) rising from 5.8% in 2007-2013 to 7.9% in 2021-2027. Qualitatively also, instruments have diversified, with an increasing part of the funding taking the form of extra-budgetary programmes. As things stand, European initiatives can be grouped into three buckets (Box 1): EU budget-funded programmes; the emissions trading system-funded Innovation Fund, and Important Projects of Common European Interest (IPCEIs) and Alliances.

Box 1: EU Funding of research and innovation

Bucket 1: Budget-funded EU programmes

Horizon Europe, the main EU funding programme for research and innovation, represents the latest generation of the EU's Framework Programmes for Research and Technological Development that have been rolled-out since 1984. It has a budget of EUR 95.5 billion for the period 2021-2027. The bulk of this funding goes to cross-Member-State collaborative research projects, with the strategic objective of boosting EU competitiveness and growth, with an extra focus on green and digital goals. Support schemes under its umbrella include:

- The **European Research Council** (ERC) created in 2007 to fund frontier research through grants. The overall ERC budget from 2021 to 2027 is around EUR 16 billion;
- The **European Innovation Council** (EIC) created in 2018 (and scaled up in 2021) to help companies grow and expand beyond European borders. It has been allocated a budget of around EUR 10 billion for the period 2021–2027, which is provided to beneficiaries as grant and/or as an equity investment;
- The **European Institute of Innovation and Technology** (EIT) created in 2008 with a budget of EUR 2.9 billion for 2021-2027. The EIT supports the development of pan-European partnerships among companies, research labs and universities called EIT Innovation Communities (Knowledge and Innovation Communities – KICs) to find solutions to global challenges.

Those funds mostly provide support to bottom-up initiatives selected on the basis of excellence and their potential impact on the innovation ecosystem.

Bucket 2: The ETS-funded Innovation Fund

Other EU instruments go beyond the Framework Programme and beyond R&D. The **Innovation Fund**, established in 2020, is financed from ETS revenues. Depending on the carbon price, the Fund will provide around EUR 40 billion of support over the 2020-2030 period (this figure assumes an average carbon price of EUR 75/tCO2). The Fund is meant to be one of the world's largest funding programmes for the demonstration of innovative low-carbon technologies, and a key EU industrial policy tool moving forward. The Fund focuses on highly innovative clean technology projects, especially in energy-intensive industries. As of February 2024, 104 projects had been signed, for a total contribution by the Fund of EUR 6.5 billion. Again, it will provide support to bottom-up initiatives of limited scale.

Bucket 3: IPCEIs and Alliances

A relatively new EU instrument to establish European public-private partnerships, the European Alliances have mostly been formed within the framework of the series of **Important Projects of Common European Interest (IPCEIs)**, launched in 2018. These initiatives aim at creating in Europe integrated, cross-border value chains in technologies considered of central importance for *"economic growth, jobs, the green and digital transition and competitiveness"*.[17] They are formed on the initiative of European countries that co-fund them, jointly with private investors.

By early 2024, eight IPCEIs had been approved by the European Commission under the state aid regime, for a total of EUR 34.8 billion in public funds and potentially EUR 56.8 billion in private investment. Projects so far have covered microelectronics, batteries, hydrogen and cloud computing, and they rely on coalitions of the willing, as none have been funded by the EU or all Member States.

Within the framework of IPCEIs, projects are allowed to receive state aid from Member States, conditional on certain criteria and monitoring by the Commission Directorate-General for Competition Policy. IPCEIs are therefore an instrument through which the EU level can support and coordinate national or regional innovation policies.

Overall, total annual public funding for innovation-related projects can be assessed to be:

- Some EUR 2 billion per year for EIC and EIT initiatives funded by the EU budget (plus EUR 2.3 billion for the ERC);
- Some EUR 4 billion per year for the ETS-funded European Innovation Fund;
- Some EUR 7 billion per year for the IPCEIs[18].

These are non-negligible numbers, considering that the range of sectors that could potentially benefit from support is rather limited. Moreover, total funding available for supporting business development has grown materially in recent years, beyond the EU level. Europe cannot be accused of being oblivious of the need to mobilise funds and let its business sector thrive.

There are two problems with EU programmes, however:

- ***A bias against risk-taking***. This biases against projects that have the potential to be the next big breakthroughs but typically also come with a high failure rate (high gain/high risk);
- ***Weak governance***. Budget-funded programmes are generally administered by Commission services, which have not been given the mandate and lack the independence required to terminate unsuccessful projects. This governance deficit results, in the best cases, in the

[17] See the Commission's Communication on the compatibility with the internal market of December 2021 and DG COMP's *Code of good practices for a transparent, inclusive, faster design and assessment of IPCEIs,* May 2023.

[18] Extrapolation based on the 2018-2023 experience.

selection of projects being outsourced to expert committees, which is good for scientific and technical quality but bad for the matching between funding and policy priorities.

Missions initiated within the framework of the Horizon Europe programme provide a good example. Missions are intended to provide a response to the need for a more directed top-down approach to solve specific challenges in society. For each of the five missions it has defined, the European Commission engages with the civil society in design, monitoring and assessment. Yet the total budget for the missions is a small fraction (less than EUR 600 million per year) of the total Horizon Europe budget. Second, the governance of these missions is in the hands of Deputy Director-Generals in the Commission, who lack the time and technical deep expertise to properly guide the missions towards their KPIs. Given this governance structure it is unclear, to say the least, if these missions will be able to correct the prevailing rigidity in the allocation of EU funding, or if they will result in the termination of projects that do not deliver.

The Juncker Plan of 2015 (whose main instrument is the European Fund for Strategic Investments, EFSI) aimed to address these biases by blending EU guarantees, European Investment Bank capital and private investors' money in a way that was expected to reduce risk aversion and unlock the funding of viable, yet risky projects. However, despite positive evaluations (EIB, 2021), EFSI proved insufficient to unleash the creative-destruction machine (Aghion, Antonin and Bunel, 2023) and reverse the widening of the innovation gap between the US and the EU. The sad reality is that the EU still lacks the combination of goal-oriented, top-down approach characteristic of US ARPA-type programmes (Box 2).

We propose the creation of an EU-ARPA dedicated to a limited number of explicit policy priorities and run by an independent agency. This agency would be allocated a budget, the breakdown of which into a series of precisely defined objectives would be proposed by the Commission and approved by the Council and the Parliament. The agency would then issue competitive calls for projects corresponding to these objectives. These could include, for example, new technological alternatives to critical components, products or services where there are supply risks in existing technologies, thus addressing the EU's demand for resilience by soliciting the EU's science and innovation capacity. Objectives could also include fully recyclable solar panels, next-generation batteries using materials that are non-critical for the EU and next-generation vaccines.

The EU ARPA could have several compartments (e.g. an EU-ARPA-E, EU-ARPA-C, EU-ARPA-H – see Box 2). It could also connect to complementary funding schemes, at national (e.g. Germany's SPRIN-D) and EU level (such as upstream ERC and downstream Innovation Fund). The ERC and EIC should keep their focus on supporting bottom-up ideas, thus balancing EU ARPA's top-down focus.

Box 2: The ARPA ecosystem

To support transformative and high-risk research approaches to tackling societal challenges, the Biden Administration's 2023 federal budget included funding for breakthroughs based on the successful model of the Defense Advanced Research Projects Agency (DARPA), which has a budget of $4.1 billion (2023):

• $5 billion for the Advanced Research Projects Agency for Health (ARPA-H), within the $49 billion requested for the National Institutes of Health (NIH), to drive health and biomedical breakthroughs that enhance health, lengthen life, reduce illness and disability, and spur new biotechnology products and innovation.

• $700 million for the Advanced Research Projects Agency-Energy (ARPA-E), in the Department of Energy, which will expand its activities into adaptation and resilience.

• $3.2 million for the planning and development of the new Advanced Research Projects Agency-Infrastructure (ARPA-I) in the Department of Transportation to accelerate the transformative transportation goals of the Infrastructure Investment and Jobs Act.

DARPA has also inspired other governments to duplicate this agency within their own borders. The United Kingdom announced its version, the Advanced Research and Invention Agency (ARIA), in January 2023 with an initial allocation of £800 million. German's SPRIN-D started in 2019 and set to operate for 10 years with a budget for this period of EUR 1 billion, allocated by the German Federal Government. Japan launched in 2019 its Moonshot Research & Development Programme, with a budget of 100 billion yen ($963 million). The JEDI agency, created in 2018 and based in France, with a budget above EUR 1 billion, claims to be the European ARPA, but does not have a recognised EU dimension.

Source: Bruegel.

An EU-ARPA could also top-up national funding for projects that demonstrate pan-European collaboration (such as the IPCEIs), thus contributing to the creation of new high-tech ecosystems at EU scale, even in areas where Member-State funding would be insufficient. It could also be utilised to top-up national public procurement of innovative technologies (for instance as proposed by the Net-Zero Industry Act), to enable more strategic use of this tool in Europe, fostering roll-out of innovative technologies at EU scale.

It is important to stress that an ARPA-style approach requires more than just importing a label. It requires sufficient funding – part of which could be funded by redeploying existing budgets – to allow it to make multiple bets within a portfolio approach to manage the high-risk position it should take. A total budget of about EUR 5 billion, similar in size to non-defence, non-health US ARPA-type programmes, would be adequate. Equally important would be its autonomy and organisational flexibility, especially the ability to recruit venture capital entrepreneurs and technology specialists as policy programmers and officers. Calls must have clear quantifiable goals and trackable metrics, so that policy officers can be given elevated levels of autonomy, together with clear mandates and accountability.

A strong governance set-up would be required for EU ARPA to work efficiently. After all, a key reason why the US ARPA ecosystem is successful in funding mission-oriented high-risk and high-reward research is that is has a great organisational flexibility. Its directors and their programme officers are allowed to work autonomously, designing and selecting projects from across the distribution of reviewer scores, to avoid any risk bias ARPA's reviewers may have. Autonomy of personnel, obviously matched with strong accountability and clear targets, could thus be seen as ARPA's *"secret sauce"* (Tollefson, 2021).

As discussed in section 3, pushing the innovation frontier would open up important distributional issues in Europe. Innovation policy cannot be expected to fix by itself the inevitable trade-off between excellence and cohesion. Excellence should be the only selection criterion for innovation policy measures, but the distributional challenge should be acknowledged and addressed. At the very least, dedicated programmes to ensure cohesion must be put in place in parallel to the launch of the scheme, for instance to transfer innovation results or to foster the mobility of researchers.

By themselves, such programmes are unlikely to solve the problem, however. In a static environment, gains from cooperation can be redistributed from winners to losers so that no player ends up with a loss. As the cooperative outcome improves on the the *status quo* for all countries, there are no good reasons why a country should oppose cooperation. However, this is not true in a stochastic environment (because uncertainty affects the distribution of gains and losses). When their outcome is uncertain, innovation-enhancing policies like ARPA can be resisted on distributional grounds, both *ex ante* and *ex post*. For example, support for high-risk, high-return projects can yield fewer benefits for some countries than the money they contribute by taking part in the overall financing of the scheme. If this is the case, it is rational for these countries to oppose it.

Thought should be given to ways to tackle this problem. One approach would be to cap the loss a country can incur from participating in the innovation-supporting scheme. A change in the risk profile of aggregate investment would improve the incentive to participate in the scheme because, while gains would not be capped, losses would. It is important that loss limits be applied over a multi-year period to the whole portfolio of investments, and not to individual projects.

Loss limits would both incentivise national participation in the overall scheme and help avoid the temptation not to terminate unpromising projects. Obviously, the main guarantee against financial forbearance should be the independence of decision-making. But governments have means to keep on supporting lame ducks, for example through national subsidies. This is why financial incentives should be designed to help steer government behaviour in the right direction.

5. CONCLUSION

European competitiveness is hampered by the combination of a scarcity of fossil fuel resources and the incompleteness of the single market for goods, services, labour, capital and technology. There is not much Europe can do to tackle the first obstacle, apart from accelerating the transition to a fully decarbonised economy. But there is a lot it can do by putting the emphasis on market and policy integration at European scale.

European integration is however elusive. Gains from unifying markets and putting resources in common are evident on paper, but can look like chimeras in reality. The prospect of future enlargement to countries with histories and institutions that differ from those – already diverse – of the current Member States is creating pervasive suspicion. Disputes over the EU budget and the perennial controversy between the ants and the grasshoppers undermine mutual trust. But without trust, there cannot be a way forward. This is the reason why Europe is stuck.

It is tempting to plead for the integration agenda, in the hope that rationality will ultimately prevail. But rational arguments based on economic analysis will likely fail to lift deep-rooted objections to further integration. What has blocked the banking union or what is blocking the capital markets union is not the lack of rational economic arguments. Rather, what fuels resistance to progress towards an integrated EU is a combination of reluctance to agree to irreversible transfers of competence, uncertainty over the distribution of gains, mistrust of partner Member States, and distrust of the common institutions.

These obstacles will likely remain in the foreseeable future. True, experience with the COVID-19 shock has shown that they can be overcome in exceptional circumstances. But it also shows that they reappear once the acute phase of the crisis is over. This is why we are arguing in favour of an alternative approach, which we call *coordination for competitiveness*, that could be applied in fields where gains from cooperation are high enough, and whose ingredients would be:

- Clearly defined objectives to be reached at a certain horizon;
- Flexible and open, coalitions involving Member States and EU institutions;
- A creative blend of public resources from EU institutions or participating Member States;
- Mission-oriented governance.

Energy policy coordination and an EU-ARPA are two areas where this new approach could be tried. Energy is a field where the case for integration is strong but where Member States are reluctant to give up their prerogative to take sovereign decisions on the energy mix. Innovation is a field where countries are conscious of their limitations but afraid of losing their chances of nurturing national champions. In both cases, they are not ready to endorse a purely federal solution. For these reasons, a step-by-step, experimental approach would help overcome reluctance and fear.

If successful, experiments in coordination for competitiveness could develop into permanent schemes and be eventually integrated into the European Union's legal and institutional apparatus. If unsuccessful, they could be reformed or discontinued. This approach would make the development of EU much more organic.

REFERENCES

- Aghion, Ph, C. Antonin and S. Bunel (2023), *The Power of Creative Destruction*, Harvard University Press.
- Anderson, J. E. and E. Van Wincoop (2003) 'Gravity with Gravitas: A Solution to the Border Puzzle', *American Economic Review*, 93(1), 170–192, available at: https://doi.org/10.1257/000282803321455214.
- Breitinger, J. C., B. Dierks, and T. Rausch (2020) 'World-class patents in cutting-edge technologies: The innovation power of East Asia, North America, and Europe', Bertelsmann Stiftung, June 2020, available at: https://www.bertelsmann-stiftung.de/fileadmin/files/user_upload/BST_World_class_patents_2020_ENG.pdf.
- Criscuolo, C. (2021) 'Productivity and Business Dynamics through the lens of COVID-19: the shock, risks and opportunities', Paper for the 2021 ECB Forum on Central Banking, available at: https://www.ecb.europa.eu/pub/conferences/ecbforum/shared/pdf/2021/Criscuolo_paper.en.pdf.
- Claeys, G. and A. Steinbach (2024, forthcoming) 'A conceptual framework for the identification and governance of European Public Goods', *Bruegel Policy Brief*.
- Darvas, Z. (2023) 'The European Union's remarkable growth performance relative to the United States', *Bruegel Analysis*, available at: https://www.bruegel.org/analysis/european-unions-remarkable-growth-performance-relative-united-states.
- ECB (2022) 'Beyond the pandemic, the future of monetary policy – ECB Forum on central banking – 28–29 September 2021 – Conference proceedings', European Central Bank, available at https://data.europa.eu/doi/10.2866/191929.
- ECB (2021) 'Key factors behind productivity trends in EU countries'. Occasional Paper 268, September, available at https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op268~73e6860c62.en.pdf.
- EIB (2021), *Evaluation of the European Fund for Strategic Investments,* June (available at https://www.eib.org/en/publications/evaluation-of-the-efsi)
- EIB (2023) 'EIB investment survey 2023 - European Union overview', European Investment Bank, available at: https://op.europa.eu/en/publication-detail/-/publication/bbe30fa1-6bd5-11ee-9220-01aa75ed71a1/language-en.
- Feenstra, R. C., R. Inklaar and M. P. Timmer (2015) "The Next Generation of the Penn World Table", *American Economic Review*, 105 (10): 3150-82.
- Gallardo Albarrán, D., Inklaar, R. and P.J. Woltjer (2019) "The Composition of Capital and Cross-country Productivity Comparisons*", International Productivity Monitor*, 36(Spring 2019), 34-52. https://pure.rug.nl/ws/portalfiles/portal/86632694/CapitalServices_IPMpublished.pdf
- Gutiérrez, G. and T. Philippon (2019) 'The failure of free entry', *NBER Working Paper No. w26001*, National Bureau of Economic Research, available at: https://www.nber.org/papers/w26001
- Gutiérrez, G. and T. Philippon (2019) 'Fading stars', *AEA Papers and Proceedings* Vol. 109, pp. 312-316, *American Economic Association*, available at https://www.aeaweb.org/articles?id=10.1257/pandp.20191065.

- Kleimann, D., N. Poitiers, A. Sapir, S. Tagliapietra, N. Véron, R. Veugelers and J. Zettelmeyer (2023) 'Green tech race? The US Inflation Reduction Act and the EU Net Zero Industry Act', *The World Economy*, 46(12), 3420-3434.
- Krugman, P. (1994) 'Competitiveness: a dangerous obsession', *Foreign Affairs*, 73, 28, available at https://www.jstor.org/stable/20045917.
- McKinsey Global Institute (2022) 'Accelerating Europe: Competitiveness for a new era'
- McWilliams, B., G. Sgaravatti, S. Tagliapietra, and G. Zachmann (2024) 'Europe's under-the-radar industrial policy: intervention in electricity pricing', *Bruegel Policy Brief*, available at: https://www.bruegel.org/policy-brief/europes-under-radar-industrial-policy-intervention-electricity-pricing.
- Sapir, A., et al. (2004), *An Agenda for a Growing Europe*, Oxford University Press.
- Sapir, A., S. Tagliapietra and J. Zettelmeyer (2023) 'Making the most of Europe's anti-subsidy probe into Chinese electric vehicles', *Bruegel First Glance*, available at: https://www.bruegel.org/first-glance/making-most-europes-anti-subsidy-probe-chinese-electric-vehicles'
- Schnabel, I. (2024), 'From laggard to leader? Closing the euro area's technology gap', Speech from 16 February 2024, available at: https://www.ecb.europa.eu/press/key/date/2024/html/ecb.sp240216~df6f8d9c31.en.html.
- Smith, A. (1771) 'The wealth of nations: books IV-V' (Vol. 2). Penguin UK.
- Tagliapietra, S., R. Veugelers, and J. Zettelmeyer (2023) 'Rebooting the European Union's Net Zero Industry Act', *Bruegel Policy Brief, no. 15/2023*, available at: https://www.bruegel.org/policy-brief/rebooting-european-unions-net-zero-industry-act.
- Tagliapietra, S. and R. Veugelers (2023) 'Developing a green industrial policy for the European Green Deal', In Handbook on Innovation, Society and the Environment (pp. 36-50), Edward Elgar Publishing.
- Tagliapietra, S., R. Veugelers and J. Zettelmeyer (2024) 'Guiding the EU's quest for economic competitiveness', Politico, available at:https://www.politico.eu/article/guiding-the-eus-quest-for-economic-competitiveness/
- Tollefson, J. (2021) 'What the rise of 'arpa-everything'will mean for science', Nature, 595, 483-484, available at: https://pubmed.ncbi.nlm.nih.gov/34244687/.
- Philippon, T. (2019) 'The great reversal: How America gave up on free markets', Harvard University Press.
- Pisani-Ferry, J., S. Tagliapietra, and G. Zachmann (2023) A new governance framework to safeguard the European Green Deal', *Bruegel Policy Brief no. 18/2023*, available at: https://www.bruegel.org/policy-brief/new-governance-framework-safeguard-european-green-deal.
- Zachmann, G., C. Batlle, F. Beaude, C. Maurer, M. Morawiecka and F. Roques (2024) 'Unity in power, power in unity: why the EU needs more integrated electricity markets', *Bruegel Policy Brief no. 03/24*, available at: https://www.bruegel.org/policy-brief/unity-power-power-unity-why-eu-needs-more-integrated-electricity-markets.
- Santamaría, M., J. Ventura and U. Yeşilbayraktar (2023) 'Exploring European regional trade' *Journal of International Economics*, 146, available at: https://doi.org/10.1016/j.jinteco.2023.103747.

- Santamaría, M., J. Ventura and U. Yeşilbayraktar (2021) 'Borders within Europe', working paper, available at: https://drive.google.com/file/d/1SAXw8Kp3lEYxaYMIyVtuu2IzM6ORLEPk/view.
- World Economic Forum (2017) 'Methodology and Computation of the Global Competitiveness Index 2017-2018', available at: https://www3.weforum.org/docs/GCR2017-2018/04Backmatter/TheGlobalCompetitivenessReport2017%E2%80%932018AppendixA.pdf

This paper reviews the state of EU competitiveness and introduces a strategy to improve it, based on medium-term, sector-level coordination of Member State reform policies and/or investments. The idea is illustrated with two examples: an investment and reform programme to create a single EU electricity market and an Advanced Research Projects Agency (EU-ARPA).
This document was provided/prepared by the Economic Governance and EMU Scrutiny Unit at the request of the ECON Committee..

PE 747.838
IP/A/ECON-ED/IC/2023-090

Print ISBN 978-92-848-1685-9 | doi: 10.2861/781120 | QA-09-24-097-EN-C
PDF ISBN 978-92-848-1684-2 | doi: 10.2861/388325 | QA-09-24-097-EN-N