

ECONOMIC POLICY AND ITS IMPACT

Focus on Critical Key Technologies: The Race for Leadership in Industry and Technology Policy

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POLICY DEBATE OF THE HOUR

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econPOL FORUM

Europe – once a leader in industrial development and innovation – has lost its competitiveness. Which place will it take in a new world order? Climate protection and the digital transformation will also influence the next era of prosperity. The EU and its member states now want to build a robust, secure, resilient, and sustainable economy. Meanwhile, the US, China, and some emerging economies have overtaken the EU in many international rankings.

In this issue of EconPol Forum, our authors take a critical look at the main economic and political causes of the EU's declining competitiveness and its consequences for prosperity. And they also shed light on the bigger challenges that lie ahead. Our authors explore how future economic policy at the level of the EU and its member states should respond to increasing global competition.



In “Economic Policy and Its Impact,” the authors systematically compare how selected countries and the EU promote technological sovereignty. In “Institutions Around the World,” they examine how different cultural values and attitudes in the population affect the most important dimensions of economic performance. In “Big-Data-Based Economic Insights,” the authors show that differences in people’s patience (“the relative valuation of present versus future payoffs”) could be responsible for the large and long-standing sub-national differences in student achievement.

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Introduction to the Issue on

EU Policy Priorities: How to Ensure Europe's Competitiveness and Future Prosperity?

Chang Woon Nam

There is little sign that Europe's gradual industrial decline over the last twenty years can be halted in the near future. Over the same period, the economic disparity between EU member states and US states has translated into an 82 percent difference in GDP per capita between the EU and the US. In the face of major geopolitical changes, Europe, which was at the forefront of industrial development and innovation in the last century, has become less competitive and its place in the new world order is no longer secure. The US, China, and some emerging economies have already overtaken the EU in many international indicator rankings, while climate change mitigation and digital transformation will continue to influence the next era of prosperity.

The EU and its member states want to build a robust and future-proof economy that ensures competitiveness and long-term prosperity for all in the face of a challenging geopolitical environment. To achieve this ambitious goal, the EU's future strategies will follow an integrated, three-pronged approach: First, the promotion of EU competitiveness will be further advanced by strengthening the Single Market, supporting a strong and resilient economy, investing in skills, and promoting the EU's research, technology, and industrial base. Sustainable reforms and substantial EU investment appear necessary in this context, while the Recovery and Resilience Facility and cohesion policy will continue to be the main drivers of economic development. Second, protecting the EU's economic security (including supply chain and energy security, physical and cyber security of critical infrastructure, technology leakage, and weaponization of economic dependencies) through a range of existing policies and instruments, as well as considering new measures to address potential gaps. Third, working with the broadest possible range of partners to strengthen economic security and resilience, including by promoting and concluding trade agreements, strengthening the international rules-based economic order and multilateral institutions such as the WTO, and investing in sustainable development through Global Gateway.

This issue of EconPol Forum contains eight articles on how to strengthen Europe's competitiveness and secure its future growth. They not only take a critical look at the main economic and political causes of the EU's declining competitiveness and its consequences for prosperity, but also shed light on the big-

ger challenges ahead and how future economic policies at the levels of both the EU and its member states should respond to increasing global competition.

Pointing out that the EU's GDP remains at two-thirds of that of the US, but productivity growth has lagged behind since the 1990s, *David Pinkus, Jean Pisani-Ferry, Simone Tagliapietra, Reinhilde Veugelers, Georg Zachmann* and *Jeromin Zettelmeyer* emphasize the EU's two supply-side disadvantages: high energy costs and a fragmented single market. To get a better grip on this problem, they propose a strategy of "Coordination for Competitiveness" – national-level policy coordination as an alternative to full EU-level integration – and illustrate this with two examples: energy policy coordination and an EU Agency for Advanced Research Projects (ARPA).

Frédéric Gonand, Pedro Linares, Andreas Löschel, David Newbery, Karen Pittel, Julio Saavedra and *Georg Zachmann* argue that the EU can only secure its competitiveness in global markets if it decarbonizes its economy and reduces its dependence on energy and raw materials. Postponing policies to decarbonize the energy system will increase long-term welfare losses. They also emphasize that EU energy policy needs to be better coordinated and provide long-term price signals, and that systematic risk assessments and improved data infrastructure are essential to strengthen resilience.

According to *Giuseppe Bertola*, decarbonization and security are desirable goals, but it would be a mistake to believe that protecting and subsidizing domestic manufacturing will reduce its costs. Wars and climate change are bad, and it is even worse when sanctions and environmental policy measures rule out advantageous trade opportunities. Circumstances may necessitate building costly walls around Fortress Europe, but strengthening markets, confidence, and policies within the EU should be the top priority.

Georg Duernecker finds that the structural change toward services has contributed significantly to the slowdown of EU's aggregate productivity growth in recent decades. Future growth is likely to decline further, as sectors with stagnating productivity will increase, including the business services sector, which is predicted to grow rapidly in size but is characterized by sluggish productivity. R&D tax credits, a widely used policy measure in Europe, may not solve Europe's productivity woes due to negative redistribu-

tive effects by accelerating structural change toward stagnating sectors.

To boost the EU's productivity, *Fredrik Erixon*, *Oscar Guinea* and *Oscar du Roy* argue that actions to increase innovation and investments in intangible assets and to promote market dynamism are needed. In this context, the EU should (1) increase spending on R&D and better incentivize private sector R&D spending, (2) develop policies to channel savings into business growth and encourage venture capital, and (3) close its technology gap and reduce market fragmentation to support firm growth and technology adoption.

Maria Savona postulates that mastering emerging digital automation technologies, and data in particular, requires a multidisciplinary perspective that includes techno-legal, geopolitical, and economic expertise. Regulating the process of individual and B2B data sharing, either through binding rules or the creation of incentives for exchange, will be an important research and policy agenda in the EU. A "data-haven hypothesis" could explain asymmetries in the concentration of digital infrastructures, whereby countries with stricter data protection, intellectual property, or tax regulations relocate cloud services and data hubs to countries with weaker regulations. The EU's AI law could lead to a new wave of the so-called "Brussels effect," even if it is not yet optimal and requires further discussion and public scrutiny.

Public investment in the EU has been low in recent years, leading to a lack of infrastructure and other public assets that can support economic growth and competitiveness. On the other hand, efforts at the EU level to establish a Sovereignty Fund to boost

competitiveness and respond to the US Inflation Reduction Act have been weakened, as have plans to increase funding for the Strategic Technology Platform for Europe. In this context, *Iain Begg* and *Daniel Cicak* propose applying a revived golden rule at both the EU and member state level to improve the quality of public finances and competitiveness: key principles include (1) a more targeted but more open approach to eligible expenditure as opposed to the traditional definitions of investment in national accounting, (2) the scrutiny of government plans by independent financial institutions or similar, and (3) the adoption of a medium-term perspective. They believe that the financing of public goods in the EU should be furthered through the issuance of debt instruments rather than relying on the constrained resources of the EU budget.

According to *Roel Beetsma* and *Marco Buti*, EU economic policies need to be fundamentally reoriented to create European public goods (EPGs). The so-called "genuine" EPGs in the area of the green and digital transitions would be financed by a new fund of around EUR 750 billion, which would be set up as a follow-up to Next Generation EU, and access to it would be conditional on compliance with the revised fiscal rules. In addition, a systematic review of the various existing investment support instruments at the EU level should be carried out and, where feasible, collecting the EU financing instruments into a single facility would substantially improve the market perception of EU debt. In many areas, including defense, the expansion of EPGs requires coordination of national policies rather than additional EU funding.

We hope you enjoy this Policy Debate of the Hour!

David Pinkus, Jean Pisani-Ferry, Simone Tagliapietra, Reinhilde Veugelers, Georg Zachmann and Jeromin Zettelmeyer

Coordination for EU Competitiveness

The debate about EU competitiveness has been reignited by 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 decarbonization, deficit reduction, and higher defense spending.¹ One side of this debate implores EU policymakers to finally address long-standing weaknesses of the single market. 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 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 a full banking union or a much larger EU budget, is not currently viable. What may be both feasible and effective, however, is to seek coordination of policies and spending at the national level (or joint spending in support of coordinated policies), in specific areas, provided that this can 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 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: an energy policy coordination; and an EU Advanced Research Projects Agency (ARPA).

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 characterization of the problem, and the objective of regaining competitiveness to be a natural way to organize a policy discussion.

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

- KEY MESSAGES**
- **The competitiveness of countries and that of firms are different concepts**
 - **EU GDP is stable at two-thirds of the US, but productivity growth has lagged since the 1990s. The EU does better on wealth equality and clean-tech export shares**
 - **The EU faces two supply-side disadvantages: high energy costs; and a fragmented internal market**
 - **We propose a strategy of “Coordination for Competitiveness”: national-level policy coordination as an alternative to full EU-level integration**
 - **We illustrate this with two examples: energy policy coordination; and an EU-level ARPA**

partners² and not a zero-sum game. In the remainder of this paper, we 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 competitors. Economies are competitive if their supply-side conditions and policies lead to high productivity growth relative to their peers, sustainably.

Trying to answer the question of whether the EU is competitive or not, and whether its competitiveness has declined, we briefly sketch comparisons at three levels: aggregate performance, sector and firm-level performance, and supply-side conditions underpinning that performance.³

At the aggregate level, 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, see Darvas (2023)), labor productivity and total factor productivity growth have trailed the US since the 1990s. The EU has done consistently worse on TFP growth since 2001, with an average annual TFP growth of 0.34 percent compared to 0.56 percent for the US during the 2013–2019 period. It has done worse on labor productivity as well, except during 2013–2019. However, according to OECD data, the US pulled far ahead of the EU during the most recent, 2020–2022 period, with average labor productivity

² See Smith (1771, Book IV) and Krugman (1994).

³ For a more detailed comparison, see the full paper available at: [https://www.europarl.europa.eu/thinktank/de/document/IPOL_STU\(2024\)747838](https://www.europarl.europa.eu/thinktank/de/document/IPOL_STU(2024)747838).

¹ The authors gratefully acknowledge the research assistance of Nina Ruer in the preparation of this article.

growth of 1.41 percent compared to 0.77 percent, reflecting its more vigorous recovery from Covid-19. China's GDP per capita has been catching up rapidly since 2000, although this has recently tailed off. TFP growth in China was remarkable before the global financial crisis, but has been negative in the Xi Jinping era. In contrast, India's productivity growth has been strong both in TFP and labor productivity terms. Importantly, prosperity tends to be more equally distributed in the EU than in the other economies mentioned.

At the sector and firm levels, labor productivity growth has been fastest in the manufacturing and information and communication technology (ICT) sectors in both the EU and the US, but the former sector has driven the EU productivity performance, whereas the latter has driven the US performance (ECB 2021). Some of this is attributable to slower IT adoption and lower IT capital in the EU than in the US. However, IT investment alone does not explain all productivity differences. The UK leads in IT investment but lags in overall productivity.

Furthermore, private R&D expenditure in the EU is also far lower than in the US. This is mostly attributable to the smaller number of large R&D investors in the EU rather than to lower R&D intensity. The EU also trails the US and, increasingly, China in patents in frontier technologies (McKinsey Global Institute 2022). However, it still leads the US, but lags China, on clean-tech export shares (batteries, wind, and solar).

Finally, 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. Moreover, the energy price gap has recently widened with China, the US, and South Korea, and there is no likelihood of it declining in the foreseeable future. Electricity prices for business were already 60 percent higher in the EU than in the US before the Covid-19 pandemic.

A STRATEGY FOR RAISING EU COMPETITIVENESS

Against this background, two strategies should be pursued to strengthen EU competitiveness: (a) deepen the

single market; (b) cooperate in sectors that offer the greatest gains, supported by some EU-level funding.

The cost of non-Europe is much higher nowadays than it has been in the past. 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 labor market has increased in a world in which productivity relies on the mobilization 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. To only cite a few examples. The fragmentation of the EU and the imperfections of the single market remain despite massive past efforts. Market integration is in a way the EU's Sisyphean rock.

But market integration (Plan A) may not suffice due to resistance against across-the-board integration. 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 them, 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.

Acknowledging this reality, Plan B, in complement to Plan A, should focus on specific high-return integration projects that yield the highest common gains and pursue a strategy that we call *Coordination for Competitiveness*. The remainder of this paper offers two concrete ideas for coordination that would achieve significant medium-term gains.

POLICY CONCLUSIONS

We focus on two reform avenues: energy policy coordination; and the redesign of EU innovation policy. Neither of these reforms would require a fundamental overhaul of the EU Treaty architecture. Rather, they



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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.

Energy Policy Coordination

If decarbonization 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. Since clean energy (electricity, green hydrogen) is generally much more expensive to transport than coal and oil, 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.

It is not clear whether accelerated decarbonization will reduce or increase the total cost of energy at the EU level. However, we *do* know that the current cost structure is far from optimal. Because decarbonization 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 minimize costs.

This insight forces us to revisit the gains from integrating electricity markets, which can yield advantages through five channels. First, by exploiting geographic comparative advantages. Second, by reducing volatility, thus reducing the need for backup capacity. Third, by reducing fuel consumption during the energy transition. Fourth, by diminishing capital costs through a more reliable market framework. And finally, by realizing cost savings through better sequencing of investment.

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.⁴ 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. 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 costs 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 scrutinized (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 harmonization 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

⁴ For more detail on what not to do, see the full paper.



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institution that would lend on a long-term basis to network operators, or a consortium of them, and would favor 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 et al. 2023). This would result in a future-proof system that overcomes many of the complexities and inefficiencies of the current patchwork of inconsistent instruments and reduces their unpredictability. It would also require a governance system that ensures member-state governments know they can still exert control in case of dramatic events.

An EU-ARPA

On average, European firms are older, less productive, and less innovative than their US counterparts (Schnabel 2024). Without policy initiatives, there is a 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 commercialization at the technology frontier. And there are good reasons for undertaking action at the EU level. It allows for sustainable comparative advantages across the entire value chain, helps manage cross-country externalities, prevents inefficient national subsidies, and avoids distortions in competition within the single market. 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 share of R&D expenditures in the EU budget (as reflected by the Framework Programme budget) has risen from 5.8 percent in 2007–2013 to 7.9 percent in 2021–2027. Qualitatively also, instruments have diversified, with an increasing part of the funding coming through extra-budgetary programs. As things stand, European initiatives can be grouped into three buckets: EU budget-funded programs (e.g., Horizon Europe), the emissions trading system-funded Innovation Fund, and Important Projects of Common European Interest (IPCEIs) and Alliances. Europe cannot be accused of being oblivious of the need to mobilize funds and let its business sector thrive. There are, however, two problems with EU programs: a bias against risk-taking; and weak governance.

Missions initiated within the framework of the Horizon Europe program provide a good example. The governance of these missions is in the hands of Deputy Director-Generals in the European 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.

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 based on precisely defined objectives. 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.

The EU ARPA could have several compartments (e.g., an EU-ARPA-E, EU-ARPA-C, EU-ARPA-H). It could also connect to complementary funding schemes at the 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.

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 the EU scale, and it could 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 the rollout of innovative technologies at the 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-defense, non-health US ARPA-type programs, would be adequate. Equally important would be its autonomy and organizational 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.

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 dis-

tributional challenge should be acknowledged and addressed. At the very least, dedicated programs 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.

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.

REFERENCES

- Darvas, Z. (2023), *The European Union's Remarkable Growth Performance Relative to the United States*, Bruegel Analysis, <https://www.bruegel.org/analysis/european-unions-remarkable-growth-performance-relative-united-states#:~:text=The%20EU%20has%2C%20in%20fact,Figure%202%2C%20Panel%20A>.
- ECB (2021), "Key Factors behind Productivity Trends in EU Countries", *Occasional Paper* 268.
- Krugman, P. (1994), "Competitiveness: A Dangerous Obsession", *Foreign Affairs* 73, 28–44.
- McKinsey Global Institute (2022), *Accelerating Europe: Competitiveness for a New Era*, <https://www.mckinsey.com/mgi/our-research/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, <https://www.bruegel.org/policy-brief/europes-under-radar-industrial-policy-intervention-electricity-pricing#:~:text=Membership-,Europe's%20under%2Dthe%2Dradar%20industrial%20policy%3A%20intervention%20in%20electricity,%2C%20with%20cross%2Dborder%20implications>.
- Pisani-Ferry, J., S. Tagliapietra and G. Zachmann (2023), *A New Governance Framework to Safeguard the European Green Deal*, Bruegel Policy Brief, <https://www.bruegel.org/policy-brief/new-governance-framework-safeguard-european-green-deal>.
- Schnabel, I. (2024), "From Laggard to Leader? Closing the Euro Area's Technology Gap", Speech from 16 February, <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.

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Key Post-Crisis Challenges and Lessons for EU Energy Policy*

KEY MESSAGES

- **Only by decarbonizing its economy and reducing energy and raw-material dependencies can the EU safeguard its competitiveness in the global markets**
- **Postponing policies to decarbonize the energy system will increase long-run welfare losses**
- **Decarbonization offers great potential for improving energy security, if pursued systematically**
- **EU energy policy must be better coordinated and provide long-run price signals**
- **To strengthen resilience, systematic risk assessments and improved data infrastructure are essential**

Putin's invasion of Ukraine forced the EU into a profound reality check regarding its energy procurement and consumption habits – and into giving a renewed impulse to speedy decarbonization. Both endeavors are now deeply intertwined: the EU seeks to make its energy supply both greener and as independent as possible of autocrats' whims. But political, economic, and societal support for the energy transition will require striking a balance between economic efficiency on the one hand – i. e., keeping the costs of meeting the climate targets as low as possible – and, on the other, distributing the unavoidable costs in a way that is perceived as fair. Given the potential shift of the EU's political landscape after the upcoming European Parliament election, upholding these two commitments seems more important than ever.

Although much has been done to shift away from Russian energy, while at the same time managing to stick to the Green Deal's decarbonization efforts during and after the energy crisis, there are still several challenges that the European Commission will face in the coming years, even as it pays heed to the lessons learned out of the EU response to the crisis itself. These include the physical transformation of the energy system, for example by ramping up the share of renewables, adapting the power grid to the new energy mix, and securing the raw materials needed for the technologies underpinning the green transition, as well as balancing cost-efficiency and system resilience. This article will lay out some of these lessons and key chal-

lenges moving forward. Let us start with a short review of the lessons learned.

EU REACTION TO THE CRISIS

Russia's invasion of Ukraine in February 2022 led to gas supply in Europe dropping dramatically, which posed three interacting challenges at the EU level: how to balance gas supply and demand; how to dampen the impact on the economy and citizens; and how to preserve the internal market.

To balance supply and demand, gas-saving mandates, increases in import capacity, and enhanced reverse-flow capabilities were quickly addressed and implemented. The storage mandates introduced, while effective, may have been implemented in such a way that they ended up pushing up prices more than necessary – to a peak exceeding EUR 350/MWh in the summer of 2022.

Gas supply in Europe fell by 15.5 percent and demand by 13 percent over the first eleven months of 2022 compared with the same period in 2021. On the supply side, the drop in Russian pipeline imports was largely offset by a sharp rise in liquefied natural gas (LNG) imports. Thanks to the drop in demand, gas supplies turned out to be sufficient to devote a significant proportion to replenishing gas storage. In the end, thanks in part also to a mild winter, Europe managed to cope much better than originally expected. In the wake of the crisis, however, Europe's dependence on Russian gas has been partly replaced by a growing dependence on the world LNG market in general and on US LNG in particular.

To cushion the effects of higher energy prices, member states were given wide latitude to prop up consumers. Measures included income support, deferrals of bill payments, temporary tax exemptions, and reduced tax rates. Other schemes included attempts at raising windfall revenues from the energy sector through an inframarginal price cap (which was never reached), as well as through a fossil-fuel windfall tax. The results were mixed: while this may have been important politically (by avoiding more distorting measures), the EU's Agency for the Cooperation of Energy Regulators (ACER 2023a) was rather unimpressed by the effectiveness of the measures chosen by the member states, while a study for the European Parliament was slightly more optimistic regarding windfall taxes (Nicolay et al. 2023).

All in all, most of the new policies and funding happened at the member-state level, with ACER (2023b)

* This article is based on *Watts Next: Securing Europe's Energy and Competitiveness – Where the EU's Energy Policy Should Go Now* (Gonand et al. 2024).

listing more than 400 national measures (see Figure 1), half of which were support to consumers. Altogether, since September 2021, EUR 758 billion has been allocated and earmarked across European countries to shield consumers from rising energy costs.

In terms of reforming the electricity market, calls for decoupling electricity prices from gas prices became loud. Spain, for example, devised a system, which came to be dubbed the “Iberian Exception”, under which the gas price for use in power plants was subsidized by electricity consumers. This mechanism, according to most estimations, proved to be effective in lowering prices in the wholesale market, although the extent of this decrease depends on whatever counterfactual one employs (Linares and San Román 2023). On the negative side, the mechanism resulted, among other things, in a very significant increase in gas use, as well as cross-border subsidies to French consumers.

However, the leeway granted to member states to support private and industrial consumers raised concerns about the effects on the EU’s internal electricity market. Foremost was avoiding a subsidy race between member states and upholding marginal pricing in the internal market, as well as setting national gas saving and storage targets in order to avoid border closures prompted by fears of potentially free-riding neighbors.

Now, two years after Russia’s invasion of Ukraine, the energy crisis seems to be largely behind us. Energy prices have fallen – albeit not to pre-crisis levels – and we have made it through the winter 2023/2024 without any alarming news. It is time to think about the lessons learned from the crisis and the reactions to it. It is, however, also time to look beyond the crisis, toward the challenges for the years to come.

POLICY CONCLUSIONS AND RECOMMENDATIONS FOR THE NEXT ELECTION CYCLE

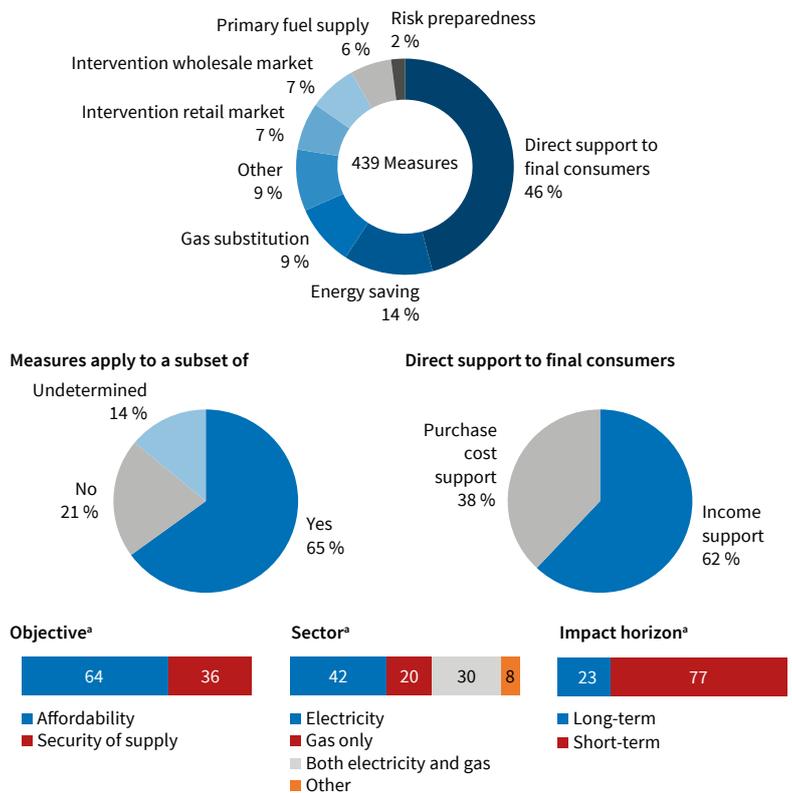
Lessons Learned from the Crisis

As discussed, the energy crisis prompted a flurry of reactive and widely varying measures by the EU and its member states. As in most emergency responses, some measures worked out well, others less so. Some lessons learned:

First, facilitating the shift to non-fossil energy sources can not only lessen strategic dependence, but also reduce electricity prices and help the EU attain its climate goals. This makes it imperative to *further integrate European electricity markets and gas networks* to better balance regional scarcities, for example by removing connector limitations. Equally important is to avoid any other strategic dependencies, such as for green metals or hydrogen. This calls for flexibility within Europe, global diversity of supply, and, for hydrogen and gas, an adequate design of pipeline systems. Likewise, incentives

Figure 1

National Measures to Ameliorate the Energy Crisis Impact



^a Percentage of the total number of filtered measures. Source: ACER (2023c).

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are needed to improve efficiency across industry, buildings, and transport to reduce energy demand.

Second, *avoid distortionary policies* that can act as a short-term palliative at the cost of longer-term damage. Capping energy prices can dampen signals to reduce energy demand. Market signals as a rule manage to allocate scarce energy resources better across uses and users than mandates. Striking a balance between supporting households and firms is also crucial, keeping in mind that all measures should be *temporary* and designed in such a way as to not relieve the pres-



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sure for undertaking the structural change required to remain competitive in a decarbonized world, as well as to keep market-distorting signals to a minimum.

Governments must create the necessary *fiscal space* to support actors in times of crisis, which comes on top of the public support needed to foster the transition to a low-carbon economy. This does not call for an increase in public debt, but rather for slashing outlays through the abolition of fossil-fuel subsidies, as well as raising revenue through the systematic use of CO₂ prices.

Third, start planning now for the *repurposing or decommissioning of gas grids*, as the UK is already doing. To reach the net-zero greenhouse-gas emissions target by 2050, households will eventually have to give up their gas boilers in favor of heat pumps and their gas cookers in favor of electric options, while firms will have to switch to other energy carriers. The gas grid will need to be safely phased down, or possibly partially repurposed to transport hydrogen.

Fourth, on a more strategic level, a *Foresight Office* should be set up, tasked with thinking ahead to potential future crises, monitoring global trends, and anticipating risks. Crucially, such an office would also devise emergency response mechanisms that take the interconnectedness of the European economies into account. This applies not only to future energy supply shocks but also to supply chain disruptions, raw material shortages, or large-scale cyberattacks.

Fifth, *communication* must be improved significantly. The most sensible and best-intentioned policies will flounder if the key stakeholders – governments, firms, and households – fail to grasp their meaning and intent. Carefully crafted communication and education campaigns must always accompany the proposal of every policy intervention crucial to safeguarding our economies, well-being, and social cohesion.

Most of all, policymakers need to make clear that switching to renewables will cost money upfront, that the energy transition will involve pain and disruption to secure prosperity in the long run – and they need to reassure the public that the policies have been devised

in such a way as to minimize both pain and disruption. Crucially, the message must be clearly communicated that the alternative, namely doing nothing, will quickly become much more disruptive, expensive, and painful.

Energy and Infrastructure

Decarbonization of electricity requires a *suitably sized and properly located network*, which calls for timely network planning and construction combined with a better method of signaling where new generators can best locate, taking account not just of local resources (wind, sunshine) but also of current and expected network constraints. When it comes to getting the most out of renewables, the UK offers a very useful example of the infrastructure considerations that ought to accompany the planning of any renewable electricity project – in particular, a good method of signaling where new power generators can best locate.

Policy Coordination

Long-term contracts and hedging could have protected European consumers against the exceptional spike in energy prices after February 2022 – and would now also help accelerate the deployment of renewables or storage needed to reduce dependence on imported fossil fuels at volatile prices. Asymmetric information, growing uncertainty, and unhelpful regulation are among the many reasons for the sluggish development of long-term markets, despite their recognized advantages (Rodilla 2012; Daskalakis et al. 2015; Lucia and Schwarz 2002; Vehvilainen 2002). One way to improve this is to strengthen the role of instruments such as power purchase agreements (PPAs) or contracts for difference (CfDs), i.e., long-term contracts between electricity producers and consumers in which they agree on strike prices. In this regard, the agreement reached in December 2023 on EU electricity market reform is a step in the right direction.

But using all these instruments nationally in an uncoordinated manner may distort short-term markets, create sizable differences among European consumers, and result in an overall loss of efficiency in the deployment of renewables, storage, or backup capacity. Europe already has a somewhat-integrated short-term electricity market; if the benefits of a single energy market are to be enjoyed by European consumers, this integrated approach should also be extended to the long-term market. In our opinion, we need Europe-wide standardized products and trading platforms for long-term markets.

In this regard, CfDs may prove to be a suitable instrument for creating long-term certainty for investors and consumers. But they should not be mandatory, nor should they be exclusively bought by governments, to avoid



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crowding-out and other undesirable effects (Chaves et al. 2023). A correct design of the CfD is also essential to avoid distortions (Newbery 2023).

However, developing these products, platforms, and infrastructure will take time, as was the case with the existing European energy markets. This might get in the way of the fast response needed to achieve energy security and boost the decarbonization drive. The key, then, is to set up temporary coordination arrangements (such as common instruments or coordinated targets) among member states to allow for a quick deployment of renewables, as well as of hydrogen and storage, while ensuring an efficient operation of the European energy market.

Strengthening Resilience

While the European markets worked well in reshaping energy flow patterns during the 2022 crisis, governments found it hard to come up with efficient answers for four reasons. First, the lack of access to timely and suitable *data* on energy storage, flows, value chains, prices, vulnerability of consumers, and the like made an efficient answer hard to design. Second, *assessments of systemic risk* were not carried out before the crisis, or not duly discussed at the appropriate political level. Third, most administrations failed to mobilize sufficient in-house and external *expertise* to work on such technically complex and politically sensitive issues in a quick and reliable manner. Fourth, the European Commission suffered from insufficient *trust* in its independence. This hindered the adoption of Europe-wide solutions, especially to the most politically sensitive questions.

This calls for developing a *European knowledge infrastructure for data and expertise* to support policy-making in such a technically challenging field.

Since no one knows where or when the next crisis will hit, we should refrain from sinking undue amounts of capital into overbuilding storage infrastructure, domestic production capacity, and so on for the past crisis, but rather keep in mind that our systems can evolve and that being *fiscally solvent* and *economically pro-*

ductive provide some of the best long-term insurance against any crisis.

Metals and Raw Materials

But energy is not the EU's only worrisome dependence. Metals, in particular those needed to beef up grids, multiply fleets of electric vehicles, and build renewable energy facilities, show high concentration on a small number of suppliers.

Decarbonization efforts have fueled vigorous worldwide growth in demand for several metals needed for the green transition, such as lithium, cobalt, graphite, rare earths, and others, as well as aluminum and copper. Europe will be heavily dependent on imports for many of these metals. In addition to the implementation of the Critical Raw Materials Act, the EU should encourage the recycling of metals whenever economically viable (He et al. 2020), and encourage the *production of critical metals in Europe*, in order to diversify sources and reduce risks of supply disruptions.

Industrial Decarbonization

The costs of going green on top of more expensive energy post-crisis are putting a strain on European competitiveness, with higher energy prices hitting the chemical, steel, and metal processing industries in countries like Germany, Spain, and Poland particularly hard. The situation for small and medium-sized enterprises, which are less energy intensive, is also difficult, albeit not to the same degree.

There are three main challenges for the industrial transition: First, financing the large investments required for new production processes. Second, creating markets for green products in a circular economy, with incentives for efficient and smart use of basic materials. Third, avoiding carbon leakage and safeguarding industrial competitiveness with mechanisms that do not hinder free trade.

Temporary proposals that may help include *production premiums* given to the producer for each unit produced, independent of the final cost of selling the



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product. *Carbon contracts for difference*, which hedge industrial producers against volatile carbon prices, and other indexation options could help reduce risks for the most heavily emitting industries, such as steel, cement, aluminum, and metals. However, the use of these instruments should also be coordinated to prevent more affluent countries from subsidizing industrial production and creating an uneven playing field for industrial products in Europe. To lessen this risk, the integrated approach of Europe's short-term electricity market should be extended to the long-term market, with Europe-wide standardized products and trading platforms for long-term markets.

Instituting a *circular economy* will require well-tailored policies to help *create markets for such recycled products*. Two areas stand out in this regard: public procurement; and measures targeting business models in the manufacturing and recycling value chain. Furthermore, instituting a well-designed Green Public Procurement obligation for public tenders can help reduce the emissions associated with each procurement proposal.

A *charge based on the final consumption* of materials, independent of their production process, would not only incentivize more efficient use of materials, but also raise funds to finance the necessary investments for a circular industry.

Finally, the Carbon Border Adjustment Mechanism (CBAM) must operate in such a way as to not end up reshuffling production to third countries, sending the “clean” products to Europe and the “dirtier” ones elsewhere, while overall emissions remain unchanged. The best solution for these shortcomings would be to create a “Climate Club” (Nordhaus 2015) among the G7 or G20 countries, which would help harmonize and coordinate climate policies for industries, in particular for the high-emitting sort.

SMEs and SMIs

Small and medium-sized enterprises (SMEs) and small and medium-sized industries (SMIs) could benefit from the emergence of *aggregators* who operate as brokers of industrial access to electricity, enabling such companies to optimize their electricity supply through new PPAs for *groups of companies*. This type of arrangement can also mitigate the risks associated with price volatility, regulation, market events, operations, and financing.

As to specific electricity supply contracts for SMIs and, more generally, for manufacturers that are low energy consumers exposed to international competition, simple contracts *with prices largely uncorrelated with future markets* would be useful. Promising formulas include PPAs, or contracts over three to five years, covering all supply needs and whose prices are not – or only slightly – indexed to future contracts, adding stability to producers' costs over the multi-year duration of investment cycles.

Digitalizing procurement processes, finally, would clearly promote more sustainable sourcing, eliminate inefficiencies, standardize contractual processes, and ensure that supplier emissions data is tracked and reported.

OUTLOOK

The shifting political landscape and looming electoral cycles across the EU and elsewhere should not distract policymakers from the task at hand: the policies they put in place today, or fail to put in place, will have an impact on how the crucial decades to come will play out.

Lack of foresight led to the tight spot the EU found itself in after Russia's invasion of Ukraine. While the outlines of the major challenges on the intertwined energy/climate front are clear, a great deal of science-supported and policy-driven forward thinking still needs to be done. If we wait until the need is urgent and only painful measures are left as a last resort, we will have waited too long.

REFERENCES

- ACER (2023a), *Market Correction Mechanism for the Cooperation of Energy Regulators, Effects Assessment Report*, https://acer.europa.eu/Publications/ACER_FinalReport_MCM.pdf.
- ACER (2023b), *Assessment of Emergency Measures in Electricity Markets, Market Monitoring Report*, https://acer.europa.eu/Publications/2023_MMR_EmergencyMeasures.pdf.
- ACER (2023c), *Wholesale Electricity Market Monitoring 2022 – Emergency Measures*, <https://www.acer.europa.eu/media/charts/wholesale-electricity-marketmonitoring-2022-emergency-measures-0>.
- Chaves, J. P., R. Cossent, T. G. San Román, P. Linares and M. Rivier (2023), “An Assessment of the European Electricity Market Reform Options and a Pragmatic Proposal”, *Working Paper IIT-23-035WP and EPRG Working Paper 2305*.
- Daskalakis, G., L. Symeonidis and R. N. Markellos (2015), “Electricity Futures Prices in an Emissions Constrained Economy: Evidence from European Power Markets”, *The Energy Journal* 36(3), 1–33.
- Gonand, F., P. Linares, A. Löschel, A., D. Newbery, K. Pittel, J. Saavedra and G. Zachmann (2024), *Watts Next: Securing Europe's Energy and Competitiveness Where the EU's Energy Policy Should Go Now*, EconPol Policy Report 49.
- He, P., H. Feng, G. Hu, K. Hewage, G. Achari, C. Wang and R. Sadiq (2020), “Life Cycle Cost Analysis for Recycling High-tech Minerals from Waste Mobile Phones in China”, *Journal of Cleaner Production* 251, 119498.
- Linares, P. and T. G. San Román (2023), “An Assessment of the Iberian Exception to Control Electricity Prices”, *Economics and Policy of Energy and the Environment* 2023(1), 5–16.
- Lucia, J. J. and E. S. Schwartz (2002), “Electricity Prices and Power Derivatives: Evidence from the Nordic Power Exchange”, *Review of Derivatives Research* 5, 5–50.
- Newbery, D. M. (2023), “Efficient Renewable Electricity Support: Designing an Incentive-compatible Support Scheme”, *The Energy Journal* 44(3), 1–22.
- Nicolay, K., D. Steinbrenner, N. Woelfling and J. Spix (2003), *The Effectiveness and Distributional Consequences of Excess Profit Taxes or Windfall Taxes in Light of the Commission's Recommendation to Member States*, European Parliament - FISC Subcommittee, [https://www.europarl.europa.eu/RegData/etudes/STUD/2023/740076/IPOL_STU\(2023\)740076_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2023/740076/IPOL_STU(2023)740076_EN.pdf).
- Nordhaus, W. (2015), “Climate Clubs: Overcoming Free-Riding in International Climate Policy”, *American Economic Review* 105, 1339–1370.
- Rodilla, P. and C. Battle (2012), “Security of Electricity Supply at the Generation Level: Problem Analysis”, *Energy Policy* 40, 177–185.
- Vehvilainen, I. (2002), “Basics of Electricity Derivative Pricing in Competitive Markets”, *Applied Mathematical Finance* 9, 45–60.

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Trade, Manufacturing and the Economics of Europe's Emergencies

To prevent deterioration of the planet's climate and shelter the European economy from international tensions, the EU's policy plan is not only to reduce carbon-intensive energy production and diversify energy sources (European Commission 2022) and boost production of ammunition (European Commission 2023a), but also to boost manufacturing of clean energy and military equipment in the EU. The Net-Zero Industry Act proposal (European Commission 2023b) would like "manufacturing capacity of strategic net-zero technologies to meet at least 40 percent of the EU's annual deployment needs by 2030," and it aims to achieve this objective by intense solar energy investments with obvious superficial appeal but dubious environmental and security advantages (Vezzoni 2023). And a communication in March 2024 (European Commission 2024) advocates strengthening of joint procurement programs, notes that "78 percent of the defense acquisitions by EU member states between the start of Russia's war of aggression and June 2023 were made from outside the EU, with the US alone representing 63 percent," and invites member states "to make steady progress towards procuring at least 50 percent of their defense investments within the EU by 2030 and 60 percent by 2035."

Local production can be a means to an end if it is more secure than distant production, but, as discussed in what follows, it increases the cost of facing global challenges, as do the subsidies needed to make it profitable for domestic firms. Public opinion backlash is likely if that cost is not accounted for, because local manufacturing is viewed as a positive side effect for the whole economy rather than for special interests, and it becomes apparent without having been communicated clearly.

THE COST OF FIGHTING WARS AND CLIMATE CHANGE

War is bloody and expensive. The economic cost of war is obvious when one sees that Europe and the US are providing weapons and paying Ukrainians to fight Russia on their behalf, just like Britain paid coalition partners to fight France in Napoleonic times, which in this and other ways (briefly reviewed below) resembles the current situation.¹ It is less obvious if one sees that war sometimes increases not only the profits and stock prices of arms makers and dealers,

¹ Roberts (2014) provides an interesting account of that period's economic policies, as well as of the battles and romance that recent and less recent movies focus on.

- KEY MESSAGES
- **Decarbonization and security are worthy goals, but it would be a mistake to think that protection and subsidization of domestic manufacturing reduce their cost**
 - **Trade restrictions decrease economic efficiency. Creating manufacturing jobs may sound like a benefit, but in advanced countries it increases costs**
 - **Subsidy-based policies are prone to capture by special interests and need to be funded by tax or debt, which introduce distortions of their own and reduce economic efficiency**
 - **In theory and in history, wars and climate change are bad, and worse when sanctions and environmental policies cut off beneficial trade opportunities**
 - **Circumstances may call for building costly walls around a fortress Europe, but strengthening markets, trust, and policies within the EU should have the highest priority**

but also overall employment and production.² However, jobs are inputs, not outputs, and what ultimately matters for economic welfare is consumption. In wartime, paying the military and purchasing weapons requires much of earned income to be taxed away or saved, typically in the form of special war bonds or more general government debt.³ Otherwise, consumer spending would cause inflation, or would need to be restrained by rationing.

Income that is not consumed can be earned across the country's border, where foreigners who export more than they import accumulate claims on the future production of the country at war. This accounting constrains flows of current income and production, hence past savings do not matter: seizing the enemies' financial assets would prevent them from spending in the future, but it does not relax the flow resource con-

² War generally decreases production and income, which, however, do increase in countries that fight wars away from their territory. For literature reviews and empirical results – see e. g., Thies and Baum (2020); Chupilkin and Kóczán (2022).

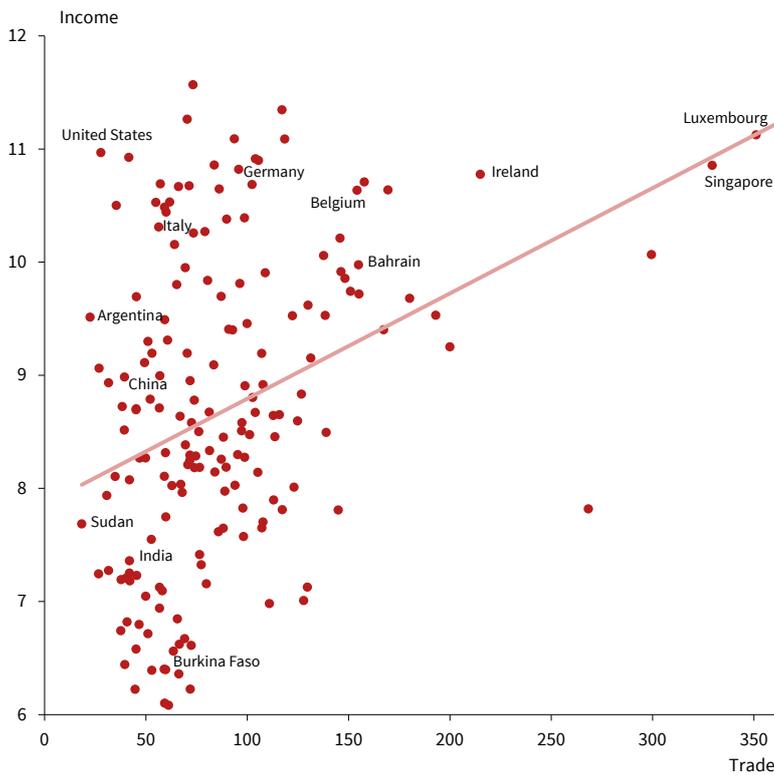
³ Thierry Breton, the European Commissioner in charge of industry, has expressed support for issuance of European war bonds and use of the proceeds to buy weapons manufactured in Europe.



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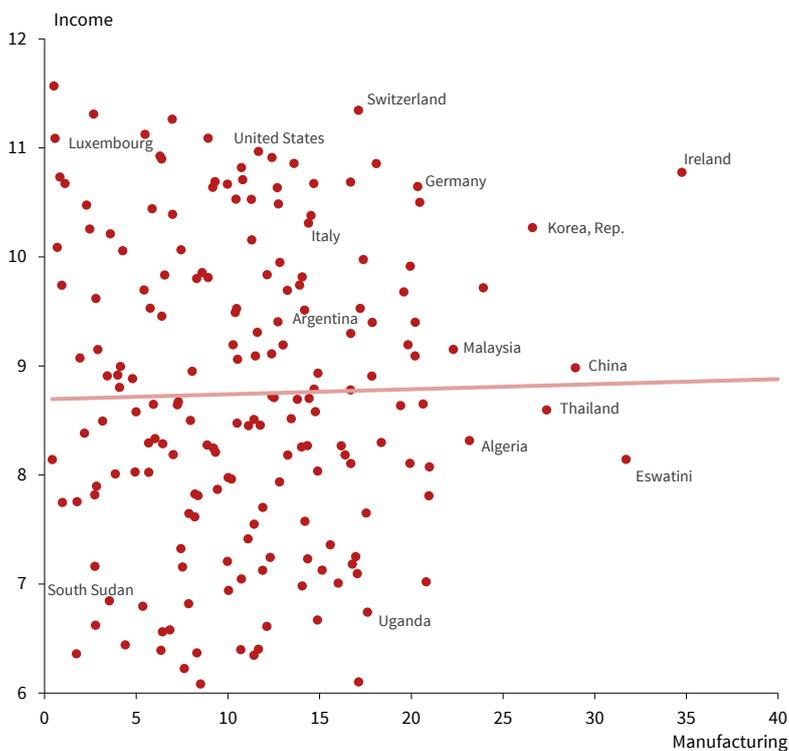
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Figure 1
The Cross-country Relationship between Income per Capita and Trade 2015



Note: Income is the logarithm of GNI (formerly GNP) in constant 2015 US dollars, divided by mid-year population. Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (GDP). Source: World Bank; OECD. © ifo Institute

Figure 2
The Cross-country Relationship between Income per Capita and the Manufacturing Share of Production 2015



Note: Income is the logarithm of GNI (formerly GNP) in constant 2015 US dollars, divided by mid-year population. Manufacturing is the percentage in GDP of the value added of industries belonging to divisions 15–37 of ISIC revision 3. Source: World Bank; OECD. © ifo Institute

straint – especially when those assets are frozen and trade is restricted by sanctions – and would damage trust in international finance and future borrowing opportunities.

All this applies equally well to the cost of waging war and to that of combating climate change. Just as battles require soldiers, so recycling requires human resources and clean energy production requires investment in equipment that, like guns and tanks, needs to be produced instead of consumer goods. Somebody somewhere must not be spending their income on what they personally enjoy, because it is taxed away or saved.

WHAT COULD REDUCE THE COST OF FIGHTING...

At the global level, or in a country that neither imports nor exports anything, more investment in weapons requires less consumption or more production, which requires more painful work unless productivity increases. One might hope for higher productivity because the economic system somehow becomes more efficient. World War Two did end the Great Recession, and it spurred technological progress in transportation and energy production. However, higher production and productivity in war results mostly from tremendous effort and comes with loss not only of life but of consumption: virtually no cars were produced for non-military use throughout World War Two.

It is also misleading to think that paying compatriots to produce equipment conveys economic benefits because, outside recessions, this need not be a way to procure gun shells and solar cells at the lowest cost, i.e., in exchange for the fewest enjoyable goods or services. Production is most efficient, and economic welfare highest, when workers do what they do best and exchange their production for what others do more easily. This is what happens in families, cities, regions, as well as in the world across countries.

Figure 1 illustrates this point by displaying the cross-country relationship between income per capita and trade. Countries that trade a lot tend to have high income, like Ireland. Countries that do not tend to have low income, like Sudan. Almost all other country names are not shown in the figure, but the message of the data is conveyed simply by the strongly increasing regression line. Economic success is positively associated with the intensity of trade, an empirical relationship driven not only by country size and geographical proximity, which is what it is (Frankel and Romer 1999), but also by ports and roads and legal constraints, which governments build or dismantle.

Trade can help make fights less costly, and so can division of labor in production supply chains. Some workers design and distribute, others make parts and assemble them, and an appropriate distribution of tasks reduces the overall cost of producing and delivering goods. This also happens at all levels within an economy, and across countries when trade is possible.

Another common but misguided notion is that makers of physical things enjoy higher economic welfare than providers of ideas and services. In history, trading peoples like the Phoenicians and the Dutch have often been richer than the people who produced the goods they traded. In cross-country data, there is no relationship between per capita income and the manufacturing share of production, which are plotted against each other in Figure 2. Germany and Switzerland have high income and above-average manufacturing shares, like Italy's and Uganda's, but the horizontal regression line indicates that economic success is not at all related to the share of manufacturing in production.

Neither this lack of relationship nor the very positive one seen in Figure 1 are coincidences, and both are theoretically sensible in an integrated economy.⁴ Manufacturing jobs are good when the alternative is back-breaking agricultural work, not when it is work in knowledge-intensive services. Countries that trade with each other and specialize are differently placed in this respect at different points in time.⁵ The same is true within countries, as high incomes are not necessarily found where the factories are in and around a city, and within families, where relatively high-income members may or may not be producing things rather than ideas and services.

The popularity of manufacturing in advanced countries is perhaps rooted in nostalgic memories of getting rich with urbanization, industrialization, and post-war adoption of new American technologies. But those were different times. Putting lead back in gasoline would not reenact economic miracles, and reshoring manufacturing would not make Europe rich again. Creating manufacturing jobs may sound like a benefit, but in advanced countries it increases costs.

...AND WHAT INCREASES IT

War and climate change are both bad news, and their interaction with trade policy and industrial policy makes them worse. While trade does not always prevent wars (Martin et al. 2008), wars definitely make it difficult to trade, which increases their cost. Sanctions currently create a situation comparable to Napoleon's Continental System blockade of British trade, which tried to make Europeans eat beet sugar and drink herbal tea or chicory.⁶ Autarchy is a byproduct of war, but producing or preparing to produce locally what

would be more cheaply produced somewhere else is a more expensive weapon than tanks and fortifications.

Trade restrictions also worsen the economic consequences of climate change, which will diminish agricultural production in some regions but increase it elsewhere. Not only the quality of wine produced in Northern Europe but also grain production in Russia are favored by recent climate developments (USDA 2023). Econometric estimates on regional data predict that climate change will drastically reduce aggregate income, but increase it by 10–20 percent in Canada and Russia and decrease it by more than 30 percent in Sub-Saharan Africa and inner Brazil (Kotz et al. 2024). Trade can and hopefully will reduce real income losses.

Being equipped for autarchy is a good idea if war comes in the future, but it is costly, especially so when local production is fostered by the public subsidies also deployed in the fight against climate change. Subsidies that lower the price of desirable expenditures (like locally produced electric cars or batteries) are prone to capture by special interests and need to be funded by tax or debt, which introduce distortions of their own. They have long been a resilient policy feature of developing countries, and of all populist governments that refrain from imposing taxes that increase the price of undesirable expenditures (like diesel cars) and directly address the distortion that needs to be corrected.

In the pandemic, war, and climate emergencies, subsidies and trade restrictions that privilege domestic production have become pervasive in advanced countries, and most notably in the US (Evenett et al. 2024). Production efficiency must be low, and costs high, in a policy environment that relies on subsidies to make investment and consumption more secure and sustainable, and dislikes international trade and supply chains.

The cost is sometimes visible, as it will be in the price of imports when the Carbon Border Adjustment Mechanism will make them more expensive. But it is too often disguised by views of protection of manufacturing as a good thing in itself – the polar opposite of views about immigration, which appears to be resented as much as it historically was at the time of what is in some languages called “Barbaric invasions” and in others “migrations of people” (Völkerwanderung), even though it could reduce production costs and is not particularly intense.⁷

POLICY CONCLUSIONS

It would not be a good idea to surrender in the fights of war or climate change, but it is crucial to face reality and fight them well. Economics is the art of choos-

⁴ An equally naïve inspection of the relationship between income growth and changes in trade and manufacturing as shares of production delivers a similar message. For the fewer countries with available data (which do not include China) between 1990 and 2015, real income grew a little more strongly where imports and exports increased faster, and actually grew more slowly where manufacturing increased more.

⁵ See Rodrik (2016) for a discussion of measurement issues and of the history of industrialization and deindustrialization in more or less developed countries.

⁶ Beet sugar was fine, but now that we can import less expensive cane sugar, we do. Lack of access to caffeine was definitely not fine, and spurred plenty of illegal imports of real tea and coffee, also for the benefit of ruling relatives of Napoleon and for his own use.

⁷ Eurostat reports that in 2022, 8.5 percent of EU residents were born in non-EU countries, and an additional 3.9 percent in an EU country different from the one of residence; in the US, the OECD records 14 percent foreign-born residents in 2021.

ing, even when all choices are unpalatable. Politics is the art of compromising and focusing on the common good rather than on popular myopic misguided objectives.

To avoid a future backlash, it is important to recognize and communicate clearly that relying on local manufacturing rather than on strangers' willingness to trade is costly. The cost may, of course, be justified by the need to increase economic security, but it should be made as small as possible by resisting attempts on the part of special interests to capture subsidies, and by expanding trade whenever possible.

Strengthening markets, trust, and policies within the EU is more important and fruitful than building costly walls around a fortress Europe. Restricting market interactions puts the European economy on a slippery slope, because it is not clear that security concerns cease to be relevant inside an EU that finds it difficult to field a joint army that would be disproportionately staffed and equipped by some countries' citizens and firms, or indeed inside countries where regions and social strata supply different shares of military labor. Because the production share of manufacturing and of weapons is different across member states inside the EU, and across regions of member countries, opening the Pandora's box of trade restrictions and subsidies unleashes special interests and endangers the economic efficiency fostered by common markets and common policies.

In an extremely fragmented Europe, isolated small city-states might feel very secure with respect to international tensions, all the more so if they arm themselves well and refrain from trading with strangers. But they would certainly be much poorer and much more exposed to the consequences of local weather and natural catastrophes than cities that can access the social and market insurance instruments that were introduced along with industrialization and financial markets in each nation a long time ago, and are still less developed at the EU level than they are in the US and have become in China.

REFERENCES

- Chupilkina, M. and Z. Kóczán (2022), "The Economic Consequences of War: Estimates Using Synthetic Controls", *EBRD Working Paper 271*.
- European Commission (2022), *REPowerEU: Affordable, Secure and Sustainable Energy for Europe*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en.
- European Commission (2023a), *The Net-Zero Industry Act: Accelerating the Transition to Climate Neutrality*, https://single-market-economy.ec.europa.eu/industry/sustainability/net-zero-industry-act_en.
- European Commission (2023b), *ASAP | Boosting Defence Production*, https://defence-industry-space.ec.europa.eu/eu-defence-industry/asap-boosting-defence-production_en#:~:text=The%20objective%20of%20ASAP%20is,well%20as%20their%20supply%20chains.
- European Commission (2024), *A New European Defence Industrial Strategy: Achieving EU Readiness through a Responsive and Resilient European Defence Industry*, https://defence-industry-space.ec.europa.eu/document/download/643c4a00-0da9-4768-83cd-a5628f5c3063_en?file-name=EDIS%20Joint%20Communication.pdf.
- Evenett, S., A. Jakubik, F. Martín and M. Ruta (2024). "The Return of Industrial Policy in Data", *IMF Working Paper WP/24/1*
- Frankel, J. A. and D. Romer (1999), "Does Trade Cause Growth?", *American Economic Review* 89, 379–399.
- Kotz, M., A. Levermann and L. Wenz (2024), "The Economic Commitment of Climate Change", *Nature* 628, 551–557
- Martin, P., T. Mayer and M. Thoenig (2008), "Make Trade Not War?", *The Review of Economic Studies* 75, 865–900.
- Roberts, A. (2014), *Napoleon the Great*, Allen Lane, New York and London.
- Rodrik, D. (2016), "Premature Deindustrialization", *Journal of Economic Growth* 21, 1–33.
- Thies, C. F. and C. F. Baum (2020), "The Effect of War on Economic Growth", *Cato Journal Winter*, <https://www.cato.org/cato-journal/winter-2020/effect-war-economic-growth>.
- USDA (2023), *Russia Grain and Oilseed Exports Expand*, <https://fas.usda.gov/data/russia-grain-and-oilseed-exports-expand#:~:text=The%20expansion%20of%20Russian%20grain,the%20second%20largest%20on%20record>).
- Vezzoni, R. (2023), "Green Growth for Whom, How and Why? The REPowerEU Plan and the Inconsistencies of European Union Energy Policy", *Energy Research & Social Science* 101, 103134.

Georg Duernecker

Deindustrialization, Structural Change and the European Productivity Dilemma*

GROWTH SLOWDOWN AND THE LOST DECADE

The slowdown in aggregate productivity growth is currently a major economic challenge for many advanced economies. The European Union (EU) is no exception. While productivity in the EU14 grew rapidly until the mid-1980s, at annual rates well above 2.5 percent, it has slowed significantly in recent decades and has been virtually stagnant in recent years, with no signs of recovery.¹ This pattern is shown by the solid line in Figure 1.² As a result of this growth slowdown, the EU is currently on the verge of entering a “lost decade” for productivity.

Low rates of productivity growth are a cause for concern, as sustained productivity improvements are considered a key determinant of economic development and future living standards. As a result, there has been considerable recent interest among policymakers and researchers alike in understanding the roots of Europe’s dismal productivity performance. Some of the most prominent potential explanations that have been put forward in recent research include diminishing returns to R&D and innovation, a decline in business dynamism, a lack of investment in ICT and intangibles, mismeasurement, the slow diffusion of technology and innovation, and regulatory barriers.

Much of the existing work emphasizes the role of the slowdown in traditional engines of growth – such as technological progress and the accumulation of factors of production such as physical, human, and intangible capital. However, a recent strand of the literature emphasizes the importance of changes in the sectoral composition of economies as a key factor behind the observed growth slowdown. This explanation is based on two prominent empirical observations: structural change, and sectoral productivity differences.

Since the work of Kuznets (1966) and later Herrendorf et al. (2014), it is a well-established empirical fact that economies undergo large-scale sectoral reallocations of economic activity as they develop. This process is known as structural change, and it typically results in a secular decline in the relative size of the agricultural and industry sectors and an increase in the services sector.³ Structural change in the EU14 has led to a significant decline in the rela-

* This article is based on selected previous work of the author, including Duernecker et al. (2024) and Duernecker and Sanchez-Martinez (2023 and 2024).

¹ In this context, productivity is defined as real value added per hour worked.

² The data used in this article come from the EU-KLEMS database.

³ In low-income countries, the manufacturing sector initially rises with income but then starts to decline for a sufficiently high level of development.

KEY MESSAGES

- **Aggregate productivity growth in the EU14 has slowed significantly in recent decades**
- **Structural change toward services has contributed significantly to the growth slowdown**
- **Future growth is projected to decline further due to the rise of sectors with stagnant productivity**
- **Europe is projected to fall further behind the US in terms of productivity**
- **R&D tax credits may not cure Europe’s productivity malaise due to negative reallocation effects**

tive size of agriculture and industry over time. The employment shares of these sectors declined from 17 percent to 4 percent and from 38 percent to 22 percent, respectively, between 1970 and 2017. Over the same period, the services sector has expanded massively, increasing its employment share by 30 percentage points from 45 percent in 1970 to 75 percent in 2017. A similar picture emerges when looking at other measures of sectoral economic activity, such as value added or final expenditure. As a result of this evolution, it is fair to say that structural change has led to a pronounced transformation of the structure of European economies, resulting in large-scale deindustrialization and a pronounced expansion of the service economy.

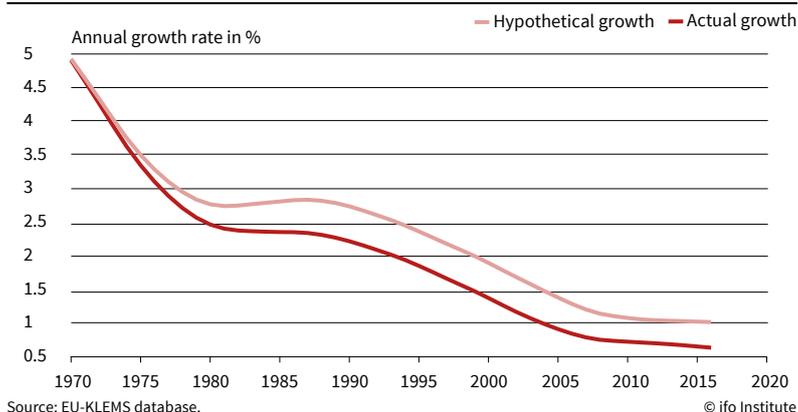
The second important observation concerns the differential productivity performance across sectors. As is well known, both agriculture and industry have traditionally been very dynamic sectors in most advanced economies, characterized by high rates of innovation, capital accumulation, and technological progress, leading to rapid productivity growth in these sectors. In the EU14, agriculture and industry have experienced rapid and sustained productivity growth of 4 percent and 2.5 percent per year, respectively, over the period from 1970 to 2017. In contrast, productivity in services has tended to be sluggish, with growth rates well below those of agriculture and industry. In the EU14, services productivity grew at an annual rate of only 1.2 percent over the period 1970–2017.



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Figure 1
Aggregate Productivity Growth in the EU14



In some subsectors of services – such as personal services, business services, and education – productivity has stagnated or even declined over the long term.

Taken together, structural change tends to reduce aggregate productivity growth because it leads to a reallocation of economic activity from sectors with high rates of productivity growth – such as agriculture and industry – to the service sector, which is characterized by comparatively low rates of productivity growth. This phenomenon is commonly referred to as cost disease, a term first coined by Baumol (1967). In the EU14, the sectoral reallocation from dynamic to sluggish sectors has led to a significant reduction in aggregate productivity growth over time. The quantitative importance of the cost disease can be illustrated by a simple calculation. In this calculation, a hypothetical series of aggregate labor productivity growth is computed as the weighted sum of sectoral labor productivity growth. Importantly, the weights used in this calculation are held constant at the values of the initial year of observation (here: 1970). By keeping the sectoral weights constant, it is possible to isolate the contribution of structural change to the evolution of aggregate productivity growth. The pink line in Figure 1 shows the resulting series. The difference between the series of hypothetical productivity growth (pink line) and actual productivity growth (red line) represents the contribution of structural change to aggregate productivity growth.

Two important observations emerge from this calculation. First, the pink line is always above the red line throughout the period, implying that structural change has reduced aggregate productivity growth in Europe. The reduction is substantial, amounting to 0.4 percentage points of the annual growth rate. Second, the observed sectoral reallocation toward services has been a major contributor to the growth slowdown in Europe, accounting for almost 20 percent of the reduction in productivity growth between 1970 and 2017. Importantly, the European average masks a high degree of heterogeneity in these results across countries. For some countries, these effects are much

larger; for example, in Germany, the contribution of structural change to the growth slowdown is almost 40 percent.

WHAT TO EXPECT FOR THE FUTURE?

An important question that arises in this context concerns the future role of structural change in shaping aggregate productivity. Can we expect the growth slowdown to continue in the future and, if so, at what pace? Will it eventually come to a halt or even be reversed? Such questions can be addressed by model-based simulations. These simulations are based on a multi-sector macroeconomic model in which consumers make optimal choices about the consumption of different types of goods, and firms in each sector hire labor from households to produce those goods. In addition, there is technological progress at the sectoral level, which leads to productivity gains. In line with empirical observations, productivity growth is allowed to differ across sectors. Consumers and firms interact in markets where prices adjust to balance supply and demand. In this model economy, structural change is driven by two empirically grounded mechanisms. The first mechanism is based on an income effect induced by the structure of consumer preferences. Preferences imply that some goods are increasingly demanded as income rises (so-called luxury goods), while other goods are less demanded as income rises (necessity goods). As the economy grows, the rise in income induces the consumer to shift consumption expenditures toward luxury goods (typically services) and away from necessity goods (agricultural and manufactured goods).

The second mechanism is governed by a substitution effect. In the model economy, the relative price between two goods is inversely related to the productivity levels of the sectors producing those goods. As a result, uneven growth in sectoral productivity leads to changes in the relative price of goods. For example, if productivity grows faster in agriculture than in services (which is the empirically relevant case), then services become more expensive relative to agricultural goods. In the model, this change in relative prices induces the consumer to adjust the consumption bundle and to spend a larger share of income on services.⁴

The model framework is sufficiently rich to capture some key features in the data, yet simple enough to allow the main mechanisms at work to be studied analytically. Importantly, a calibrated version of the model is able to replicate the historical paths of structural change in employment and value added, as well as the evolution of relative prices and the path of aggregate productivity growth. At the same time, it is

⁴ This is because agricultural goods and services are gross complements in preferences (as is the empirically relevant case). If the two goods were gross substitutes, then the consumer would reduce the spending on the more expensive good.

consistent with empirically observed features of consumer demand, such as the direction and magnitude of the income effects described above. The empirical fit of the model economy is reassuring with respect to the applicability of the model for conducting credible simulations.

The calibrated model can be simulated forward in time to predict the future path of structural change and to explore the impact of shifts in sectoral composition on aggregate productivity. These simulations yield a number of results, some of which are expected, others are surprising, yet others are worrying. We start with the expected. Empirically, services are now the dominant sector in most EU countries, accounting for three-quarters or more of total employment and value added. It is therefore not surprising that the model predicts a limited role for future reallocations from agriculture and industry to services. At first glance, this result is good news, as the historically strong expansion of services has been a major drag on aggregate productivity growth in Europe. However, while the size of the services sector is predicted to grow only moderately in the future, the model predicts large reallocations within the services sector. As briefly mentioned above, the subsectors of services are very diverse in terms of productivity growth. Some subsectors – such as trade, transport, and communications – are very dynamic with high rates of productivity growth, sometimes even exceeding those observed in agriculture and industry, while other sectors tend to have stagnating or even declining productivity. The model predicts a strong expansion of these sectors with stagnant productivity. This includes, for example, the business services sector, which is predicted to grow rapidly in size but is characterized by sluggish productivity. These large shifts toward services with stagnant productivity represent a major drag on future productivity growth in Europe. According to the model, the annual rate of aggregate productivity growth will continue to slow from currently 1 percent to 0.8 percent over the next ten years.

Importantly, the model paints a less grim scenario for US productivity. The model also predicts a pronounced structural change in the US services sector, particularly toward business services. However, in contrast to Europe, the US business services sector is characterized by positive and sustained productivity growth. Therefore, the projected strong expansion of this sector will not be a drag on overall productivity growth as it is in Europe.

In summary, Europe is projected to experience a sustained slowdown of aggregate productivity growth in the future, while structural change in the US is projected to have only a moderate impact on aggregate productivity growth. As a result, Europe is expected to fall further behind the US in terms of productivity. The existing productivity gap between the US and Europe of 3 percent in 2017 is projected to widen to around 20 percent by 2027.

POLICY CONCLUSIONS

A number of policy implications can be derived from this. Structural change has been shown to be one of the causes of the secular stagnation of productivity growth in Europe. Moreover, structural change is also predicted to have a significant negative impact on future productivity growth. However, these findings should not be interpreted as evidence calling for policy interventions to reverse the path of structural change – for example, through policies aimed at redirecting economic activity toward high-growth sectors such as agriculture and industry.

Structural change and deindustrialization in advanced economies are often met with deep scepticism and even outright fear by politicians and special-interest groups, who tend to be concerned about issues such as migration of companies abroad, mass unemployment, or threats to domestic competitiveness. Clearly, structural change can have adverse effects on individual workers, firms, or regions (e.g., through job losses or plant closures). At the aggregate level, however, these processes are the result of an efficient reallocation of economic activity, driven by differential productivity gains at the sectoral level. Thus, any policy aimed at forcing a shift in the path of the sectoral composition of an economy would be welfare reducing.

In an effort to boost aggregate growth, governments in many advanced countries have recently begun to use R&D tax credits as a tool to stimulate innovation. In 2021, twenty EU member states offered tax relief for R&D expenditures at the central or subnational government level. However, upon closer inspection, R&D tax credits may not be an effective cure for Europe's productivity malaise due to negative reallocation effects triggered by this policy.

To analyze R&D tax credits and their impact on growth, the model framework outlined above is extended to include private innovation activity as a driver of economic growth. In this framework, entrepreneurs engage in R&D to create new capital goods (machines) that increase productivity at the sectoral level. R&D tax credits stimulate private innovation by providing financial incentives to entrepreneurs.

However, the effect of the tax credit on innovation is not uniform across sectors but depends on the capital intensity of the sector. Some sectors are very capital-intensive and thus offer ample scope for further capital-embodied innovation. Empirically, these sectors include agriculture and industry, as well as subsectors of services such as transportation, trade, and finance. In these sectors, entrepreneurs respond strongly to R&D tax credits, which stimulates productivity growth in these sectors. Other sectors of the economy are highly labor-intensive, such as accommodation, personal services, business services, and education. In these sectors, there is limited scope for capital-embodied innovation and, as a result, entre-

preneurs' innovation efforts respond only moderately to more generous R&D policies.

Taken together, an untargeted R&D tax credit tends to stimulate innovation in capital-intensive sectors that already have strong productivity growth but has limited growth effects in labor-intensive sectors that are characterized by stagnant productivity growth.

The heterogeneous response of sectoral productivity implies that the productivity differential between the fast-growing sectors and the stagnant sectors in the economy further widens. This effect has important implications for the sectoral reallocation process, as it reinforces the substitution effect of structural change. Specifically, the larger gap in productivity growth across sectors accelerates the shift of economic activity from sectors with dynamic productivity growth to sectors with lower productivity growth. In other words, R&D tax credits may imply a worsening of the cost disease.

In sum, an R&D tax credit affects aggregate productivity growth through two opposing channels. It leads to a positive effect on aggregate growth by stimulating sectoral innovation and productivity growth, and to a negative reallocation effect by accelerating structural change toward stagnating sectors. Whether and to what extent the positive growth effect outweighs the negative reallocation effect is a quantitative question and depends on the specific parameterization of the model economy.

Finally, in order to boost aggregate productivity growth in Europe, policy efforts should focus primarily on the business services sector and other services with stagnant productivity and address the underlying

causes of sluggish productivity in these sectors. As noted above, these services are the main culprit of Europe's low productivity growth in the recent past and the projected decline in future growth. In most European countries, these service sectors are large and fast growing, and in contrast to the United States, they are characterized by stagnant productivity. To understand the causes of stagnant productivity in these sectors, it may be worthwhile to examine, possibly at the firm level, the role of regulation, firm dynamics, automation, human capital accumulation of workers, and occupational structure. Although these sectors have traditionally been seen as having an inherently limited scope for technological progress, intangible assets and digital technologies have a number of characteristics that could potentially improve the efficiency of production processes even in these sectors.

REFERENCES

- Baumol, W. J. (1967), "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis", *American Economic Review* 57, 415–426.
- Duernecker, G., B. Herrendorf and A. Valentinyi (2024), "Structural Change with the Services Sector and the Future of Cost Disease", *Journal of the European Economic Association* 22, 428–472.
- Duernecker, G. and M. Sanchez-Martinez (2023), "Structural Change and Productivity Growth in the EU – Past, Present and Future", *European Economic Review* 151, 104329.
- Duernecker, G. and M. Sanchez-Martinez (2024), R&D, *Growth and Structural Change*, Mimeo.
- Herrendorf, B., R. Rogerson and A. Valentinyi (2014), "Growth and Structural Transformation", in P. Aghion and S. N. Durlauf, eds., *Handbook of Economic Growth* 2, 855–941.
- Kuznets, S. (1966), *Modern Economic Growth*, Yale University Press, New Haven.

Fredrik Erixon, Oscar Guinea and Oscar du Roy

The EU's Productivity Performance: Falling Behind the Curve

Europe is yet again confronted with concerns over its economic performance. In recent years, the United States and other developed regions have grown faster than the European Union. Two former Italian premiers, Enrico Letta and Mario Draghi, have been separately tasked to come up with recommendations for economic reforms and improved competitiveness. With few European firms in the world league tables of market capitalization, and even fewer European companies involved in leading the current acceleration of structural and technological change (e. g., data, artificial intelligence, and quantum technology), there is growing pessimism about the region's economic future. Adding other challenges like demographic changes, corporate risk aversion, and hindrances to entrepreneurial growth, one might ask: is Europe doomed?

No, Europe is not doomed: it remains a region that is rich in capital and talented labor, with access to many necessary factors of fast growth. It is true that it used to be a global leader in company-led innovation and that it has lost some of its edge, but the region still has a strong class of companies with capacity to innovate and grow at scale. For improvement to happen, however, Europe needs to break with its habit of low productivity and address problems with poor underlying economic oomph. Productivity is the cornerstone of long-term economic prosperity. It allows for a more efficient use of resources and sustains competitiveness. Between 1995 and 2022, the EU's productivity level, measured as gross domestic product (GDP) per hour worked, grew by 42.6 percent. However, EU labor productivity growth, a better measure of changes in economic prosperity than the productivity levels, has been on a downward trend. It fell from an average of 2.1 percent between 1995 and 2000 to 0.8 percent between 2018 and 2022 (OECD 2024a).

Europe's productivity performance can be better understood by comparing its productivity growth over time. Additionally, a country with a similar size, level

of economic development, and institutional framework can serve as a benchmark for comparison. The first part of this paper examines the productivity gap between the EU and the US, and the factors driving productivity growth in both regions and setting them apart. The second section of the paper outlines policy recommendations for the EU to enhance its productivity. These recommendations focus on fostering innovation and reducing barriers to services, including financial services. The final section presents the key policy conclusions.

THE EU'S PRODUCTIVITY PROBLEM

The EU faces a productivity challenge, which has become more apparent over time in comparison to the US. In 1995, the EU lagged behind the US in GDP per hour worked by 16.3 percent. This gap had widened to 22.8 percent by 2022. There is also a significant disparity within the EU. Central and Eastern European

KEY MESSAGES

- **The EU lags the US in productivity growth**
- **Actions to increase innovation, investments in intangible assets, and promote market dynamism are needed to improve the EU's productivity**
- **The EU should increase expenditure on R&D and create better incentives for private-sector R&D spending**
- **The EU should design policies to channel savings to firm growth and boost venture capital**
- **The EU should close its technology gap and reduce market fragmentation to support firm growth and technology adoption**



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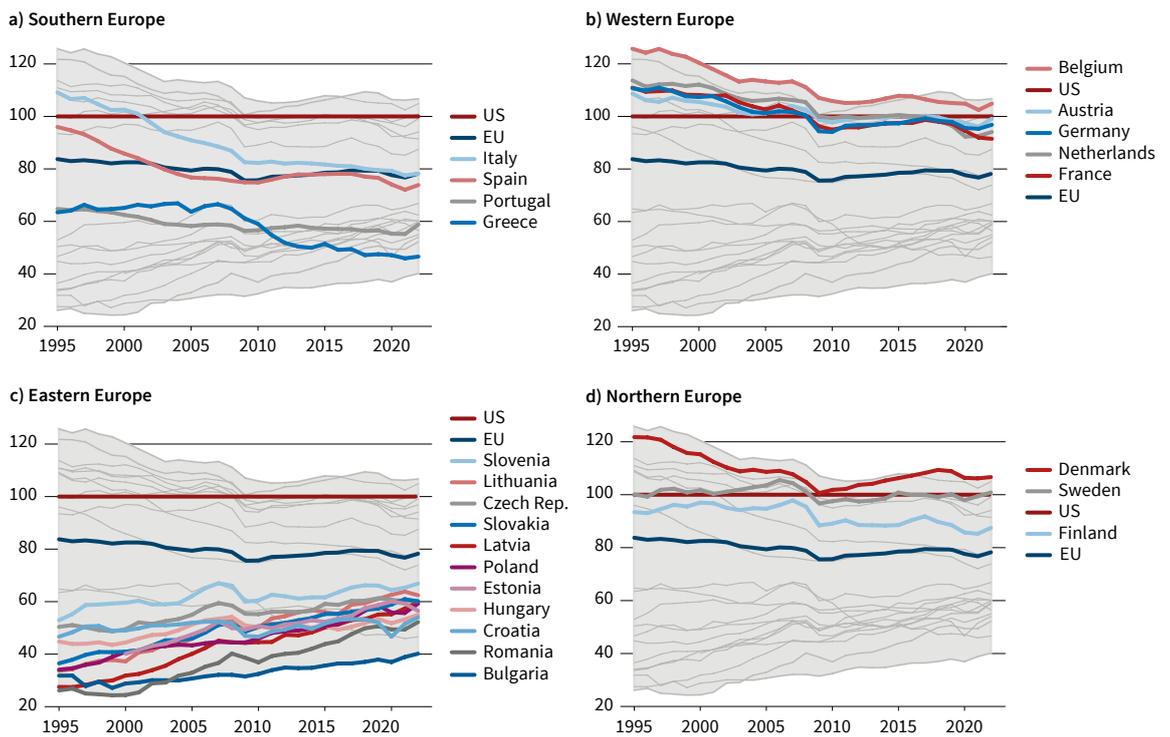
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Figure 1
EU GDP per Hour Worked Relative to the US



Note: Constant 2017 dollars PPP, US = 100. Ireland and Luxembourg were omitted from Western Europe figure for clarity reasons. Source: OECD; World Bank; Authors' calculations.

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(CEE) countries, despite having lower overall productivity than the EU average, have consistently exhibited higher productivity growth rates compared to western and southern EU countries (Figure 1, panels a, b, and c). These latter regions have witnessed a concerning downward trend relative to US productivity. Among the Nordic countries, Sweden's productivity remained comparable to the US. Denmark's productivity initially declined relative to the US but began recovering after 2010. Finland's productivity, on the other hand, converged with the US until the Great Recession.

In other words, Europe's productivity problems are predominantly about slower paces of productivity growth in western and continental Europe. CEE countries have enjoyed faster growth – also in economic output and GDP per capita – and generally reduced the prosperity gap between them and other members of the EU. They have also caught up in prosperity with the US. Remarkably, Poland is now richer than Portugal, and Estonia is richer than Spain (in real PPP terms). Yes, slower growth in other parts of the EU has expanded the prosperity gap with the US. If the EU was a state in the United States, it would be third poorest state – trailed only by Idaho and Mississippi.

Developments in total factor productivity (TFP) exacerbate Europe's productivity challenge. TFP captures the growth in output that cannot be attributed to changes in physical and human capital. This includes advancements in technology, innovation, and management practices. As a critical driver of economic growth, TFP contributed around 60 percent of labor produc-

tivity growth within the EA12 (i.e., twelve euro-area countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain). However, this contribution has diminished, falling from 68 percent to 55 percent between 1995 and 2019 (Lopez-Garcia and Szörfi 2021).

Figure 2 illustrates the concerning slowdown in TFP growth for both the EA12 and the US. Since 1965, both regions have experienced a significant decline, with TFP growth rates dropping from 3 percent in the US and 4 percent in the EA12 to roughly 0.5 percent today. Notably, the EU's TFP growth suffered a sharper decline compared to the US, particularly during the Great Financial Crisis and the subsequent European sovereign debt crisis of the early 2010s. However, the EU's TFP slowdown began well before these events, suggesting the presence of deeper structural factors.

FACTORS SLOWING THE EU'S PRODUCTIVITY

Addressing Europe's productivity slowdown is critical for long-term economic prosperity. Three interrelated factors are essential determinants of both current and potential productivity growth: innovation; intangible assets; and market dynamism.

Innovation is key to sustain technological progress and TFP growth. Traditionally, research and development (R&D) expenditure and the number of patents have served as key metrics for assessing a country's innovative capacity. In 2002, the EU set a target of allocating 3 percent of GDP to R&D. However,

two decades later, the EU's R&D expenditure stands at EUR 355 billion, representing just 2.23 percent of GDP. This falls short of comparable economies like Japan (3.34 percent, 2021), the US (3.46 percent, 2021), and South Korea (4.93 percent, 2021) (EC 2024a).

In terms of innovation output, the EU's share of global technology patent applications has shrunk dramatically, falling from 30 percent to just 17 percent between 1990 and 2022 (OECD 2024b). While patent quantity is a metric, it is important to acknowledge that not all patents hold equal weight in terms of innovation. However, even when examining the most complex technologies like nanotechnology, optics, and semiconductors, the EU's relative contribution has diminished. According to a Knowledge Complexity Index (KCI) that analyses 36 technology categories, the EU ranked 3rd behind the US and Japan in the 1990s. However, by 2020, the EU had fallen to the 5th position (Di Girolamo et al. 2023).

Modern knowledge-based economies increasingly rely on intangible capital, a broad category of assets that include organizational structures, human capital, industrial designs, IT software, and intellectual property rights (IPRs). Investments in these intangibles are crucial for driving productivity growth. Figure 3 compares the relative shares of tangible and intangible capital investments between the EA9 (i.e., nine euro-area countries: Austria, Finland, France, Germany, Italy, Luxembourg, the Netherlands, Portugal, and Spain) and the US. While intangible investment in the EA9 surpassed tangible investment in 2009, reaching 17 percent by 2020, the US holds a significant lead with a 6 percentage-point higher share and a much earlier shift toward intangibles.

Beyond innovation and intangible capital, market inefficiencies hinder productivity growth in Europe. Efficient allocation of capital and labor ensures resources reach the most productive firms, allowing them to scale, while less productive ones exit the market. This process is another key driver of TFP growth (Baqae and Farhi 2020). Prior to the financial crisis, Europe witnessed a robust flow of resources toward high-performing firms. However, this trend has stagnated, coinciding with a significant decline in job dynamism. At the heart of this challenge lies the diminished role of young, high-growth firms. These companies, despite employing less than 20 percent of the workforce, contribute 7.6 percentage points more to job creation than larger firms (Crisciolo et al. 2014). However, Europe's startup rate, particularly in several euro-area countries, has been declining.

ADDRESSING EUROPE'S PRODUCTIVITY PROBLEM

What can European policymakers do to lift growth in productivity? In Enrico Letta's report on the EU single market, useful reforms are outlined (Letta 2024). The EU could reduce barriers to economic integration in sectors like telecommunications and energy. Reform-

Figure 2
Total Factor Productivity Growth

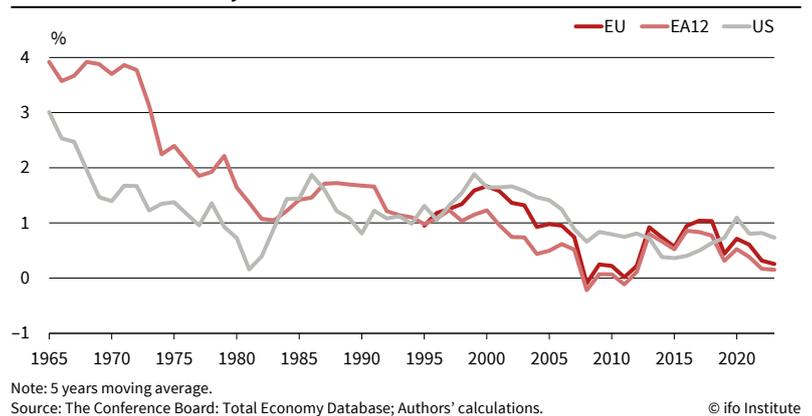
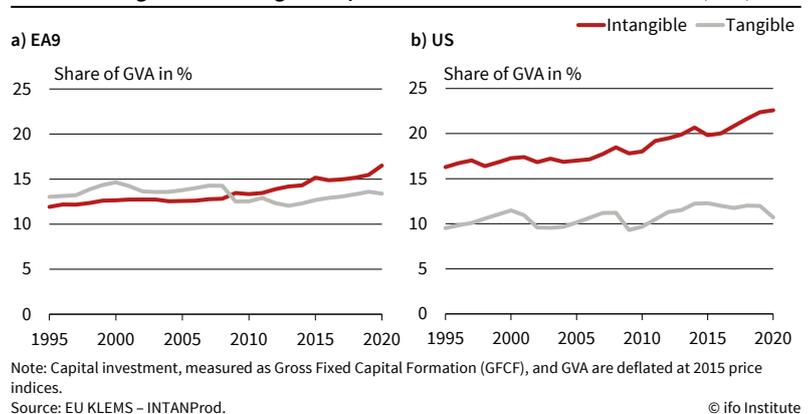


Figure 3
Shares of Tangible and Intangible Capital Investment in Gross Value Added (GVA)



ing a fragmented system of national financial supervision could help foster better allocation of capital and deter habits of banking and capital nationalism. After an era of muscular regulatory unilateralism, the EU could seek better cooperation with other large markets in the regulation of businesses and technology. Europe's global trade performance has been underwhelming for some years now (the profile of total EU trade has become more internal than external – despite global demand growing much faster than EU demand – but a friendlier approach to trade partners could help reverse the trend). Using a conservative assumption to estimate potential gains to the EU from a set of similar moderate-level reforms, we found that total EU GDP could increase by a bit less than 3 percent in the medium term (Erixon et al. 2023).

However, the productivity challenge needs much more comprehensive reforms. The EU faces a critical juncture in innovation and innovation-led growth. Data from 2022 reveals that private firms contribute the majority (58 percent) of the EU's EUR 355 billion R&D expenditure, with governments providing 30 percent (EC 2024a). Therefore, if the EU is serious about moving the needle of its R&D spending, it must support private R&D spending, either by encouraging market competition or through initiatives such as tax incentives. Otherwise, European firms risk falling behind

in the technological race. Large European companies spent a lower percentage of their revenue on R&D than comparable economies (McKinsey 2022).

Public investment in R&D also merits attention. The EU's public R&D spending (0.24 percent of GDP) falls short compared to similar economies like Japan (0.28 percent), the US (0.29 percent), and South Korea (0.48 percent) (EC 2024a). This disparity raises concerns about EU priorities. While Horizon Europe, the most significant EU R&D program, boasts a EUR 95.5 billion budget (nearly 9 percent of the 2021–2027 EU budget), agriculture spending holds a considerably larger share at 31 percent (European Council 2022).

Ambitions also need to be raised. The target of spending 3 percent of GDP on R&D reflected the profile of the economy in the 1990s, but since then the role of knowledge, human capital, and scientific discovery in the economy has become much bigger. A better target for the economy of the future is a target of, say, 4 or 5 percent of GDP, and to achieve that by 2040 requires a significant increase in R&D spending in the next 15 years. In the next Financial Framework of the EU, R&D spending should double, and individual member states need to take even greater responsibility for incentivizing private R&D and expanding on the national research spend.

While raising the level of EU R&D spending is crucial, maximizing its impact requires improving how those funds are spent and how they help fuel economic growth. Currently, a uniform distribution across member states, while seemingly equitable, contradicts the economic logic of fostering innovation. Take Horizon 2020 – the predecessor to Horizon Europe. As a percentage of GDP, Cyprus, Luxembourg, and the Netherlands received the highest research spending (EC 2024b). However, these are not the hubs for European innovation. Importantly, this approach hinders efforts to cultivate world-class research, which is essential for the EU to compete and engage with global centers of excellence. In a ranking of the top 25 universities globally, only one EU institution (Université PSL) made the cut. When looking at the top 50 universities, Asia is home to nearly three times as many as the EU (QS World University Ranking 2024).

Skilled workers are another fundamental driver of technological advancement, as they determine an economy's capacity to adopt new technologies. Unfortunately, demographic trends suggest a decline in Europe's domestic supply of advanced human capital, leading to potential skills shortages in critical innovation areas (Lamprecht 2022). To mitigate this challenge, the EU should prioritize funding for educational programs aligned with these emerging skills gaps. Additionally, the EU should attract foreign talent and foster mobility for EU researchers to participate in international networks and tap into the growing body of research undertaken outside the EU.

Improving capital markets also goes in tandem with accelerating innovation-led growth. Eu-

rope does not have a shortage of savings that can be used by capital markets to fund corporates and growth. Capital markets are also liquid, which means foreign capital also comes to Europe's capital markets. However, corporate funding in Europe remains all too dependent on banks and bond markets, and too small shares of European savings find their way into growth funding for companies. Both corporates and capital markets in Europe are more risk averse than their American peers, and financial sector regulations have encouraged an allocation of capital that makes the corporate sector too dependent on public bond markets and savers too dependent on treasuries, corporate bonds, and other assets that tend to go to incumbent companies. For instance, venture capital funding as a share of GDP is ten times larger in the US than in the EU (Elert et al. 2019). In other words, there is a strong potential for better corporate growth funding in Europe, and this could also help provide funding at scale.

Finally, there is substantial work ahead to raise the technology and productivity performance in Europe's SME sector. Europe's industrial profile is strongly based on SMEs, and there is a firm-level productivity distribution pattern that is worrying. Technology adoption in the US economy is stronger than in the EU across all firm sizes, but the gap is the largest for small and medium-sized enterprises (EIB 2023). Low levels of technology adoption weigh down on productivity performance, and also make it harder for European companies to grow on the back of technology acceleration. The services sector in particular is fragmented and based on unconsolidated markets with many firms that do not grow much. With smaller scale comes smaller capabilities for technology investment. In the end, it reduces the contribution that these firms can make to the economy.

POLICY CONCLUSION

In this article we have argued that:

- Europe has a productivity growth problem, and it is especially alarming in western and southern Europe. While total factor productivity growth has gone down in the US, too, the deceleration is stronger in the EU, and it requires urgent policy attention.
- Europe's key productivity problem is to accelerate technological change and have more companies that lead on modern innovation, not least in areas of data, AI, and quantum technology.
- There is a strong case to be made for improving EU policies on the single market and for reducing barriers to trade and investment both within the EU and externally with other countries. Europe should change its stance of regulatory unilateralism toward more regulatory cooperation with key partners, leading to better opportunities for economic integration.

- European policymakers should increase expenditure on R&D and create better incentives for private-sector R&D spending. They should also pursue policies that lead to a greater share of European savings being invested in growth funding for firms and that allow for faster growth in venture capital.
- Policymakers in Europe should also focus on closing the gap in technology adoption and productivity across firm-size classes and making it easier to diffuse technology to SMEs.

REFERENCES

- Baqae, D. and E. Farhi (2020), “Productivity and Misallocation in General Equilibrium”, *Quarterly Journal of Economics* 135, 105–163.
- Criscuolo, C., P. N. Gal and C. Menon (2014), “The Dynamics of Employment Growth: New Evidence from 18 Countries”, *OECD Science, Technology and Industry Policy Papers* 14, <http://dx.doi.org/10.1787/5jz417hj6hg6-en>.
- Di Girolamo, V., A. Mitra, J. Ravet, O. Peiffer-Smadja and P. A. Baland (2023), *The Global Position of the EU in Complex Technologies*, Publications Office of the European Union, <https://data.europa.eu/doi/10.2777/454786>.
- EIB (2023), *Digitalisation in Europe 2022-2023: Evidence from the EIB Investment Survey*, European Investment Bank.
- Elert, N., M. Henrekson and M. Sanders (2019), *The Entrepreneurial Society: A Reform Strategy for the European Union*, Springer, Berlin.
- Erixon, F., O. Guinea, P. Lamprecht, E. Sisto and E. van der Marel (2023), *The Economic Dividend of Competitiveness*, <https://ecipe.org/publications/economic-dividend-of-competitiveness/>.
- European Commission (2024a), *R&D Expenditure*, Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure.
- European Commission (2024b), *Horizon 2020 Dashboard*, <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-dashboard>.
- European Council (2022), *Long-term EU Budget 2021-2027 and Recovery Package*, <https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/>.
- Lamprecht, P. (2022), “Does Shortage of High-Skilled Labour Threaten Germany’s Ambitious Sustainability Goals?”, ECIPE, <https://ecipe.org/blog/does-shortage-of-high-skilled-labour-threaten-germanys-ambitious-sustainability-goals/>.
- Letta, E. (2024), *Much More Than a Market – Speed, Security, Solidarity: Empowering the Single Market to Deliver a Sustainable Future and Prosperity for All EU Citizens*, <https://www.consilium.europa.eu/media/ny-3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>.
- Lopez-Garcia, P. and B. Szörfi (2021), *Key Factors behind Productivity Trends in Euro Area Countries*, https://www.ecb.europa.eu/pub/economic-bulletin/articles/2021/html/ecb.ebart202107_02-c95a8477e1.en.html.
- McKinsey & Company (2022), *Securing Europe’s Competitiveness: Addressing Its Technology Gap*, <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/securing-europescompetitiveness-addressing-its-technology-gap>.
- OECD Dataset (OECD, 2024a), *Growth in GDP per Capita, Productivity and ULC*, https://stats.oecd.org/viewhtml.aspx?datasetcode=PDB_GR&lang=en#.
- OECD Dataset (OECD, 2024b), *REGPAT: Patents by Regions*, https://stats.oecd.org/Index.aspx?DataSetCode=PATS_REGION.
- QS World University Ranking (2024), <https://www.topuniversities.com/world-university-rankings>.

Maria Savona

Data Governance: Main Challenges*

KEY MESSAGES

- **Addressing the governance of emerging digital automation technologies and data in particular requires a multidisciplinary perspective, including techno-legal, geopolitical and economic expertise**
- **Research on governing the process of individual and B2B data sharing, either through mandatory rules or the creation of incentives for sharing, will be important for setting the policy agenda**
- **A “data-haven hypothesis” might explain asymmetries in the concentration of digital infrastructure, with countries with more stringent data protection, IP or tax regimes offshoring cloud services and data hubs to countries with weaker ones**
- **The EU AI Act might lead to a new wave of the so-called “Brussels effect,” even though it may still not be optimal and require further debate and public scrutiny**

Economists of innovation know too well that the governance of emerging technologies to prevent potential side effects of uncontrolled developments usually requires more time than firms need to enter those markets. The unprecedented pace of development of digital automation technologies and artificial intelligence (AI) makes the identification of such effects and the formulation of tools to address these challenges complex from different perspectives.

The first one is *techno-legal* and concerns the pervasiveness of AI applications and the need to regulate them in very diverse realms, often at odds with each other (e.g., the attribution of intellectual property rights on AI-generated art; the protection of privacy in increasingly complex data-treating business models). The second one is *geopolitical* and specific to AI, which seems to have sparked a wave of “new protectionism” and ensuing tensions among China, the US and the EU, on pretty much every aspect related to digitalization, from domestic chipmaking to the regulation of digital trade and

* The paper builds on several solo and joint working and briefing papers, keynote addresses and panel discussions over the past few years, quoted in the text and referenced.

cross-border data flows “with trust” (OECD 2022). The third one is *economic* and includes, for instance, the need to adapt and possibly “upgrade” competition and antitrust regulations to digital markets; mitigate the effects of digital automation on labor markets; ensure a fair and inclusive redistribution of both the private and social value generated by (personal and business) data among firms, individual data subjects and public actors.

The case of generative AI is an example of the extent to which we shall understand and predict how the emerging digital automation technologies raise questions that have been unprecedented in the history of other technological paradigms. Never have the same entrepreneurs and innovators, owners of “too-big-to-fail” platforms, demanded regulatory intervention from governments to “slow down” the development of generative AI,¹ the core of their business and competitive advantage. Neither have they explicitly expected public institutions to identify and regulate undesirable effects such as fake news and cybersecurity.

Addressing each of the above challenges and understanding how they are interrelated is an arduous task. We offer a brief reflection on two – relatively less explored – policy-relevant economic aspects of data governance, data sharing and the concentration of digital infrastructure, and then focus briefly on the recent EU AI Act.

DATA SHARING

The economic nature of data changes along the data “value chain,” which includes the aggregation, processing and analytics of individual data (Corrado et al. 2022; Goos and Savona 2024). Individual data² is a *club good*, excludable but not rivalrous (Savona 2019), as individuals or business might prevent the use of their personal or copyright-protected³ information. However, once shared, data can be re-used at virtually no marginal costs. A legally owned database is a *private good*, excludable, and rivalrous, and is usually included in the intangible assets of firms (Corrado et

¹ See “Pause Giant AI Experiments: An Open Letter” (March 2023): <https://futureoflife.org/open-letter/pause-giant-ai-experiments/>.

² Personal data means “any information relating to an identified or identifiable natural person (“data subject”); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person” (article 4(1), EU GDPR, 2018).

³ EU Directive 96/9/EC of 11 March 1996 recognizes the legal ownership of databases to firms, with *database property rights* being a legal category implemented in that context.



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al. 2022), being thus a source of comparative advantage. The ensuing data analytics is valuable information that eventually becomes collective knowledge whose economic nature is inherently a *public good*.

Depending on the actors involved and the purpose that information and collective knowledge serve, data presents the challenge of having to reconcile objectives that are often at odds with each other. For instance, it is important to create incentives to *maximize data sharing* for purposes of public interest such as health, mobility, or research. However, data as an asset in firms that benefit from inherent network economies require *capping private value concentration* from an antitrust perspective. Facilitating data sharing and preventing value concentration might be at odds with *protecting individual privacy and other rights* (Savona 2020 and 2021; Goos and Savona 2024). The European Commission has been trying to resolve this policy conundrum in the context of the articulated regulatory framework developed over the past few years and considered a benchmark worldwide.

An interesting instance of such EU regulations is the EU Data Governance Act (DGA), which has explicitly aimed to foster the “availability of data for use by *increasing trust in data intermediaries* and by *strengthening data sharing mechanisms* across the EU.” The focus is on the *creation of data markets* by legitimizing data intermediaries (i.e., data trusts, cooperatives, stewards, unions). Further, it aims to “*make public sector data available for re-use (..) on altruistic grounds.*”

Data intermediaries are supposed to act in the interests of individual data subjects and facilitate data sharing (Savona 2021; Goos and Savona 2024). However, to achieve a sufficient scale of aggregate information that serves public purposes such as research and public health, data intermediaries would need large-scale digital infrastructure to manage large amounts of data, which might lead to the same challenges that current big techs pose, such as market concentration, privacy leakages, and cybersecurity.

In addition, trustees that operate on a fiduciary basis on behalf of a group of individual data subjects should demonstrate a commitment to pro-social and “altruistic” behavior, supported by appropriate incentives. This is not trivial.

A governance model that enforces data sharing for public interest has been proposed for the design and launch of the green mobility plan of the City State of Hamburg (The New Institute 2023). Within the legal framework designed in this case, data sharing has been made mandatory, rather than delegated to voluntary data trusts. The effectiveness of the DGA in creating missing data markets through data intermediaries is yet to be assessed, but it would be important that the intermediaries be capped in scale, limited to specific purposes, and monitored by an independent governing body in order to minimize risks of shifting from big tech to big trusts.

Graef and Prufer (2021) propose a governance framework for B2B data sharing that aims at avoiding market concentration. From a legal perspective, they claim that data sharing should be made mandatory and regulated, and propose three potential models.

The first model would be a fully centralized one, involving a central role for a European Data Sharing Agency that would manage a mandatory data sharing. The second model would be fully decentralized, involving the creation of a Data Sharing Cooperation Board, which would oversee a network of National Competition Authorities (NCAs) whose remit would be to enforce data sharing contracts. The third one would be a hybrid model, with both centralized and decentralized features.

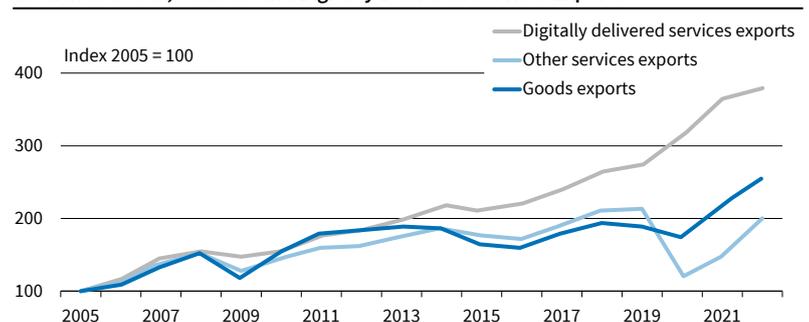
Governing the process of individual and B2B data sharing, either through mandatory rules or the creation and maintenance of incentives for sharing that do not lower consumer and citizens’ protection, is no easy task. Overall, research and case studies on the creation and implementation of regulatory frameworks with different degrees of centralization are still in their infancy, let alone the assessment of their effectiveness. This is likely to become an intriguing research and policy agenda in the near future.

THE GEOPOLITICS OF DIGITAL INFRASTRUCTURE

Trade in digital services has increased considerably over the past decades (Figure 1), and relies on the investment capacity in physical digital infrastructure that supports cross-border data flows, including submarine cables, optic fibers, and, more recently, data centers and cloud storage of data and software. Arguably, the intertwined effect of technological advances in digitalization and the specificities of the digital infrastructure needed to support cross-border data flows are changing the sources of comparative advantage of countries in the digital service trade.

According to IMF et al. (2023), “*cloud computing services, defined as ‘computing, data storage, software, and related IT services accessed remotely over a network, supplied on demand and with measured*

Figure 1
Growth of Goods, Services and Digitally Delivered Services Exports



Note: Digitally delivered services include GATS mode 1 exports of financial, insurance, telecommunications, computer and information services (ICT), charges for the use of intellectual property, and most of other business services and of personal, cultural and recreational services in the Balance of Payments.
Source: Trade Finance Global (2023); Papadakis and Savona (2024).

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resource usage that allows charging on a pay-per-use basis', are increasingly used to replace ownership of on-premises IT equipment." This means that, particularly when the scale of digital activity increases, the costs of storing and processing data lead companies to outsource (and offshore) data stocks to external cloud service providers and data centers.

Papadakis and Savona (2024) show that digital infrastructure (data centers and cloud storage) is unevenly concentrated across developed and developing countries, with a non-negligible share located in small developing countries. There are different potential explanations for this.

First, the concentration of digital infrastructure might mirror the asymmetrical distribution of (digital) trade among headquarter and factory countries (Baldwin and López-González 2015), with large core countries offshoring digital infrastructure to peripheral and small economies, reproducing a core-periphery structure of digital trade.

Second, a high concentration of digital infrastructure in specific countries might be due to different digital regulatory regimes, including the articulated EU digital regulations mentioned in the previous section, the EU adequacy regulations on digital trade (see e.g. , Ferracane et al. 2023; Bacchus et al. 2024), and intellectual property (IP) regulatory regimes (Santancreu 2023). Data storage might be concentrated in countries that are destination of IP profit shifting or patent boxes (Haufler and Schindler 2023; Alstadæter et al. 2018; Accoto et al. 2023).

In Papadakis and Savona (2024) we argue that a "data-haven hypothesis" might explain asymmetries in the concentration of digital infrastructure, similarly to how the "pollution-haven hypothesis" has explained patterns of trade of green and brown products: advanced countries offshore activities that would not meet their strict environmental regulations to mid- and low-income countries with less stringent regulations (see Savona and Ciarli 2020 for a selected review). In the same vein, countries with more stringent data protection, IP or tax regimes would offshore cloud services and data hubs to countries with weaker ones.

The idea of increasing "data governance interoperability" (Bacchus et al. 2024) might go in the direction of strengthening the role of national governments vis-à-vis private owners of data centers or cloud services. However, the plea for international cooperation to ensure interoperability of data governance regimes should be extended beyond data protection to other realms, including IP and tax regulation.

THE EU AI ACT

The European regulatory framework of digital emerging technologies has always been at the forefront of what has been named the "Brussels effect." When

the GDPR became law, US tech giants had to comply, and several governments chose to align themselves onto the main principles and rules to protect citizens' privacy – and digital rights – more broadly. It will be interesting to see whether the EU Artificial Intelligence Act will trigger another Brussels effect. A few considerations are in order.

First, since the GDPR, the development of AI applications, the market concentration and the lobbying of US Big-Tech now calls for articulated and comprehensive governance of data and AI that goes well beyond individual privacy protection. As mentioned above, governance interoperability (Bacchus et al. 2024) can be fostered by reducing the widening gaps in digital, IP and tax regulations.

The EU AI Act includes not only a systematization of high-risk cases, such as predictive policing, social scoring, and algorithmic management in workplaces, but also an attempt to regulate foundation models such as LLMs, which have sparked much debate in the case of generative AI. As it has been pointed out, the regulation of foundation models is at the root of AI governance, and this is essentially what will be at stake over the next few years.

This opens a Pandora box and leads to a second point: there seem to be hints that the US is moving closer to the EU's regulatory framework. One of the issues at stake is the alleged copyright infringement on digital texts copied from the web and used to train LLMs and generative AI. It is well known how the debate has been nurtured by the cases of the *New York Times* and, separately, eight other American newspapers owned by Alden Global Capital – including the *Chicago Tribune* and *New York Daily News* – suing OpenAI and Microsoft. In the *New York Times* instance, the complaint crucially goes beyond the infringement of copyright law and lays down the case for regulating AI more broadly, borrowing much of the thrust and the principles of risk-adverse and rights-preservation contained in the EU AI Act. It raises concerns that touch upon misinformation, the protection of human creativity, the social value of professional and truthful journalism, as well as democracy itself. A highly reputable US company is suing a formerly non-profit and now for-profit billion-heavy US company.

A further instance where the US has moved quite unexpectedly toward the EU regulatory framework is in the sudden change of its position on digital trade (Ruiz and Savona 2024). The US announced last October that it was withdrawing its position on digital trade from the WTO to allow for stronger regulation. This might certainly be in line with the protectionism strategy in the context of geopolitical tensions mentioned above and the wish to maintain the US forefront position in the global AI race. However, it is not inconsistent with the Biden administration's Blueprint for an AI Bill of Rights.

In sum, the EU AI Act might still not be optimal and may require further debate and public scrutiny.

However, it may still lead to a new wave of the Brussels effect, as the governance of AI and data is and will continue to be increasingly challenging.

CONCLUDING REMARKS

As briefly argued above, one of the challenges of AI and data governance is to reconcile often conflicting objectives: to create (and maintain) incentives to maximize data sharing for purposes of public interest, such as health or research; to limit the concentration of private value arising from (involuntary or voluntary) data collection and analytics as in the case of LLM training; to protect privacy and other individual rights such as copyright in a context where human creativity (still) has social value.

All this calls for thinking out of the box, relying on a multidisciplinary understanding of: (i) what the (economic) detrimental effects of a badly or non-regulated technology are, linked with (ii) carefully designed legal frameworks that prevent or internalize these externalities, alongside a (iii) forward-looking view of how the geopolitics of technology and the striking asymmetries in the lobbying powers of different actors involved play out.

REFERENCES

- Accoto, N., S. Federico and G. Oddo (2023), "Trade in Services Related to Intangibles and the Profit Shifting Hypothesis", *Temi di discussione (Economic Working Papers)* 1414, Bank of Italy, Economic Research and International Relations Area.
- Alstadsæter, A., S. Barrios, G. Nicodeme, A. M. Skonieczna and A. Vezzani (2018), "Patent Boxes Design, Patents Location, and Local R&D", *Economic Policy* 33(93), 131–177.
- Bacchus, J., I. Borchert, M. Morita-Jaeger and J. Ruiz Macpherson (2024), *Interoperability of Data Governance Regimes: Challenges for Digital Trade Policy*, CITP Briefing Paper 12, <https://citp.ac.uk/publications/interoperability-of-data-governance-regimes-challenges-for-digital-trade-policy>.
- Baldwin, R. and J. López-González (2015), "Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses", *The World Economy* 38, 1682–1721.
- Corrado, C., J. Haskel, M. Iommi, C. Jona-Lasinio and F. Bontadini (2022), *Data, Intangible Capital and Productivity*, <https://www.nber.org/books-and-chapters/technology-productivity-and-economic-growth/data-intangible-capital-and-productivity>.
- European Commission (2022), *European Data Governance Act*, <https://digital-strategy.ec.europa.eu/en/policies/data-governance-act>.
- European Commission (2023), *Data Act*, <https://digital-strategy.ec.europa.eu/en/policies/data-act>.
- Ferracane, M., B. Hoekman, E. van der Marel and F. Santi (2023), "Digital Trade, Data Protection and EU Adequacy Decisions", *CITP Working Paper* 6.
- Goos, M. and M. Savona (2024), "The Governance of Artificial Intelligence: Harnessing Opportunities and Mitigating Challenges", *Research Policy* 53(3), 104928.
- Graef, I. and J. Prüfer (2021), "Governance of Data Sharing: A Law & Economics Proposal", *Research Policy* 50(9), <https://doi.org/10.1016/j.respol.2021.104330>.
- Haufler, A. and D. Schindler (2023), "Attracting Profit Shifting or Fostering Innovation? On Patent Boxes and R&D Subsidies", *European Economic Review* 155, 104446, <https://doi.org/10.1016/j.euroecorev.2023.104446>.
- IMF, OECD, UN and WTO (2023), *Handbook on Measuring Digital Trade*, 2nd Edition, https://www.wto.org/english/res_e/publications_e/digital_trade_2023_e.htm.
- Papadakis, I. and M. Savona (2024), *The Uneven Geography of Digital Infrastructure. A 'Data Haven Hypothesis'?*, CITP Briefing Paper, Forthcoming.
- Ruiz, J. and M. Savona (2023), "The US Turn Is Reshaping the Geopolitics of Digital Trade. What Does This Mean for the UK?", *CITP Blog*, December.
- Santacreu A. M. (2023), "International Technology Licensing, Intellectual Property Rights and Tax Havens", *The Review of Economics and Statistics* 2023, https://doi.org/10.1162/rest_a_01382.
- Savona, M. and T. Ciarli (2019), "Structural Changes and Sustainability. A Selected Review of the Empirical Evidence", *Ecological Economics* 159(c), 244–260.
- Savona, M. (2019), "The Value of Data: Towards a Framework to Redistribute It", *SPRU Working Paper Series (SWPS)* 2019-21, www.sussex.ac.uk/spru/swps2019-21.
- Savona, M. (2020), "Governance Models for Redistribution of Data Value", *VOX CEPR* 17 January.
- The New Institute New Hanse Blueprint (2023), *Governing Urban Data for the Public Interest*, Hamburg.
- Trade Finance Global (2023), *Global Trade Shows Resilience (for Now) in the Face of Increased Fragmentation: Standard Chartered Global Research Special Report*, <https://www.tradefinanceglobal.com/posts/global-trade-shows-resilience-now-face-of-increased-fragmentation-standard-chartered-global-research-special-report/>.

Iain Begg and Daniel Cicak

The EU's Future Prosperity: What Role for the Fiscal Framework?

KEY MESSAGES

- **Public investment has been low in recent years, resulting in shortcomings in infrastructure and other public assets capable of underpinning economic growth and competitiveness**
- **Efforts at the EU level to establish a Sovereignty Fund intended to enhance competitiveness and to respond to the likes of the US Inflation Reduction Act have been watered down, as have plans to boost funding for the Strategic Technologies for Europe Platform**
- **Although golden rules have fallen out of favor in some jurisdictions, there is a case for a fresh look at how such rules, applied at both the EU and member state levels, could boost the quality of public finances and competitiveness**
- **Three principles for a revived approach to golden rules could be: a focused, but more open approach to eligible spending, as opposed to conventional national accounting definitions of investment; scrutiny of government plans by independent financial institutions or similar; and the adoption of a medium-term perspective**
- **Building on the analytic reviews by Mario Draghi on competitiveness and Enrico Letta on the single market, funding EU public goods by issuing debt should be furthered, rather than relying on the constrained resources of the EU budget**

In the aftermath of the coronavirus pandemic and cost of living crises, European countries are struggling to revive economic growth and to respond to policy initiatives in major competitor countries, not least China and the United States. Countering climate change, accelerating digitalization, and securing a prominent position in emerging technologies, ranging from artificial intelligence (AI) to life sciences, are all on the agenda and are being advanced by initiatives at both the national and EU levels.

Yet, as the strongly worded opening line of a study by the European Policy Analysis Group (EPAG) (Fuest et al. 2024) observes: “The EU is losing the global innovation race.” The same can be said of the EU’s immediate neighbors, not least the UK. There are many well-known reasons for this outcome, among which the EPAG highlights the relatively low level of private investment in research and development, the relative concentration of that investment in what the Group characterizes as “middle technology trap”

sectors (above all automobiles, and thus not at the cutting edge of science-based “new” industries), and various governance shortcomings.

In addition, the EU approach to fiscal governance plays a key role. The new approach just adopted has dealt with some of the more egregious shortcomings, but at both the national and EU levels, fresh thinking on public investment is needed. The next section assesses the global competitive challenges and is followed by a discussion of the EU’s unconvincing responses to them. In the subsequent sections, the effects of the fiscal framework are examined and the merits of reviving some forms of the golden rule are considered. Policy Conclusions complete the paper.

THE CHALLENGE FOR THE EU EMANATING FROM THE IRA IN THE US AND THE CHINA 2025 STRATEGY

The EU is under pressure from global competitors, not least the US and China. In the former, the Inflation Reduction Act (IRA) is a program that, according to the latest estimates, will pay out up to USD 1.2 trillion mainly in tax credits (Goldman Sachs 2023). The China 2025 strategy aims at enabling catch-up in industries where the EU has a competitive advantage (e.g., railways or aerospace). But it is also investing in future-oriented sectors such as robotics, creating a double challenge for the EU: new competitors in old industries and competition for new sectors (Wübbecke et al. 2016).

The dearth of European companies in the global league tables of technology is also striking. The Forbes global ranking¹ lists only three Europe-based companies in the top 20: Accenture based in Ireland (and even then, the company is not really “Irish”) at 13, SAP (Germany) at 16, and ASML (Netherlands) at 18. American companies dominate the list, but it is worth noting that Taiwan has two companies ranked above the Europeans. Other Forbes lists, such as the top 50 AI companies (six from the EU and two from the UK) and Fintech companies (a solitary one from the Netherlands), are even more dominated by the US.²

The EU has not been short of initiatives aimed at boosting its competitiveness. The Lisbon strategy launched twenty-four years ago sought to transform the Union into the “most competitive and dynamic

¹ <https://www.forbes.com/sites/jonathanponciano/2023/06/08/the-worlds-largest-technology-companies-in-2023-a-new-leader-emerges/>.

² <https://www.forbes.com/lists/ai50/>; <https://www.forbes.com/lists/fintech50/>.

knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion” by 2010. Can anyone regard it as a success? The Europe 2020 strategy had the strapline “smart, sustainable, and inclusive” growth, but scarcely fared better. The strategic ambition is now encapsulated in the “Green Deal,” complemented by aspirations on accelerated digitalization.

“Green” and “digital” are also central to the Recovery and Resilience Facility (RRF), the large fund established in 2020 in response to the pandemic (albeit not a more conventional fiscal stimulus like those implemented by both the Trump and Biden administrations). In addition, there has been much talk in Brussels about establishing a Sovereignty Fund, intended partly as a retort to the US IRA, but also as a means of reinvigorating European industry. In her 2019 political guidelines for the incoming European Commission, Ursula von der Leyen asserted that it was “not too late to achieve technological sovereignty in some critical technology areas” (von der Leyen 2019). In her 2022 State of the Union address, she went further by promising to “push to create a new European Sovereignty Fund. Let’s make sure that the future of industry is made in Europe” (von der Leyen 2022).

According to Isabel Schnabel (2024), a shortfall in public investment has been damaging for the EU relative to the US. She emphasizes the complementarities between public and private investment, and expresses concern about the overly tight timetable for investment funded by the RRF and the associated administrative burdens. The EIB also points to a gap in productive investment of 1.5 to 2 percentage points of GDP between the EU and the United States.

THE COHERENCE (OR ITS ABSENCE) OF THE EU RESPONSE AS THE AMBITIONS OF THE SOVEREIGNTY FUND HAVE BEEN WATERED DOWN

Despite calls for a substantial Sovereignty Fund, the ambition behind it has been watered down because of disputes among the member states about its purpose and which investments it should prioritize. While there are various EU programs, the landscape for promoting competitiveness is very opaque and heterogeneous. This complexity detracts from the EU’s response to challenges such as the IRA.³ In addition, EU programs tend to be more upstream than the IRA’s investment and production subsidies and are specifically aimed at promoting certain industries. Indicators such as the quantity and quality of different publications illustrate the point: even though the quality of research in Europe is in many ways comparable to that of the US and China, it does not translate into downstream funding of innovation.

³ https://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/Publikationen/FGCEE/CAE-SVG_Joint_statement_IRA_2309.pdf.

As so often, the question of funding is critical. Making room within the EU budget for a Sovereignty Fund is bound to be contentious, with opposition likely from current recipients of EU spending on the one hand and, on the other, from net contributors reluctant to see the overall size of the budget increase. Yet the appetite for additional debt to finance such a fund is also limited.

Consequently, instead of an ambitious retort to programs like the IRA, today there is only a minimal response in the form of the Strategic Technologies for Europe Platform (STEP). Although announced with great fanfare, it has a budget of just EUR 72 billion; its financial resources are thus relatively meager and unlikely to change significantly in the future.

THE FISCAL FRAMEWORK IN FOSTERING COMPETITIVENESS

Fiscal frameworks in EU member states comprise both national- and EU-level obligations, with the latter especially binding on euro area members. The EU level’s own finances can also be conceived of as being set within a fiscal framework, albeit far from systematic at present (Begg et al. 2023). This framework comprises the EU budget, the various off-budget and associated lending mechanisms, and governance provisions.

The European Commission has long pushed for a sharper focus on the “quality” of public finances. The communication that launched the review of economic governance in 2020 (European Commission 2020) dwelt on this notion, noting that it is multi-faceted. The proposition is beguilingly simple: the “right” kind of public spending will enhance economic growth and, thus, act on the denominator (GDP) of the ratios (debt and deficits) used to monitor fiscal sustainability. The Treaty requires the Commission “to take into account government investment spending when considering whether a Member State has an excessive deficit.” The communication also recalls that the Stability and Growth Pact “recognizes the need to consider the overall quality of public finances in terms of the growth-friendliness of the taxation system and public expenditure.”



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Of the responses to a consultation launched in February 2020 by the European Commission, 60 per cent “highlight the green and digital transitions as key challenges in the years to come. One-half of these respondents call for a permanent exemption of investment expenditure from fiscal surveillance indicators, as a way to tackle the twin transition, for example through a so-called green golden rule. On the other hand, nearly three out of ten respondents caution against giving preferential treatment to investment expenditure in fiscal surveillance” (European Commission 2022).

Fabio Panetta (Governor of the Bank of Italy, formerly an executive board member of the ECB) pointed out in a speech in November 2022 that net public investment had slumped in the decade prior to the pandemic, a trend in need of urgent correction. His compatriots, Enrico Letta and Mario Draghi, charged with producing reports on, respectively, the future of the single market and on European competitiveness, both emphasize the need for a fresh approach to EU-level creation of public goods.

In a speech anticipating the findings of his review of EU competitiveness, Draghi (2024) highlights the need for the EU to be the provider of public goods to resolve the problem of underinvestment where a single member state cannot appropriate the benefits: “Where there are investments from which we all benefit, but no country can carry out alone, there is a powerful case for us to act together – otherwise we will underdeliver relative to our needs. We will underdeliver in climate and defense, for example, but in other sectors as well.”

After lengthy negotiations, the Council of Economic and Finance ministers reached an agreement at the end of 2023 on a revised EU approach, emphasizing debt sustainability assessed country by country rather than with common rules. However, it is unclear whether it will lead to changes in how public investment is prioritized and how productive public investment can be stimulated.

A REVIVED GOLDEN RULE?

Over the years, many jurisdictions have made use of a golden rule to restrict borrowing to the funding of investment, while current public spending had to be balanced by revenue. Up to 2009, Germany was a leading example, yet it is instructive that when the German debt brake was introduced that year, the golden rule was abandoned. A similar rule in the UK was terminated at much the same time, but is likely to be revived by the Labour Party (Reeves 2024) if, as seems nearly certain, it wins the general election due to take place in 2024.

Anderson and Darvas (2020) summarize the advantages and drawbacks of a golden rule, but also mention a number of proposals designed to limit the negative effects, such as by specifying categories of

public investments more likely to enhance growth or able to avoid distorting investment priorities. The principal objection to golden rules is that it becomes increasingly difficult to restrict the coverage of public investment when political leaders try to exempt new categories of spending from the current balance rule. In addition, unless the exempted categories of spending demonstrably increase future GDP, public debt ratios could rise.

Equally, proposals for exemptions have abounded. Keen to create momentum for the European Fund for Strategic Investment (EFSI, which evolved to become InvestEU), the European Commission issued (cautious) guidance in 2015 permitting Stability and Growth Pact rules to be eased for contributions to EFSI, as well as for action to accelerate structural reforms. A more subtle approach mentioned by Anderson and Darvas is to vary the golden rule according to the economic cycle, seeking to boost (or avoid cuts in) public investment in downturns, but being more stringent in boom times – they call this an “asymmetric golden rule.”

There have also been calls for some form of “green golden rule” (for example, Pekanov and Schratzenstaller 2023). While the motivation is laudable, the risk of debt outpacing GDP growth remains. These authors also concede that adding a specific category of exemption would further complicate EU fiscal rules that are already criticized for being too complex. A solution proposed by van den Noord (2023) is for EU-level co-funding, making it more likely that fiscally constrained member states would be able to maintain public investment.

Could an independent board or agency be charged with assessing government proposals for investments subject to a new golden rule? In principle, independent fiscal institutions can play such a role, certainly at the national level by exercising a “watchdog” role, though over and above their primary mandate of scrutinizing the sustainability of public finances. An alternative model could be an independent infrastructure commission, as in New Zealand, where the mandate is to advise the government on planning and implementing major projects, including by combining public and private funding.⁴ At the EU level, an extension of the role of the European Fiscal Board might be envisaged.

Another approach could be to allow exceptions where a certain future stream of income is equal to (or greater than) the cost of servicing and amortizing the investment. A similar, albeit not as far-reaching principle, exists in the German debt-brake exceptions if the government acquires specific types of assets. For example, an investment in rail infrastructure can be made if the money is later collected through fares. Such a concept may also be politically attractive if it allows expenditure usually classified as public consumption, but it rules out politicians’ spending

⁴ <https://tewaihang.govt.nz>.

money on additional social welfare based on debt. The advantage of such an idea is that it is specific and contained (compared to some conceptually vaguer options). However, it could be criticized as being a bit bureaucratic and politically awkward, since each proposed budget line would have to be justified.

POLICY CONCLUSIONS

EU member states have consistently resisted providing the Union with the budgetary resources required to make a telling difference in stimulating competitiveness. In the mid-term review of the MFF, even the modest proposals for a bigger budget for STEP were salami-sliced. Proposed new funding was cut to EUR 1.5 billion and was accompanied by a cut of EUR 2.1 billion in the Horizon research budget. An article in Euractiv quotes Simone Tagliapietra of the Bruegel economic think tank as saying, “We were expected to get an EU fund to strategically invest in clean tech after the IRA, and what we get, basically, is a website.”⁵

The EU public investment shortfall does not bode well for a revival of growth and higher system productivity. It is also likely to have a damaging effect on intergenerational fairness. Consequently, despite the reservations about golden rules, there is a sufficiently persuasive case for adopting such a rule both as a component of the revised fiscal framework in relation to national policy and for the EU level of public finances. The question then becomes how, so as to limit the negative effects. Here we suggest three principles.

First, public investment should be defined in such a way as to reflect economic priorities and not be unduly confined by national accounting conventions, notably the emphasis on physical capital. For example, maintenance of infrastructure may be more valuable than big, costly new projects. While there is bound to be a risk of opening Pandora’s box, the guiding principle should be the potential contribution to sustainable growth. In Germany, for example, the Council of Economic Experts (2023) has clearly identified deficiencies in data infrastructure as a threat to growth.

Second, external scrutiny by the national IFI (or the New Zealand option of a dedicated body) or, for the EU level, a beefed-up European Fiscal Board can be used to validate public investment choices. There will be some risk of adding to administrative burdens, but these can be attenuated by a combination of suitable guidelines and transparency. In addition, performance indicators can serve a useful purpose in ensuring that qualitative milestones and quantitative targets are achieved. Indeed, as championed by the OECD (2023), an enhanced performance budgeting framework could be envisaged as a tool for effective delivery.

The third principle is to adopt a long enough medium-term perspective for public investment, linking it to creating public assets. For too long, the discipli-

nary character of fiscal rules has been at their core, but predominantly focused on the short term. Avoiding having too great a concentration of effort on one theme, such as “green,” to the exclusions of others is also important.

Both Letta and Draghi identify fragmentation at the European level as an obstacle to technological advances and draw the conclusion that greater EU involvement in financing is required. However, the details will be crucial. Sentiment today has become negative about new EU funds based on borrowing (although the Ukraine Facility agreed on in February 2024 is a counter-example), while the experience of STEP is discouraging. Yet the concept of an EU-level Sovereignty Fund should not be abandoned too readily. As stressed by Draghi, EU public goods could be pivotal if they are under-provided by either private agents or by the public sector at the national level; he cites energy grids and super-computing as good examples of “chokepoints” that the EU level would be best placed to rectify.

Draghi clearly advocates EU borrowing as the answer but coupled with bringing in substantial amounts of private capital. Letta, too, mentions borrowing as the preferred mechanism for funding a new wave of EU public goods, also making the case for consolidating the many existing streams of EU borrowing. The obvious model here would be InvestEU, but with the difference that it would be based on EU borrowing, rather than funding from the EU budget. The reluctance evident in the mid-term review of the MFF to allocate funding to STEP testifies to member states’ wariness about new money for the EU level. The modalities of servicing and repaying debt are also tricky: for NGEU, future EU budgets will bear the burden.

A predictable question is whether the EU level can be trusted to administer an investment strategy aimed at boosting the Union’s competitiveness, especially in new strategic technologies, against a backdrop of member states’ reluctance to increase budgetary resources. There are positive stories to be told: in batteries, the ECA (2023) renders a positive verdict. Yet there is a lingering suspicion among member states about making resources available to the EU level. A test here could be whether the monitoring and evaluation framework (perhaps following the “milestones and targets” approach of the RRF) can be made robust.

Nevertheless, if EU competitiveness is to be enhanced, it needs a supportive fiscal framework and imaginative solutions to complement measures to boost innovation.

REFERENCES

Anderson, J. and Z. Darvas (2020), *New Life for an Old Framework: Redesigning the European Union’s Expenditure and Golden Fiscal Rules*, European Parliament, [https://www.europarl.europa.eu/RegData/etudes/STUD/2020/645733/IPOL_STU\(2020\)645733_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2020/645733/IPOL_STU(2020)645733_EN.pdf).

Begg, I., J. Le Cacheux, A. Liscai, N. Rispoli and G. Benedetto (2023), *Options for a Stronger and More Agile EU Budget*, European Parliament,

⁵ <https://www.euractiv.com/section/energy-environment/news/eu-closes-deal-on-scaled-back-clean-tech-sovereignty-fund/>.

- [https://www.europarl.europa.eu/RegData/etudes/STUD/2023/755099/IPOL_STU\(2023\)755099_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2023/755099/IPOL_STU(2023)755099_EN.pdf).
- Draghi, M. (2024), *Speech from Mario Draghi*, 16 April, <https://belgian-presidency.consilium.europa.eu/media/v1mhgwtw/20240416-draghi-speech-la-hulpe-16-april-as-delivered-clean.pdf>.
- European Commission (2015), *Document 52015DC0012*, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0012>.
- European Commission (2020), *Economic Governance Review Report on the Application of Regulations (EU) No 1173/2011, 1174/2011, 1175/2011, 1176/2011, 1177/2011, 472/2013 and 473/2013 and on the Suitability of Council Directive 2011/85/EU*, https://economy-finance.ec.europa.eu/document/download/a636323a-917f-4840-9663-2e6c3c415195_en?filename=com_2020_55_en.pdf.
- European Commission (2022), *Online Public Consultation on the Review of the EU Economic Governance Framework. Summary of Responses Final Report*, https://economy-finance.ec.europa.eu/document/download/aab67108-00f9-4c7b-889e-f257ef88fac3_en?filename=swd_2022_104_2_en.pdf.
- European Court of Auditors (2023), *The EU's Industrial Policy on Batteries – New Strategic Impetus Needed*, https://www.eca.europa.eu/ECAPublications/SR-2023-15/SR-2023-15_EN.pdf.
- Fuest, C., D. Gros, P. L. Mengel, G. Presidente and J. Tirole (2024), *How to Escape the Middle Technology Trap?*, EconPol Policy Report, https://www.econpol.eu/publications/policy_report/eu-innovation-policy-how-to-escape-the-middle-technology-trap?econNL202402.
- German Council of Economic Experts (2023), *Germany Needs a Research Data Infrastructure for the 21st Century*, <https://www.sachverstaendigenrat-wirtschaft.de/en/annualreport-2023-pressrelease/chapter-6.html>.
- Goldman Sachs (2023), *The US Is Poised for an Energy Revolution*, <https://www.goldmansachs.com/intelligence/pages/the-us-is-poised-for-an-energy-revolution.html>.
- Landais, C., S. Jean, T. Philippon, A. Saussay, M. Schnitzer, V. Grimm, U. Malmendier, A. Truger and M. Werding (2023), *The Inflation Reduction Act: How Should the EU React?*, https://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/Publikationen/FGCEE/CAE-SVG_Joint_statement_IRA_2309.pdf.
- New Zealand Infrastructure Commission (2024), *Transforming Infrastructure for All New Zealanders*, <https://tewaihang.govt.nz>.
- OECD (2023), *OECD Performance Budgeting Framework*, [https://one.oecd.org/document/GOV/SBO\(2023\)1/en/pdf](https://one.oecd.org/document/GOV/SBO(2023)1/en/pdf).
- Panetta, F. (2022), *Investing in Europe's Future: The Case for a Re-think*, <https://www.ecb.europa.eu/press/key/date/2022/html/ecb.sp221111~9dfd501542.en.html>.
- Pekanov, A. and M. Schratzenstaller (2023), *A Targeted Golden Rule for Public Investments?*, European Parliament, [https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/733760/IPOL_IDA\(2023\)733760_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/733760/IPOL_IDA(2023)733760_EN.pdf).
- Reeves, R. (2024), *Rachel Reeves Mais Lecture 2024, Labour*, <https://labour.org.uk/updates/press-releases/rachel-reeves-mais-lecture/>.
- Schnabel, I. and ECB. (2024), *From Laggard to Leader? Closing the Euro Area's Technology Gap*, <https://www.ecb.europa.eu/press/key/date/2024/html/ecb.sp240216~df6f8d9c31.en.html>.
- Van den Noord, P. (2023), *A Targeted Golden rule for Public Investments?*, European Parliament, [https://www.europarl.europa.eu/RegData/etudes/STUD/2023/733740/IPOL_STU\(2023\)733740_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2023/733740/IPOL_STU(2023)733740_EN.pdf).
- Von der Leyen, U. (2019), *A Union That Strives for More My Agenda for Europe*, https://commission.europa.eu/system/files/2020-04/political-guidelines-next-commission_en_0.pdf.
- Von der Leyen, U. (2022), *2022 State of the Union Address: A Union That Stands Strong Together*, European Parliament, Strasbourg, 14 September, https://ec.europa.eu/commission/presscorner/detail/en/speech_22_5493.
- Wübbecke, J., M. Meissner, L. J. Zenglein, J. Ives and B. Conrad (2016), *MADE IN CHINA 2025: The Making of a High-Tech Superpower and Consequences for Industrial Countries*, <https://merics.org/sites/default/files/2020-04/Made%20in%20China%202025.pdf>.

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Promoting European Public Goods

The EU has a number of common economic priorities. These include a fair green and digital transition, including the objective of climate neutrality by 2050; social and economic resilience; energy security; and, where necessary, build-up of defense capabilities. These priorities not only require action at the national level, but warrant substantial provision at the level of the EU, because the collective benefit of fulfilling them is larger than the sum of the benefits of pursuing them at the national level, i.e., they take the form of European public goods (EPGs). This contribution discusses the case for a successor fund to Next Generation EU (NextGenEU) specifically aimed at the provision of EPGs. It also makes the case for streamlining the available instruments for the provision of EPGs, and it argues that in many instances better coordination among national policymakers can effectively mimic the central provision of EPGs. Thereby, we also touch upon the question of which goods may be provided at the level of the EU and which may be provided at the national level through better coordination.

A TAXONOMY OF EPGs

Buti (2023) and Buti et al. (2023) identify six priority areas for EPGs: the “green” transition and energy, the digital transition, the social transition, raw materials, security and defense, and health. The first two of these, the energy and digital transitions, require large investments, in particular in infrastructure. The European Commission estimates a necessary additional annual investment in energy and transport systems of about 2 percent of GDP (compared to 2011–2020 levels), or about EUR 360 billion. This corresponds roughly to the extra investment requirements estimated by Pisani-Ferry et al. (2023) for France. Out of the total, public investment would need to deliver a share of 0.5–1.0 percent of GDP. Typical examples of such investments would be investments in high-speed trains, electricity grids, and hydrogen infrastructure. Of course, the additional spending needs on EPGs exceed those just mentioned, and include, for example, investments in a common defense capacity.

Four configurations are possible for EPGs (see Table 1). “Loose” EPGs are delivered and financed at the national level; “NGEU-type” EPGs are delivered at the national level and fi-

* The views expressed in this paper are the authors’ personal views and do not necessarily coincide with those of the institutions they are or were affiliated with.

KEY MESSAGES

- **EU economic policies need to be fundamentally re-oriented to deliver European public good (EPGs) in economic and non-economic areas. To attain that, an approach that overcomes the sterile debate between risk reduction and risk sharing is needed**
- **“Genuine” EPGs in the area of the green and digital transitions would be financed by a new Fund of some EUR 750bn to be established as a follow up of Next Generation EU, access to which would be conditional on adhering to the revised fiscal rulebook**
- **A systematic review of the various existing instruments at the EU level to stimulate investments should be carried out. Where feasible, collecting the EU financing instruments into a single facility would substantially improve the market perception of EU debt**
- **In many areas, progress is held back not so much by a lack of available financial resources at the EU level as by a lack of coordination among national governments. In areas such as defense, stepping up the supply of EPGs requires the coordination of national policies rather than additional EU funds**
- **Achieving such goals would also help enhance the role of the EU in global governance. The agenda we put forward will require political leadership and a long-term time horizon**

nanced at the EU level; projects financed by externally assigned revenue are financed at the national level and delivered at the EU level; and, finally, “genuine” EPGs are both delivered and financed at the EU level.



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Table 1

Classification of EPGs

		Delivery	
		EU	National
Financing	EU	“Genuine” EPGs	“NGEU-type” EPGs
	National	Projects financed by externally assigned revenue	Coordination of national activities

Source: Authors’ elaboration.

The first three cases produce EPG “by aggregation.” The composition and amount of EPGs are unlikely to be optimal. For example, while in the initial design of NextGenEU there was a substantial EPG component, member states managed to reduce it in favor of more transfers to the national level. While the European Commission tried to give bottom-up incentives for joint plans, in the end national priorities prevailed and countries came up with their own plans for reforms and investments, resulting in an uncoordinated configuration of measures with limited benefit for the EU as a whole (Beetsma et al. 2020).

In what follows, we essentially articulate the delivery of the various types of EPGs sketched out in Table 1.

“GENUINE” EPGS

Buti et al. (2023) provide examples of “genuine EPGs” provided and financed at the level of the EU. A substantial fraction of EU funding needs to be focused on infrastructures for the energy and digital transition. The benefit increases more than proportionally with the number of countries across which these infrastructures are expanded (known as “network benefits”). Typical examples are the transportation of hydrogen, electricity, high-speed internet, and high-speed railways. Regarding the first, an obvious question is whether it will become a main source of future energy. This will to a large extent be in the EU’s own hands: a larger coverage of the infrastructure will stimulate the production of hydrogen. The role of the EU is to finance the central infrastructure with the help of national governments and private parties. Industry connecting to the infrastructure would pay user fees that help cover the original investment.

How to promote and finance “genuine” EPGs? Elsewhere we have made the case for a new fund (“the Fund”) to succeed NextGenEU (see Bakker and Beetsma 2023; Bakker et al. 2024a and 2024b). The Fund is specifically aimed at financing public investments with positive cross-border spillovers, in other words, investments the full benefits of which are insufficiently internalized at the national level. The fund would be on the order of EUR 750 billion, so roughly the size of NextGenEU. Each country would have its own compartment in the Fund, with a share related to the relative size of its economy. Access would be conditional on adhering to the revised fiscal rulebook,

that is, being outside the Excessive Deficit Procedure (EDP) or being on track with the corrections required in the context of an EDP, including the delivery of the agreed structural reforms. In fact, the European Commission is developing plans to link cash disbursements from the EU’s cohesion funding to reforms undertaken by countries (Politico 2024), in other words, by deploying a “performance-based” approach somewhat similar to that under NextGenEU.

If a country fails to come up with suitable projects or fails to adhere to the new Stability and Growth Pact rules, it would forgo part or all of its allocated envelope. These resources would then be allocated over the other envelopes. In an “ideal world,” the Fund would provide an incentive both to follow disciplined fiscal policies and to make those investments that benefit groups of countries or the EU as a whole. Which projects fulfill the condition of producing cross-border spillovers and of generating positive net present values would be assessed by an independent institution with hands-on investment expertise. Ideally, this party would also have skin in the game, thereby aligning its own interests with those who benefit from its advice. A good candidate might be the European Investment Bank.

Unfortunately, however, we do not live in an ideal world and there are several obstacles to reaching the goal of providing the full range of desirable EPGs. The political appetite for a successor to NextGenEU is rather low, although a “good” design would potentially help.¹ Total investment needs are way higher than what could reasonably be provided through financing at the level of the EU. Hence, there is an essential role for national public investment spending and private investment support, as mentioned above.

Delivering “genuine” EPGs requires more than central financing. Investments in the digital and energy transitions require long-term political commitment. They have a scale way beyond that of an ordinary industrial plant. Moreover, they have very long lead times starting with planning, arranging permits (often the most time-consuming part), the building activity itself, followed by the period in which the investment yields a return. Besides EU-level financing, national public co-financing is likely needed. However, public funds alone will generally not be enough. Typically, most of the investment needs to come from the private sector. For the latter to be willing to step in, very long-term commitment on the side of policymakers is necessary. This includes stable policies (such as on the taxation of projects), concessions, and the financial contribution from the government’s side. Sometimes the latter can be replaced or partially replaced by some risk-sharing arrangement whereby the government takes part of the losses if the project goes awry.

¹ As Buti (2023) points out, political resistance to genuine EPGs should be limited by the fact that the just retour argument is less relevant than for other programs and that they do not lead to cross-border transfers.

As an example, recently the five largest Dutch pension funds indicated their willingness to invest in the energy transition, especially in electricity and heat grids. The conditions would include a long-term partnership with the government to avoid a situation where the government withdraws from the investment projects at a later stage, the possibility of joint loan provision in which the government provides certain guarantees against losses, and a fully-fledged national investment institution as a linking pin between the government and the pension funds. The linking pin would have the role of coordinating all initiatives and ensuring consistent policies. Because pension funds have long-term liabilities, which they try to match with long-term assets, they are ideal parties to invest in the digital and energy transitions (e. g., Beetsma et al. 2024).

In this regard, there may be a role for the EU itself. EU legislation supersedes national legislation. Therefore, EU-level agreements among member state governments and private sector parties on the modalities of large infrastructure investments could support government commitments at the national level toward such investments. The European Commission could come up with a proposal for a framework for such collaboration between governments and private parties that also enshrines the long-term commitment on the side of the former.

“NGEU-TYPE” EPGs

Demertzis et al. (2024) provide a comprehensive overview of the various existing instruments at the EU level to stimulate investments. A large number of such instruments exist covering different areas, periods over which they are active, and funding sources. Funding comes mostly from the EU budget or Next-GenEU. In some instances, merely an EU budget guarantee suffices. Many of these investment initiatives are strategic, i. e., consistent with the EU’s long-term priorities, such as investment in the green and digital transitions.

However, among the existing instruments there is no instrument explicitly aimed at investments with positive cross-border spillovers of the type discussed here. There exists the Important Projects of Common European Interest (IPCEI) (see European Commission 2024), through which state aid rules allow member states and industry to jointly invest in breakthrough innovation and infrastructure. Conditions are that the market alone cannot deliver these investments, because the risks are too large for an individual player; they have to benefit the EU economy at large; at least four member states are involved; they result in concrete positive spillover effects for the EU as a whole; and they involve co-financing by companies that receive state aid. However, the IPCEIs do not receive funding from central resources.

Not all investments a priori justify (co-)financing through EU instruments. However, investments

that do have positive externalities beyond national border are likely underprovided because these externalities are not internalized at the national level. Hence, subsidiarity considerations are an argument to finance them at the level of the EU. However, for some of the funds listed in Demertzis et al. (2024), the question is whether they can be justified from a subsidiarity perspective, while other funds do indeed fall into the areas on which our Fund focuses. Examples are the Connecting Europe Facility and the Digital Europe Program.

Overall, a streamlining of the available resources for EPGs seems desirable, collecting into a single facility – like the Fund we propose – all available financing for initiatives that benefit multiple countries or the EU as a whole. The IPCEI criteria could form a basis for the investment projects to be financed by the EPGs Fund. Above all, a single facility would provide an instrument for an integral trade-off among initiatives based on EU priorities.

COORDINATION OF NATIONAL ACTIVITIES

In many areas progress is held back not so much by a lack of available financial resources at the EU level as by a lack of coordination among national governments. In these areas, stepping up the supply of EPGs requires the coordination of national policies (see Table 1 above).

In the area of defense, outlays are primarily at the national level per the NATO requirement to spend at least 2 percent of GDP on defense. Hence, relatively little EU financing appears to be needed. The role of the EU level could mostly consist of the coordination of defense expenditures (to avoid duplication and to avoid omissions) and the joint procurement of equipment, although when it comes to what is being purchased the question is what the role of the EU is versus that of NATO. Purchases need to fit into the composition of collective needs of NATO. Collective expenditures in the area of health would mainly concern the joint procurement of medicines and medical equipment. Initiatives for the joint procurement of medical countermeasures have been underway for some time and got a boost with the joint procurement of Covid vaccines. However, the more distant goal of a European Health Union will only materialize in piecemeal steps of new initiatives with a limited scope (McKee and De Ruijter 2024), although the support for new steps seems to be quite strong (Beetsma and Nicoli 2024). In view of the large and increasing labor shortages, the social transition could take place with an eye on the need to reskill the labor force toward professions where demand is highest. Obviously, technical skills and information technology fall under these, but also healthcare. Securing critical raw materials would require the extraction of those materials found within the EU and joint procurement of materials needed from outside.

There are other important examples of the need for national coordination. One concerns the lack of capacity on electricity grids. Expanding the capacity is essential in view of the electrification of the economy. However, now a lot of capacity is effectively being lost, because national grids are not or are insufficiently connected, preventing electricity from flowing to those places where it is needed most (Het Financieele Dagblad 2024). At an EU scale, under- and overcapacity coexist. Also, the supply of electricity is unbalanced. Diversification of green sources of electricity will keep its supply more stable over time. This requires EU level planning of where these sources are best located. For example, windmills have a higher output in the north of the EU, while solar panels are more productive in the southern parts of the EU. Unfortunately, current investment patterns do not always follow this logic.

Related to this is the question of where to locate energy-intensive industry. An example concerns the greenification of Tata Steel Netherlands. A large government subsidy would be needed to transform the plant into one that runs on electricity. In addition, cheap green energy would need to be provided to the plant. Looking at it from a European perspective, it would be better to locate highly energy-intensive activities at locations close to where green energy is produced, because electricity networks are not fully integrated and because transportation of electricity over long distances leads to substantial losses.

CAPITAL MARKETS UNION TO SUPPORT FUNDING OF EPGs

An EU fund roughly the size of the current NextGenEU would have the capacity to finance roughly only one-fifth of the full investment needs for the energy and digital transitions. Hence, most of the financial resources would need to come from the private sector. Here, the lack of an integrated Capital Markets Union (CMU) stands in the way. The CMU would channel savings to those places where their risk-adjusted expected return is highest. Moreover, a better risk-return trade-off would likely elicit an increase in the volume of savings. Hence, the CMU and the large transitions need to go hand in hand.

A recent contribution by ELEC (2024) makes the case for CMU. Interestingly, Letta (2024) advocates “the formation of a Savings and Investments Union, built upon the incomplete Capital Markets Union. By achieving full integration of financial services within the Single Market, the Savings and Investments Union is envisioned to not only retain European private savings but also to attract additional resources from abroad.”

Completion of the CMU comprises a large set of measures that includes, for example, simplifying prospectus rules and reducing compliance costs for listed companies, harmonizing insolvency regimes

(including shorter recovery time and higher recovery rates), a common EU-wide system for withholding taxes on dividends and interest, a retail investment strategy to better inform consumers about financial products, improvements to the regulatory framework for securitizations, and harmonizing the definition of shareholders and rules regarding the exercise of voting rights. Completion of the CMU requires progress on each of these files separately, which makes it a long-winded process. This makes it important to speed up with these harmonizations.

POLICY CONCLUSIONS

In this contribution we have explored the promotion of EPGs. The priorities are in the areas of the “green” transition and energy, the digital transition, the social transition, raw materials, security and defense, and health. Investment needs are huge and need to be fulfilled with EU-central resources, national public spending, and private investments. We have argued that EU policies should be revamped in a consistent manner to meet these challenges. Central financing of “genuine” EPGs can take the form of a similarly sized successor to NextGenEU, with access conditional on investment projects having beneficial cross-border spillovers and countries adhering to the fiscal rulebook, including the reform commitments in the national fiscal-structural plans. However, not only central funding is needed to promote EPGs. Also, better coordination of national investment plans, such as with the upgrading of electricity grids, and a streamlining of the different EU financing instruments will be conducive to the promotion of EPGs.

An important benefit of such streamlining are the possibilities to issue debt to finance a common large-scale instrument. Investors typically prefer new instruments to be issued in substantial volumes so they attain sufficient market liquidity. Hence, a wide range of different investment projects should be financed with common debt instruments. Most important for such a “unified funding approach” is the backing by a sufficiently large base of own resources (Buti 2023).

Achieving such goals would also help enhance the role of the EU in global governance. The approach we put forward – which attempts to bring together the different political sensitivities in the EU – will require political leadership and a long-term time horizon.

REFERENCES

- Bakker, A. and R. Beetsma (2023), “EU-wide Investment Conditional on Adherence to Fiscal structural Plans”, *VoxEU*, <https://cepr.org/voxeu/columns/eu-wide-investment-conditional-adherence-fiscal-structural-plans>.
- Bakker, A., R. Beetsma and M. Buti (2024a), “The Case for a European Public-Goods Fund”, *Project Syndicate*, 4 March, <https://www.project-syndicate.org/commentary/public-goods-fund-could-finance-green-transition-and-ensure-fiscal-responsibility-by-age-bakker-et-al-2024-03>.
- Bakker, A., R. Beetsma and M. Buti (2024b), “Investing in European Public Goods While Maintaining Fiscal Discipline at Home”, *Intereconomics* 59, 98–103.

- Beetsma, R., L. Codogno and P. van den Noord (2020), "Next Generation EU: Europe Needs Pan-European Investment", *VoxEU*, <https://voxeu.org/content/next-generation-eu-europe-needs-pan-european-investment>.
- Beetsma, R., S. E. H. Jensen, D. Pinkus and D. Pozzoli (2024), *Does Long-Term Patient Capital Matter? The Impact of Pension Fund Investments on Firm Productivity*, University of Amsterdam/Copenhagen Business School, Mimeo.
- Beetsma, R. and F. Nicoli (2024), *Towards a European Health Union? Solidarity Preferences and the Roles of Trust and Covid-19*, University of Amsterdam and Politecnico di Torino Mimeo.
- Buti, M. (2023), "When Will the European Union Finally Get the Budget It Needs? The EU Budget Needs Radical Reform, But Certain Conditions Must Be in Place for It to Succeed", *Bruegel Analysis*, <https://www.bruegel.org/analysis/when-will-european-union-finally-get-budget-it-needs>.
- Buti, M., A. Coloccia and M. Messori (2023), "European Public Goods", *VoxEU*, <https://cepr.org/voxeu/columns/european-public-goods>.
- Demertzis, M., D. Pinkus and N. Ruer (2024), *Accelerating Strategic Investment in the European Union beyond 2026*, Bruegel Report 01/24.
- ELEC (2024), "Why EU Capital Markets Union Has Become a "Must Have" and How to Get There", *Position Paper*, 13 February, <https://eleclege.eu/positions/>.
- European Commission (2024), *Important Projects of Common European Interest (IPCEI)*, https://competition-policy.ec.europa.eu/state-aid/ipcei_en.
- Het Financieele Dagblad (2024), *Kampioen groene stroom Denemarken zet extra vaart achter energietransitie*, 16 March.
- Letta, E. (2024), *Much More Than a Market: Speed, Security, Solidarity. Empowering the Single Market to Deliver a Sustainable Future and Prosperity for All EU Citizens*, <https://www.consilium.europa.eu/media/ny-3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>.
- McKee, M. and A. de Ruijter (2024), "The Path to a European Health Union", *The Lancet* 36, <https://doi.org/10.1016/j.lanepe.2023.100794>, Forthcoming.
- Pisani-Ferry, J., S. Tagliapietra and G. Zachmann (2023), "A New Governance Framework to Safeguard the European Green Deal", *Bruegel Policy Brief* 8/23.
- Politico (2024), "EU Floats Radical Change to How It Funds Poorer Members", 27 March, <https://www.politico.eu/article/european-commission-propose-change-eu-budget-money-cash/>.

Oliver Falck and Svenja Falk

Focus on Critical Key Technologies: The Race for Leadership in Industry and Technology Policy*

KEY MESSAGES

- **Technological sovereignty can be defined as the ability of a country to guarantee access at all times to the key technologies that are necessary to meet social priorities and needs**
- **Despite having different competences, the countries analyzed focus largely on the same fields of technology that are expected to generate value in the future**
- **Measures to promote technological sovereignty are heterogenous across countries and range from the promotion of R&D activities to subsidies for setting up industrial plants**
- **Systematic predictions of technological trends would enable policymakers to deal with new technologies at an early stage and adapt policy measures and institutions**

Many nations are investing more in critical technologies than ever before. Numerous governments have launched programs in the past two years aimed at promoting technological sovereignty, focusing on key enabling technologies. However, these programs are often only partly motivated by innovation policy. Fundamental objectives of national security and competitiveness vis-à-vis other countries also play key roles, against the backdrop of a shifting perspective on globalization. Geopolitical fragmentation and the recent experience of broken supply chains during

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the pandemic have placed technological sovereignty on the agenda. The programs are generally backed by significant funding. In this paper, the Council for Technological Sovereignty of the German Ministry for Education and Research (BMBF) provides a comparative overview of critical technologies and the institutional governance of technological sovereignty in selected countries.

KEY OBJECTIVES OF TECHNOLOGICAL SOVEREIGNTY

The pursuit of “technological sovereignty” has become an important topic in politics and business over the past decade. Based on the Council for Technological Sovereignty’s definition, this can be understood as the ability of a country to guarantee access at all times to the key technologies that are necessary to meet social priorities and needs.

The goals of technological sovereignty have changed over time. Originally, they focused mainly on military research. As the digital transformation progressed and the importance of digital infrastructure, platform business models, and cloud computing increased, digital sovereignty took center stage. Debates centered, for example, on network components from Chinese manufacturers in domestic mobile networks, regulation of large platform operators, and the importance of a European cloud infrastructure. Later, the fight against climate change and the need for a faster energy transition came to the fore: in this context, sovereignty in environmental and energy technologies became the main topic of discussion. In the meantime, the focus has also shifted to technologies that are expected to make a significant contribution to global value creation in the future.

One current goal is to shield ourselves against geopolitical risks. These have gained prominence due to the increasing polarization and fragmentation of global markets. Concerns about developments in China, an autocratic country that is rapidly developing its technological prowess, the impact of the Covid-19 pandemic on healthcare systems and supply chains, the weakening of globalization, and the urgent need for measures to combat climate change all play a central role. Trust in transnational solutions has

Table 1

Overview of Industrial and Research Policies in Selected Countries and the EU

	Germany	European Union	USA	China	Japan	South Korea
Number of key technology areas	12 “key technologies”	10 “critical technology areas” with 4–5 technologies each (42 technologies in total)	19 “critical and emerging technologies” with 2–15 “critical and emerging technology subfields” each (103 subfields in total)	7 “cutting-edge areas of science and technology” with 3–5 specifications each (28 in total)	20 “technologies as critical fields”	12 “strategic technologies”
Strategies	“Shaping the future with technological confidence,” BMBF impulse paper, April 2021	Commission recommendation on security-relevant technology areas, October 2023 ¹	“United States government national standards strategy for critical and emerging technology,” May 2023	14th Five-Year Plan, March 2021	“Economic security strategy,” February 2022	“National strategic technology nurture plan,” October 2022
Institutions	Various institutions at the federal level: BMBF, BMWK, BMDV, Federal Chancellery	Steering board of sovereignty	Office of science and technology policy in the White House Special envoy for critical and emerging technology	Ministry of science and technology of the People’s Rep. of China	Council of experts on economic security legislation Japan science and technology agency	Ministry of science and ICT National strategic technology special committee
Central goal	Preserving values, securing prosperity and jobs	Strengthening the economic basis and competitiveness, protection against risks (disruptive technologies, dual use, risk of misuse)	Economic leadership in future technology, national security and self-sufficiency in selected areas of technology	“Self-reliance”	Economic security	Technological supremacy
Investments (2019 estimate) ²	\$ 19 billion PPP (0.41% GDP)	n. a.	\$ 84 billion PPP (0.39% GDP)	\$ 406 billion PPP (1.73% GDP)	\$ 27 billion PPP (0.5% GDP)	\$ 15 billion PPP (0.67% GDP)
Selected support measures ³	\$ 5.4 billion by 2025 for the AI strategy \$ 3.3 billion in quantum computers by 2026	\$ 294 billion for the “Green industrial deal” \$ 141.5 billion for “NextGenerationEU” \$ 762 million for 5G infrastructure (Horizon 2020) \$ 980 million for smart networks and services	\$ 369 billion IRA \$ 230 billion for semiconductor production \$ 140 billion for electric vehicles and batteries \$ 20 billion for biomanufacturing	\$ 1,400 billion for new infrastructure: 5G, AI, IoT, etc. \$ 150 billion for a next-generation AI development plan	Investments are to come primarily from the private sector. In addition, \$1.05 trillion is to come from public-private partnerships over the next 10 years ⁴	\$ 430 billion for semiconductors over 23 years \$ 10 billion for biotechnologies by 2026 \$ 73 billion for mobility/vehicles by 2026 \$ 1.3 billion for robotics by 2026 ⁵

Note: The complexity of the funding landscape of industrial and research policy channels makes it difficult to aggregate all the respective measures and investments. The table therefore contains a representative selection. Due to the limited data available, scientific work from 2019 was used in some cases, even if lists of key technology fields were not compiled until later. ¹ Mentions of strategic autonomy since 2013: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733589/EPRS_BRI\(2022\)733589_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733589/EPRS_BRI(2022)733589_EN.pdf); ² di Pippo et al. (2022); ³ Exchange rates calculated December 14, 2023; ⁴ https://www.meti.go.jp/english/policy/economy/industrial_council/pdf/0727_001.pdf; ⁵ https://www.meti.go.jp/english/policy/economy/industrial_council/pdf/0727_001.pdf. PPP = purchasing power parity.

Source: Authors’ compilation.

fallen significantly, with countries increasingly relying on national approaches or cooperation with “friendly nations.” The spectrum ranges from “as little as necessary” to “as much as possible”: China, for example, speaks of “self-reliance,” the US of “economic and national security,” and the EU of “strategic autonomy.”

THE MOST IMPORTANT CRITICAL TECHNOLOGIES

What technologies do the countries selected for this analysis focus on in the context of technological sovereignty? To answer this question, we assessed strategy papers – both government publications and secondary literature – addressing technological sovereignty and the national promotion of critical technologies in Germany and the European Union, the US, China, Japan, and South Korea. In addition, we conducted interviews with experts for the funding

programs of the individual countries studied, aiming to shed light on the strategy and motivation behind the countries’ programs.

Overall, the assumption that technological sovereignty is highly relevant internationally was validated. The terminology used in this context, however, differs from country to country: while some countries speak of “key technologies” or “key enabling technologies,” others define “prioritized” or “critical” or “frontier” technologies. The degree of national autonomy that is pursued for these technology areas also varies greatly.

The characteristics and priorities of the lists differ in their basic structures, where some are available as a one-dimensional list and some as a list with super- and subcategories. In some cases, identical technology areas are categorized into different priority levels, and some countries even include technology-intensive fields of application or industry-specific solutions in

their lists. All these aspects make a direct comparison between countries difficult.

Nevertheless, there is significant overlap between the technology lists of countries in our sample. The greatest consensus can be found in the areas of artificial intelligence, quantum technologies, biotechnology, microelectronics/semiconductors, information and communication technologies, and production technologies/Industry 4.0. But even beyond these, the lists of technologies considered relevant are very similar – although there are certain divergences in some areas. Germany, for example, gives significantly higher importance to research into green hydrogen than most other countries. The US and Japan have a special focus on “hypersonic” technologies, which are particularly relevant as the basis for launch vehicles in dual-use applications. Environmental and recycling technologies receive special attention only in the EU and the US, while they are not listed in Asia. Japan, China, and South Korea also mention deep-sea and deep-earth exploration as relevant research areas, whereas this is not the case in the EU or the US.

The process of selecting technologies differs significantly between countries. Although the details of the process cannot be fully grasped everywhere, it is clear that the US and China in particular have institutionalized this process. The US, for example, established the Fast Track Action Subcommittee on Critical and Emerging Technologies in 2020 specifically for the purpose of identifying such technologies.

In Germany, on the other hand, the process is spread across several stakeholders within the federal government. There is no cross-departmental list of critical technologies, even if there is a great deal of agreement between the focal points of the Federal Ministry of Education and Research (BMBF) and the Federal Ministry for Economic Affairs and Climate Action (BMWK). The situation is similar in the EU, where – in particular due to the decentralized structure and diverse perspectives of the member states – new lists with varying degrees of detail are constantly being published (European Commission 2023; Allenbach-Amann 2023).

In general, each compilation of the relevant technologies follows the overarching political and economic objectives of the respective country, with competition and industrial policy objectives, as well as the strengthening of the respective lead industries, reflected in the programs’ details.

FUNDING FOR TECHNOLOGICAL SOVEREIGNTY

The countries analyzed are following different approaches, including industry- and technology-funding programs, regulatory restrictions on market access for certain companies, and restrictions on exports of critical materials. A look at the semiconductor industry illustrates this development: the US has committed to investing USD 280 billion in chip production and

research over the next ten years, China is providing subsidies totaling USD 145 billion, and the EU has passed a law allocating EUR 43 billion to promote chip production in Europe. In Germany – subject to budgetary realities – billions in subsidies are planned for the construction of chip production plants, for example by Intel or TSMC. At the same time, there is a trend in some countries to restrict access to key components that are essential for chip production. China, for instance, has been restricting the export of critical minerals such as gallium and germanium since August 2023, while the US has imposed export restrictions on EUV lithography equipment – critical for chip production – to China.

The diversity of funding approaches makes it difficult to quantify the funding volumes across countries and technologies or technology-intensive applications. Various institutions are nonetheless making an attempt at quantification.¹ The Center for Strategic and International Studies, for example, estimates the expenditure on industrial policy strategies for China and seven other economies (Brazil, France, Germany, Japan, South Korea, Taiwan, and the US) (DiPippo et al. 2022). The study suggests that industrial policy is an important part of these countries’ policymaking toolbox.

Similarly, the OECD has developed cross-country methods for quantifying industrial policy for a selection of its member countries (Crisuolo et al. 2022). According to these methods, an average of around 1.4 percent of GDP was spent on support measures such as project funding, grants, and tax breaks, and a further 1.8 percent of GDP on loans. The approach is largely technology specific. Funding for explicitly sustainable projects has increased significantly in recent years (Crisuolo et al. 2023).

Another approach uses natural language processing (Juhász et al. 2022) to classify industrial policy at a high-resolution level (country-industry-year) based on publicly available descriptions of policy measures (Global Trade Alert n.d.). The core idea is that textual descriptions of programs often convey information about the objectives of policy actors and allow researchers to determine whether a policy pursues industrial policy objectives or alternative objectives (Juhász et al. 2022). Industrial policy is often granular and technocratic, and only individual companies benefit from the funds. Furthermore, these support measures are primarily applied in wealthier countries and are usually targeted at a specific industrial sector that is considered central to competitiveness and prosperity.

The following table provides an overview of the number of specifically listed key technology areas, associated strategies, participating institutions, stated goals, corresponding investments and selected funding measures for six countries or communities of states analyzed.

¹ Source of the summary: Juhász et al. (2023).

OBSERVATIONS AND DISCUSSION

The brief overview presented here supports three observations:

Same Thrust – Different Competences

The countries analyzed focus largely on the same fields of technology that are expected to generate value in the future. Even if there are certain differences between the countries when it comes to setting priorities within the technology fields, it is possible to ascertain the extent to which the selection process incorporates individual countries' strengths into specific technology fields and possible specialization advantages. After all, technological sovereignty does not necessarily mean each national entity (further) developing all technologies by itself, but rather that access to key technologies should be guaranteed at all times.

What does technological sovereignty mean in the technology-intensive area of robotics, for example? In robotics, Germany is well-positioned in engineering, presumably securing its technological sovereignty directly in this field. AI, on the other hand, which is becoming increasingly important for smart robotics, is being furthered primarily in other countries. This raises the question of the extent to which access to the relevant AI developments is guaranteed at all times in order to ensure technological sovereignty in this aspect as well.

Promotion of Production Capacities vs. Promotion of R&D

In the measures to foster technological sovereignty, the distinction between promoting R&D activities and furthering the development of production capacities is becoming increasingly blurred.

Public funding of R&D activities goes largely unchallenged due to significant (locally limited) knowledge spillovers. A certain mission-oriented approach aimed at solving urgent social problems, such as decarbonization, has prevailed over the isolated promotion of individual technologies in the R&D funding landscape.

In contrast, public support for the development of production capacities raises the question of the risk of an inefficient international division of labor. Do such measures still fully utilize a country's comparative advantages and the benefits of international trade? To what extent is the promotion of domestic production a sensible response to new geopolitical tensions and to concerns about dependence on foreign countries for certain (intermediate) products? Costly reshoring can probably be only part of the solution to ensure the resilience of value chains for high-tech goods. Multi-sourcing, which can also include friend-, near-, or reshoring, is more likely to be helpful. What might other approaches look like for shielding a country

against unforeseeable geopolitical tensions? Can suitable measures be applied and conditions devised to create mutual dependencies through the production and export of intermediate products and inputs that yield a strategic advantage?

Public support for production should also take the lifecycle of an industry into account. In the case of a nascent industry, public funding could achieve learning effects in production so that new products become competitive more quickly compared to (inferior) old products. However, the nascent industry argument justifies only the temporary promotion of such industries, and that promotion should be reduced as the industry matures. This often poses a political-economic problem: the difficulty of withdrawing support once it has been granted.

Promoting the establishment of production capacities at the expense of foreign countries is often seen as a zero-sum game. It is assumed that there is a "pie" of a given size that needs to be distributed between countries. However, this view overlooks the growth-generating benefits of international trade and cooperation. It often also triggers a spiral of intervention and subsidization between countries that is not only harmful for all countries in the long term, but also for each individual country, since each country's scarce resources – including skilled labor – are not put to their most productive use.

Possibilities for Early Detection of Technological Trends

Some countries, such as the US and China, have institutionalized and professionalized the process of monitoring emerging technologies. Even if monitoring is no guarantee of good policy decisions, it does allow policymakers to deal with new technologies at an early stage and, if necessary, adapt political conditions and institutions.

THE GOAL OF TECHNOLOGICAL SOVEREIGNTY

This paper also illustrates that very different goals, and therefore different policy measures, may lie behind the concept of technological sovereignty in different countries. In a world of rapidly changing geopolitical conditions and new technological developments and trends, perhaps the most compelling goal of technological sovereignty is to avoid one-sided dependence in accessing key technologies and inputs that are necessary to meet societal priorities and needs. Measures to promote technological sovereignty should therefore be gauged against the achievement of this goal.

REFERENCES

- Allenbach-Ammann, J. (2023), "Stricter EU Controls on Critical Technologies Possible from Spring 2024", Euractiv.com, 3 October, <https://www.euractiv.com/section/economy-jobs/news/stricter-eu-controls-on-critical-technologies-possible-from-spring-2024>.
- Criscuolo, C., L. Díaz, L. Guillouet, G. Lalanne, C. É. van de Put, C. Weder and H. Z. Deutsch (2023), "Quantifying Industrial Strategies across Nine OECD Countries", *OECD Science, Technology and Industry Policy Papers* 150.
- Criscuolo, C., G. Lalanne and L. Díaz (2022), "Quantifying Industrial Strategies (Quis): Measuring Industrial Policy Expenditures", *OECD Science, Technology and Industry Working Papers* 2022/05.
- DiPippo, G., I. Mazzocco and S. Kennedy (2022), *Red Ink: Estimating Chinese Industrial Policy Spending in Comparative Perspective*, Center for Strategic and International Studies, Washington DC.
- European Commission (2023), *Commission Recommendation of 3 October 2023 on Critical Technology Areas for the EU's Economic Security for Further Risk Assessment with Member States*, https://defence-industry-space.ec.europa.eu/commission-recommendation-03-october-2023-critical-technology-areas-eus-economic-security-further_en.
- Global Trade Alert (n.d.), "Independent Monitoring of Policies That Affect World Commerce", <https://www.globaltradealert.org/>.
- Juhász, R., N. Lane and D. Rodrik (2023), "The New Economics of Industrial Policy", *NBER Working Paper* 31538.
- Juhász, R., N. Lane, E. Oehlsen and V. C. Pérez (2022), "The Who, What, When, and How of Industrial Policy: A Text-Based Approach", *SocArXiv uyxh9*, Center for Open Science.

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Economic Culture and Economic Performance*

INTRODUCTION

Enlightenment thinkers, from Smith and Hume on to Kant and de Tocqueville, all took it for granted that a society's culture – the people's values, attitudes, morals, and beliefs, many of them learned at their mother's knee – mattered for the effectiveness of business life and, more broadly, for the realization of the society's potential. The Enlightenment is often caricatured as the doctrine that a society eschewing superstition and taboos and embracing reason and individual opportunity will with time attain perfection of its possibilities. Notwithstanding various dissenters, including Marx, who took culture to be a function of the economy's structure rather than the reverse, the Enlightenment view on the influence of a nation's culture remained prevalent right through the "Protestant ethic" in Weber (1905) and the "entrepreneurial spirit" in Schumpeter (1911).

By the middle of the twentieth century, moral relativism had taken over. Most anthropologists and many other social scientists were disinclined to evaluate contrasting national cultures, seemingly believing that every nation finds its way to the culture that is best for it. Hence a society's culture might have a downside in its ill effects on its economy, yet the cost would be compensated by benefits in other directions. Nevertheless, a push back against such relativism soon began. Ruth Benedict wrote that some cultures may be better or worse than others. Several works reestablished culture as a causal force that makes markets work better: Banfield on trust (1958), Titmuss on gifts (1970), the Russell Sage conference on altruism (Phelps 1973), and Putnam on civic virtue (1993).

The debate over economic performance in continental Europe may prove to be a testing ground for the view that culture matters – some elements of it at any rate – for a society's results. As is increasingly admitted, the performance characteristics – one might say the specifications – of the national economy in nearly every continental country are poor compared to most performance characteristics in the United States and a few other comparators. However, the crucial point is not that the Continent's economic

* This excerpt is from "Economic Culture and Economic Performance: What Light Is Shed on the Continent's Problem," in *Perspectives on the Performance of the Continental Economies*, edited by Edmund S. Phelps and Hans-Werner Sinn (2011), reprinted with permission from The MIT Press (see the book website <http://mitpress.mit.edu/9780262015318/>).

KEY MESSAGES

- This paper explores the effects of several cultural values, attitudes, and the like, on some of the main dimensions of economic performance
- It shows a weak correlation between continental countries' relative endowment of some cultural attributes and the relative performance of their national economies
- However, not all of the cultural attributes hypothesized to be important were found to matter for performance
- And not all continental countries were under-endowed in some of the cultural attributes that mattered a lot

systems are inferior to those of some comparators, but rather the nagging sense of falling short – of structural underperformance. In my view, the continental economies had started to be underperformers in the interwar period and remained so, with corrective steps here and further missteps there, from the postwar decades onward. The structural shortfall was masked during the "glorious years," when rapid growth and high employment was stimulated by the low-hanging fruit of unexploited technologies used overseas and further powered by Europeans' efforts to claw back the wealth they had lost in the war years.

Many analyses, looking beyond market forces (e.g., the rather important influence of demographic prospects), attribute the Continent's tendency toward relatively low labor-market participation, if not the lower productivity, to the Continent's social model. Yet this explanation has not had entirely clear sailing. One could as easily bring up the political model. The Continent's historic struggle between left and right may create uncertainty for those investing or innovating on the Continent. The rule of law, or procedural justice, has received much attention from Adam Smith to Douglass North. But the nations on the Continent are not a bunch of banana republics. It is not clear that they are behind



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their comparators in constitutional protections, property rights, antitrust, law enforcement, and judiciary independence.

My thesis for several years has been that it is the economic model that largely accounts for the Continent's inability to match the economic performance of the United States and in some respects that of other comparators. But what is the "economic" model – in other words, what is the "economy"? At first, like others, I meant the economic system, namely the system of economic institutions in the capital, labor, and product markets. In arguing my thesis, I pointed to the strength on the Continent of institutions understood to be bad, such as employment protection legislation and bureaucratic "red tape," and to the weakness of institutions understood to be good, such as a well-functioning stock market and ample liberal arts education.

Why might countries go on with "inefficient" institutions? It may be that countries have differing institutions because they have different economic cultures, causing them to prefer different systems of institutions. Then a country's economic institutions are proxies, to some unknown extent, for the prevailing culture. In that case, the prevailing set of institutions might not be alterable as long as the culture is unchanged.

Of course, any program to explain inter-country differences by appeal to differences in cultural influences would be incomprehensible from the standpoint of neoclassical or neo-neoclassical theory. The Arrow-Debreu equations have no cultural elements – and no economic institutions either, other than private ownership. It follows that a rationale for cultural effects must go outside the neoclassical paradigm to recognize entrepreneurship, management, engaging jobs, learning and personal growth, and team players – thus Knightian uncertainty and creativity as well as imperfect information.

CULTURAL INFLUENCES ON PERFORMANCE – A CONCEPTUAL FRAME

If we are to obtain empirical estimates of the performance effects of national cultural attributes that have any claim to reliability and interpretability, we had better base our investigation on some conceptual framework, however informally formulated it may be – rather than try whatever off-the-shelf variables are at hand. This appears to require some notion of what a system of economic institutions and economic culture is in view of economic change and particularly the processes of innovation, their benefits and drawbacks, and their consequences for the main indicators, economic growth and prosperity. The neoclassical framework, with its premise of perfect knowledge and perfect coordination, is too narrow for much understanding of underperformance and the possible role that institutions and culture may play in it; so we want to go beyond neoclassical economics.

Contrary to myth, what we commonly call the West is not polar with respect to the character of its economies, with the so-called Anglo-Saxon economies all operating on the system called capitalism, with or without an accompanying welfare state, and all the continental economies operating on the system called corporatist, social market, or Rhenish. Denmark's economy is thought to be different in some way, and Italy's is surely more industrious than most of the Anglo-Saxon economies. The Nordic nations, from Finland to Iceland, do not fit neatly into either category. Nevertheless, there is some utility in considering two extremes – two ideal types – each of which resonates somewhat with one or more actual economies in the West.

At one extreme we have a private-ownership system structured for cutting-edge innovation. It is fertile in coming up with innovative ideas with prospects of profitability; shrewd and adept in selecting among these ideas for development; finally, prepared, and venturesome in evaluating and trying the new products and methods that are brought out. A semiclassical theory of innovation began with Schumpeter (1911). Saving is allocated to developing entrepreneurs' proposed "innovations" only to the extent that there are businesspeople around with the initiative to "seize the moment" and the leadership to "get it done." The modern theory of such dynamism – and the case for adopting such a system – began in the mid-1930s with Hayek (1948). First, virtually every employee down to the humblest worker has arcane "know-how," some of it what Michael Polanyi called "personal knowledge," and out of that know-how a new idea may come that few others, if any, would have. With openness to commercial ideas and acceptance of the entrepreneurs who develop them, a plethora of new ideas may be generated. Second, the pluralism of experience and knowledge that the financiers bring to bear in their decisions gives a wide range of entrepreneurial ideas a chance of an informed, insightful evaluation. And, importantly, the financier and the entrepreneur do not need the approval of the state or of social partners. Nor are they accountable later on to such a social body if the project goes badly, not even to the financier's investors. So projects can be undertaken that would be too opaque and uncertain for the state or social partners to endorse. Third, the pluralism of knowledge and experience that managers and consumers bring to bear in deciding which innovations to try and which of those to adopt is crucial in encouraging entrepreneurs to conceive new ideas and financiers to back them.

At the other extreme we have a private-ownership system that has been profoundly modified by the introduction of additional institutions. These include the massive components of the corporatist system of interwar Italy – big employer confederations, big unions, and big banks. The system operates to discourage or bar many entrepreneurial projects, particularly

start-ups. For its “innovations” – most of them not world class, not “cutting edge,” but rather adaptations of products and methods recently introduced abroad – the system depends more on established companies in cooperation with local and national banks. For what it lacks in entrepreneurship it tries to compensate with technological sophistication and increased coordination. Where the former system allows any number of versions of a new product or method to be developed and launched, this latter system convenes experts to set a product standard before any version is launched. To what end is this system? What is the theory behind it? First, there is the solidarist aim of protecting the “social partners” – communities and regions, business owners, organized labor, and the professions – from disruptive market forces; also the consensualist aim of blocking business initiatives that lack the consent of the “stakeholders” – those with a stake besides the owners, such as employees, customers, and rival companies. Second, elevating community, society, and being over individual engagement and personal growth appeals to anti-materialist and egalitarian strains in Western culture. Third, there is the “scientism” that holds that such a system can be more dynamic than the former system – maybe not more fertile in little ideas, such as might come to petit bourgeois entrepreneurs, but certainly in big ideas. Not having to fear fluid market conditions, an entrenched firm can afford to develop expensive innovations based on current or developable technologies. And with confederations of firms and state mediation available, such firms could arrange to avoid costly duplication of their investments. The state, for its part, could promote technological advances in cooperation with industry by harnessing the society’s collective knowledge. The state could indicate new economic directions and favor some investments over others through its instrument, the big banks.

The impetus for this paper has been the intuition that several countries on the Continent – among them Germany, Italy, and France – had and still have a culture that led them to evolve and retain systems of institutions that (in most or all respects) are much closer to the latter extreme than are the systems that the culture of the United States, the United Kingdom, and Canada led them to evolve and retain. It may be that, with their culture attitudes, the former system was abhorrent to them. Or it may be that they thought that their culture would ill equip them to do well with the former system. Or, conceivably, their culture might predispose them against dynamist behavior whatever system they adopted.

CULTURAL INFLUENCES – SOME STATISTICAL TESTS

What are the presumably pertinent cultural values, attitudes, ethics, and beliefs in each economically advanced country in the OECD? And do the inter-

country differences among them appear to play a role in causing inter-country differences in economic performance? The cultural data in this paper are limited to those calculated from underlying data (on the individual respondents’ answers) contained in World Values Surveys, which, though providing a wealth of data, is not nearly as wide-ranging as we would like.

At first, I found myself defining four dimensions of culture and looking for Survey questions that would serve to characterize each country’s culture in every one of the four dimensions.

One dimension has, as I would put it, Stimulation/Engagement/Mastery/Development at one end and at the other, Being/Identity. One national indicator calculable from the underlying Survey data that belongs more clearly in this dimension than in the other dimensions gets at the centrality of jobholding in the culture of the country. This indicator, labeled Importance, measures the response to the question “Is your job the most important thing in your life?”. Other national indicators that clearly belonged in this dimension are calculated from responses to questions asking respondents what they look for in a job. One of these indicators, Involvement, measures the respondents’ reported pride in their work. A second, Interestingness, measures the preference for an interesting job. A third, Achievement, measures the preference to “achieve something.”

The second dimension has at one end Loyalty/Dutifulness/Altruism and at the other end Practicality/Opportunism/Egoism. The sole indicator from the Surveys that appears to belong in this dimension is Willingness to Follow Orders.

The third dimension has at one end Individualism/Pluralism/Tolerance and at the other Solidarity/Conformity/Unanimitarianism/Envy. Here there is an indicator, Acceptance of Competition, calculated from responses to a question of whether the respondent is positive or negative about competition.

The fourth dimension has at one end Initiative/Venturesomeness/Experimentalism and at the other end Passivity/Tradition. Culture indicators in the Surveys that fit here are Desire for Freedom to Make Decisions and thus possibly, freedom to lead – henceforth, Freedom in Decisions, Preference for New Ideas over Old Ideas, Self-confidence, Acceptance of Changes, and Initiative at Work.

We now regress our selected cultural variables on five standard economic indicators: male labor force participation, the employment rate, employment in percent of the labor force, and two measures of labor productivity. Our key findings are the following.¹

Male Participation Rate

Acceptance of New Ideas, Acceptance of Competition, Importance of Work, and Interestingness of Work are

¹ For details, see Tables 15.1–15.5 in Phelps (2011).

all significant in a GLS regression that controls for “traditional” explanatory variables such as the tax rate. It is also striking that that the degree of explanation of the cultural variables is higher than the explanation provided by the “traditional” explanatory variables.

Economic Activity Rate

Here again, the cultural variables outperform the traditional variables. In a GLS regression model that includes both cultural and traditional variables, especially Acceptance of Change performs well.

Employment Relative to Labor Force

In particular, Initiative at Work and Importance of Work are highly significant with large coefficients.

Labor Productivity

The performance of the cultural variables is generally excellent in explaining labor productivity. A highly interesting result of the analysis there is that neither the cultural group nor the traditional group performs well by itself. Yet when married, the performance of both groups improves – especially that of the cultural variables. Initiative at Work, Willingness to Follow, Freedom in Decisions, Involvement in Work, and Acceptance of Competition are all highly significant with large, positive coefficients.

Productivity Level as a Ratio to the US Level

A potential drawback of the preceding productivity regressions is that they do not take into account a possible catch-up process going on in which economies are tending to close or narrow the gap between themselves and the productive leader. To allow for this possible effect and to directly evaluate the potential forces leading to the gap, we ran regressions in which the dependent variable is the ratio of a country’s productivity level to the level of the leading economy, here that of the United States.

Here, the culture variables appear to perform at least as well as the traditional explanatory variables. In particular, Initiative at Work, Willingness to Follow Orders, Freedom in Decisions, and Acceptance of Competition are highly significant and have the theoretically predicted positive sign.

WHAT ARE THE IMPLICATIONS FOR THE CONTINENTAL NATIONS?

We may reasonably infer from the detailed empirical results here that some particular cultural attributes, namely those with significantly positive regression coefficients, really do matter for economic performance in one or more respects. They are key attributes a

deficiency of which in a country would operate to pull down its economic performance in the affected dimensions. If the nations on the Continent are deficient in some or all of the key (and not super-endowed where they are not deficient), that would help explain the widespread perception that the continental economies as structured now are “underperformers.” Is the Continent predominantly deficient in these key cultural attributes?

The brief examination that follows is confined to comparing the cultural scores of the Big Three on the Continent with the usual comparators, the US, the UK, and Canada. And the comparison is limited to a few cultural variables. Two culture variables have scored pretty well. Importance of Work, which is so important for participation and unemployment, and Involvement (or Pride) in One’s Work, which is important for productivity. In these respects, many of us think of the Europeans as painstaking craftspeople, the Americans as more practical, so we would not be surprised if the Continent’s average scores on these two variables were comparable or better than those of the comparators. In fact, according to our survey data, the nationals on the Continent are deficient on these two scores. The data set shows that with respect to Importance of Work, the Americans’ score of 0.17 tops Germany’s 0.11, Canada’s 0.11 tops Italy’s 0.08, and Britain’s 0.07 tops France’s 0.04. With respect to Involvement, America’s 2.87 tops Italy’s 2.03, Britain’s 2.80 tops Germany’s 1.79, and Canada’s 2.70 tops France’s 1.74.

This echoes de Tocqueville’s contrast in 1835 between the “tumultuous and boisterous gaiety” in aristocratic societies such as French society and the democratic Americans, who “prefer those more serious and silent amusements which are like business” (de Tocqueville 1835).

Also powerful was another pair of cultural variables, Willingness to Follow Instructions and Freedom in Decisions. The former delivered spectacularly: it raises productivity and even lowers the unemployment rate. On this score, the continentals score decisively below their comparators: America scores 1.47, Canada 1.34, and Britain 1.32; France scores 1.19, Germany 1.13, and Italy 1.04. With respect to the latter, the US scores 0.61, Canada 0.65, and the UK 0.43. Germany has 0.57, France 0.57, and Italy 0.54. The aggregates are about equal, though the Continent loses the competition 2 matches to 1.

Acceptance of Competition appears to have a powerful effect on productivity, as hypothesized, and even on participation and thus, given the unemployment rate, employment. Here the US scores 1.11, Canada 1.01, and the UK 0.57. Germany scores 1.21, thus topping the US, while France has 0.68 and Italy 0.49.

The preference for jobs offering Initiative at Work was also a significant cultural attribute in the productivity estimations and, fitfully, in the participation estimation. On this culture attribute, the Continent’s

Big Three is not dominated by the three comparators. Germany scores 0.59, beating Canada's 0.55. Yet America's 0.52 beats Italy's 0.47, and Britain's 0.45 beats France's 0.38. Also, the Big Three's aggregate score is lower than that of its comparators.

CONCLUSIONS AND POLICY IMPLICATIONS

The basic point to carry away, obviously, is that the empirical results lend support to the Enlightenment theme that a nation's culture ultimately makes a difference for the nation's economic performance in all its aspects – activity as well as productivity.

Thus, a country's initiation of a program to reform the institutional machinery with the aim of achieving a major improvement of economic performance – though a much-needed step – would, if undertaken alone, very likely succeed only to a degree and thus cause considerable disappointment. A transformation of the economy to one of dynamism, with the teamwork to implement it and to adapt well to it, can be obtained only if the economic culture and possibly other “background conditions” are conducive, not just the institutional machinery.

An aspect of the results that are of particular interest to me is that every one of the cultural “dimensions” had at least one cultural variable representing it that performed significantly in at least one of the regressions. In the first dimension, Stimulation/Engagement/Development, the (proportionate) number reporting that their job is most important in their lives is significant both in raising male participation and (to a lesser extent) raising employment. In the same dimension, the pride taken in one's work is more mildly labor force raising and more powerfully unemployment lowering. This Pride/Involvement in Work is seen as raising productivity as well.

In the second dimension, Loyalty/Dutifulness/Altruism, the willingness to take a job that requires following instructions was the sole variable entering the regressions. It delivered spectacularly in combination with the Freedom variable.

In the third dimension, Individualism/Pluralism/Tolerance, it appears that Acceptance of Competition had powerful effects on productivity, as hypothesized, and even on participation, possibly through circuitous channels.

Here the continental Big Three makes it a contest but as a group still loses badly to the comparators as a group. On Acceptance of Competition, the US scores 1.11, Canada 1.01, and the UK 0.57. Germany scores 1.21, thus topping the US, while France has 0.68 and Italy 0.49.

In the last dimension, Initiative/Venturesomeness/Experimentalism, two cultural attributes had considerable explanatory power. The preference for Initiative at Work was extremely significant in the productivity equations. It was significant also for the unemployment rate, boosting employment without

boosting participation. The desire for Freedom in Decisions, also dubbed here the Willingness to Assume Responsibility, perhaps to lead, was highly significant in the productivity equations.

I would comment that in my previous work I had organized my thinking around the intellectual currents of reaction on the Continent to the Enlightenment and to capitalism in the nineteenth century: the solidarism, consensus, anti-commercialism, and equalitarianism. It would be understandable if such a climate had a dispiriting effect on potential entrepreneurs. But to be candid, I had not imagined that Continental Man might feel less entrepreneurial. It did not occur to me that Continental Man lacked an “entrepreneurial spirit,” or intellectual curiosity, or creativity. After all, this is a region that I treasured for the creativity of its Beethoven, Wagner and Picasso. In the early twentieth century, Schumpeter was writing about the entrepreneurial spirit of the Austrians and Weber that of the Germans! Apparently, the Europeans' creativity, once unmatched and perhaps so still, does not translate to business.

Do the data then reflect “two cultures,” as argued by Bourguignon (2006)? Or are the inter-country differences here purely random disturbances around the same all-West means? In fact, variances are so low, owing to the large sample sizes, that the differences in scores between the Big Three and their comparators are statistically significant at stringent confidence levels. Such comparisons could easily be misunderstood, however. What is the meaning of the higher score in Germany? Perhaps it only means that the Germans, far more than the Americans, are deprived of opportunities for initiative. They have a craving for additional initiative as a result – far more than the Americans do; thus, initiative is on the mind of the Germans. If so, the Germans' greater interest in those rewards of work does not imply that at the same level of opportunity they would value more initiative than the Americans.

In short, the “value” expressed by the Survey respondents are apt to be biased by their current conditions: in countries where there is deprivation of supply relative to the mean in the sample, the value attached to more is thereby increased, and as a possible result, respondents place more weight on that value; symmetrically, where there is abundance relative to the mean, there is downward bias. That suggests that the true inter-country differences in reported values, insofar as what is being reported is the value of more, are apt to be much greater than the measured differences.

To sum up this exploration of culture effects on the Continent: there is a loose correspondence between the continental countries' relative endowment of some cultural attributes and the relative performance of their national economies in some, if not all, respects – though it is not yet clear how much of such effects are indirect through the culture's impact on

the nation's selection of economic institutions and how much of such effects are direct. Yet not all of the cultural attributes hypothesized to be important were found to matter for performance. And not all continental countries were under-endowed (some were well-endowed) in some of the cultural attributes that matter a lot.

Two caveats: that continental countries tend to differ from comparators with regard to some cultural attributes – the Continent is “different” – does not compel us to agree with the opinion that the continental Europeans have chosen economic institutions that are different yet “optimal” for them, given those values. The values expressed by the continental Europeans do not contrast with those in comparator economies so radically as to suggest that the Continent would reject institutional changes demonstrated to deliver greater innovation and, as a result, higher productivity and a more rewarding workplace – notwithstanding some decrease in job security. The theme that big, even radical, innovations must come from the entry of start-ups (e.g., Schumpeter 1911; Arrow 1962; Bhide 2000) and also, I think, the theme that the Continent's corporatist institutions are inimical to dynamism in all companies, both new and established (Phelps and Zoega 2004), continue to be plausible guides to needed institutional reform on the Continent.

We need not agree either that the continental Europeans have adopted the right values – right for them. It would be appropriate and possibly therapeutic if citizens in nations with unsatisfactory economic performance would compare their attitudes with those in other nations and ask whether they would not benefit from changing some of those values. That may be a long road. To embark on modifications of the economic culture and the economic institutions to implement them would be a voyage of discovery – one having parallels with the “discovery procedure” that is the essence of capitalism.

REFERENCES

- Arrow, K. J. (1962), “Economic Welfare and the Allocation of Resources for Invention”, in R. R. Nelson, ed., *The Rate and Direction of Innovative Activity*, Princeton University Press, Princeton, 609–626.
- Banfield, E. (1958), *The Moral Basis of a Backward Society*, Free Press, New York.
- Bhide, A. (2000), *The Origin and Evolution of New Businesses*, Oxford University Press, Oxford.
- Bourguignon, P. (2006), *Deux éducations, deux cultures. Le cercle des économistes, l'Europe et les Etats-Unis*, Descarte et Cie, Paris.
- De Tocqueville, A. ([1835] 1981), *De la Démocratie*, 2 vols. (trans. 1840), Paris. Reprint: T. Bender, ed., *Democracy in America*, Random House, New York.
- Hayek, F. (1948), *Individualism and Economic Order*, University of Chicago Press, Chicago.
- Phelps, E. S. (Ed., 1973), *Altruism, Morality and Economic Theory*, Basic Books, New York.
- Phelps E. S. (2011), “Economic Culture and Economic Performance: What Light Is Shed on the Continent's Problem?”, in E. S. Phelps and H. W. Sinn, *Perspectives on the Performance of the Continental Economics*, CESifo Seminar Series, The MIT Press, Cambridge, MA, 447–482.
- Phelps, E. S. and G. Zoega (2004), “The European Labour Markets - Searching for Routes to Better Economic Performance in Continental Europe”, *CESifo Forum* 5(1), 3–11.
- Putnam, R. (1993), *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, Princeton.
- Schumpeter, J. A. ([1911] 1932), *Theorie der wirtschaftlichen Entwicklung*, Vienna. Reprint: R. Fels, trans. *Theory of Economic Development*, Harvard University Press, Cambridge, MA.
- Titmuss, R. (1970), *The Gift Relationship: From Human Blood to Social Policy*, Allen and Unwin, London.
- Weber, M. ([1905] 1930), *Die Protestantische Ethik und der Geist der Kapitalismus*, Tübingen. Reprint: T. Parsons, trans., *The Protestant Ethic and the Spirit of Capitalism*, Allen and Unwin, London.

Eric A. Hanushek, Lavinia Kinne, Pietro Sancassani and Ludger Woessmann

Patience and the North-South Divide in Student Achievement in Italy and the United States

Students' academic achievement varies widely and persistently across regions in many countries. For example, in both Italy and the United States, eighth-grade math achievement differs between the top- and bottom-performing region/state by the equivalent of over two years of learning – roughly two-thirds of the achievement difference between top- and bottom-performing OECD countries. Such regional skill differences are very important for regional income differences (Hanushek et al. 2017).

Ever since the earliest human capital theory of Becker (1964), discount rates have been recognized as an important determinant of individual decisions to invest in skills (for evidence see Sutter et al. 2013; Golsteyn et al. 2014; Castillo et al. 2019; Angerer et al. 2023). But their role at the individual level is just part of the full impact of time preferences. Patience – the relative valuation of present versus future pay-offs – appears in many closely-related decisions. At the individual level, students weigh current gratification such as play time with friends against study time that may lead to deferred rewards. At the group level, communities trade off present against future costs and benefits when deciding how much to invest in school quality, how strongly to motivate children to learn, and whether to design institutions to incentivize learning. Such effects of aggregate preferences, which are a component of cultural identities, are consistent with the influence of patience found for international achievement differences (Figlio et al. 2019; Hanushek et al. 2022), and for economic development (Galor and Özak 2016; Sunde et al. 2022).

In new research (Hanushek et al. 2023), we study whether differences in people's patience can account for the large and long-standing subnational differences in student achievement.¹

USING FACEBOOK INTERESTS TO MEASURE PATIENCE AT THE REGIONAL LEVEL

Subnational investigation of patience has been stymied by a lack of representative region-specific measures of time preferences. The key methodological innovation of our research is combining the massive

¹ The underlying research paper is "Can Patience Account for Subnational Differences in Student Achievement? Regional Analysis with Facebook Interests." This summary was first published on VoxEU.org on October 11, 2023.

KEY MESSAGES

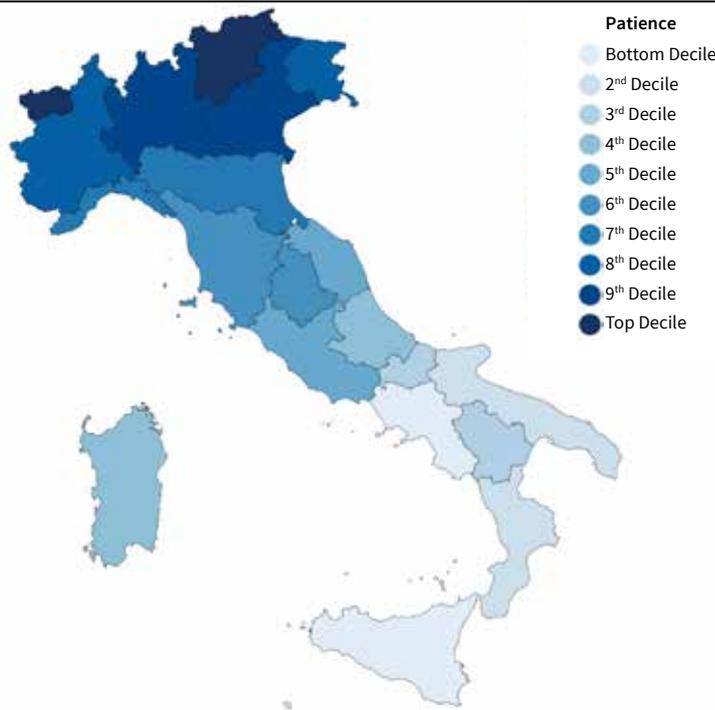
- **Human capital theory recognizes that time preferences – patience – are important for skill investments**
- **We show how Facebook interests can be used to construct subnational measures of patience**
- **Differences in patience are closely related to regional student achievement in Italy and the United States**
- **They account for two-thirds of the achievement variation across Italian regions and one-third across US states**
- **The results lead to new perspectives on long-standing within-country disparities**

data available from social media – specifically Facebook interests – with machine-learning algorithms to derive new subnational measures of patience. Our derivation of regional patience measures builds on recent international analysis of culture in Obradovich et al. (2022) and contributes to the recent work using social-media data in analyzing culture and social networks (e.g., Chetty et al. 2022; Bailey et al. 2022).

The underlying idea is that social-media data contains important information about people's underlying preferences. For marketing purposes, Facebook has developed an algorithm to classify the "interests" of over two billion people based on their self-reported interests, clicks and "likes" on Facebook, software downloads, clicks on Facebook's ads on other sites, and additional inferences from overall behavior and location. The hundreds of thousands of interests classified by Facebook are organized in categories such as business, entertainment, family, wellness, food, hobbies, fashion, sports, and technology. We scrape Facebook's marketing application programming interface to identify the 1,000 Facebook interests with the largest audiences worldwide.

From these globally relevant interests, we derive measures for national and subnational levels of patience. We extract data on the prevalence of Facebook interests in each country and region and reduce their dimensionality by principal component analyses. Employing machine-learning techniques, we train an international model to predict the scientifically validated patience measure of the Global Preference

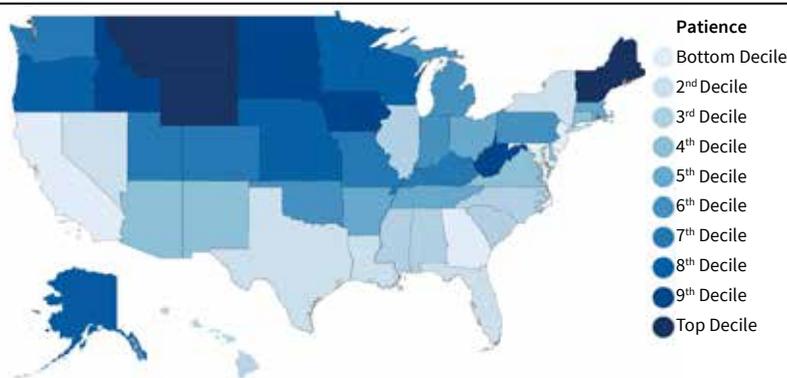
Figure 1
Facebook-derived Measure of Patience for Italian Regions



Source: Hanushek et al. (2023).

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Figure 2
Facebook-derived Measure of Patience for US States



Source: Hanushek et al. (2023).

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Survey (GPS) (Falk et al. 2018) from the principal components of the Facebook interests.

We validate the newly derived measure of patience through an international analysis that mimics prior investigations of preferences and cross-country achievement differences (Figlio et al. 2019; Hanushek et al. 2022). Our Facebook-derived measure performs as well as the original GPS measure in predicting PISA student achievement across the 48 GPS countries. Out-of-sample predictions allow us to expand the analysis beyond GPS countries to a total of 80 countries, and the patience measure provides very consistent predictions of PISA achievement for the expanded sample and the 32 added countries.

We use the parameters estimated from international Facebook interests to construct subnational patience measures across 20 regions for Italy and across 50 states for the United States based on observed regional Facebook interests. In Italy, the regions with the lowest patience measure are Sicily and Campania in the south and the highest is Trentino-Alto-Adige in the northeast (Figure 1). In the United States, the states with the highest level of patience are Vermont and Maine in the northeast (Figure 2). Both countries show substantial north-south variation in the Facebook-derived measure of patience that coincide with the long-standing geographical disparities in the two countries (for Italy, see, e.g., Putnam 1993; Guiso et al. 2004; Bigoni et al. 2018).

Non-representative regional preference measures from the GPS provide another way of validating the Facebook-derived patience measures. We can use the regional identifiers contained in the GPS data to construct regional GPS measures of patience (Sunde et al. 2022). These are obviously very noisy due to the small regional GPS sample sizes, averaging 50 individuals per Italian region and 20 per US state. Nonetheless, these are significantly positively correlated with our measure at 0.49 across Italian regions and 0.23 across US states.

PATIENCE AND STUDENT ACHIEVEMENT ACROSS ITALIAN REGIONS AND US STATES

We employ the newly derived regional measures of patience in analyses of subnational student achievement in Italy (using INVALSI test data) and the United States (using NAEP data).

The Facebook-derived measure of patience is strongly associated with regional student achievement in both countries. In Italy, a one-standard-deviation increase in regional patience is related to a 1.2–1.5-standard-deviation increase in eighth-grade math achievement (Figure 3). This is only slightly smaller than the estimate in the abovementioned cross-country analysis. In the United States, the equivalent estimate is statistically significant, albeit only about one-quarter in magnitude (Figure 4).



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Regional differences in patience account for over two-thirds of the test-score variation across Italian regions and for over one-third across US states. The smaller role in the United States may reflect that the substantial cross-state mobility of the US population lessens the preference heterogeneity and alters the intergenerational transmission of cultural traits.

While the regional analysis is descriptive, two aspects speak against major bias. First, our cross-country analysis indicates limited bias when we assign migrant students the patience measure of their origin country. This allows conditioning on fixed effects for residence countries to shield against simple reverse causation and unobserved features of students' residence countries. Second, the within-country estimation is less prone to confounding from unobserved national traits such as languages, constitutions, and institutional factors that has hampered prior cross-country analyses.

Consistent with skill development as a cumulative process, the association between patience and student achievement is stronger the higher the grade level. In Italy, estimates grow steadily across the four INVALSI testing occasions from second to tenth grade. Similarly, estimates for the US NAEP grow from fourth to eighth grade.

All results account for regional variation in risk-taking, another preference entering intertemporal decisions. The machine-learning model predicting risk-taking from Facebook interests does not, however, perform very well at the regional level. The poor measurement of risk-taking implies that the estimates of patience are lower bounds, because patience and risk-taking are positively associated and prior work suggests a negative association of risk-taking with student achievement (Hanushek et al. 2022).

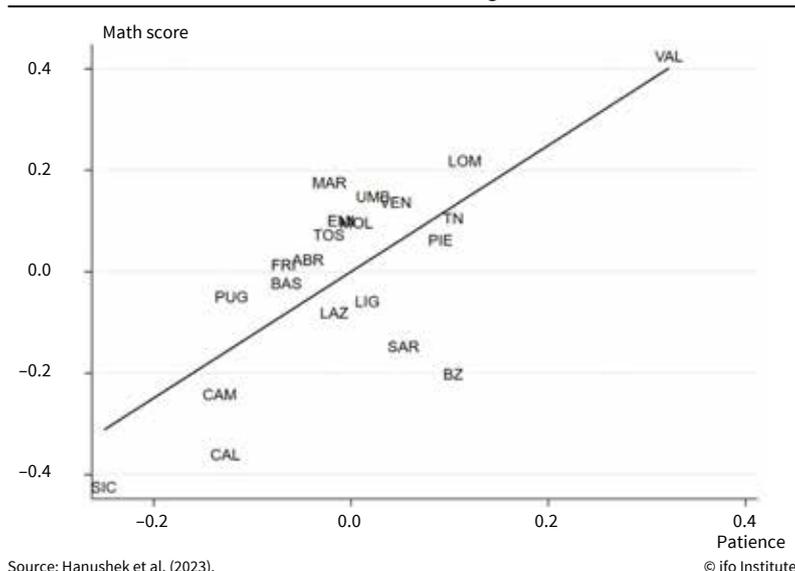
Results do not differ significantly by gender. They are also robust in the available separate assessment waves. We find similar results for reading achievement in both countries, albeit with slightly smaller point estimates.

Moreover, results are consistent for six additional countries where regional achievement data covers fewer grades or regions. The positive association between regional student achievement and Facebook-derived patience holds in a pooled sample of 190 regions in eight countries. The association is separately significant in all additional countries – Brazil, Canada, Germany, Kazakhstan, and Mexico – except Spain.

POLICY CONCLUSION: THE IMPORTANCE OF PATIENCE FOR LONG-STANDING SUB-NATIONAL DISPARITIES

Regional differences in student achievement are historically large and persistent but poorly understood and understudied. Our analysis shows that subnational differences in Face-

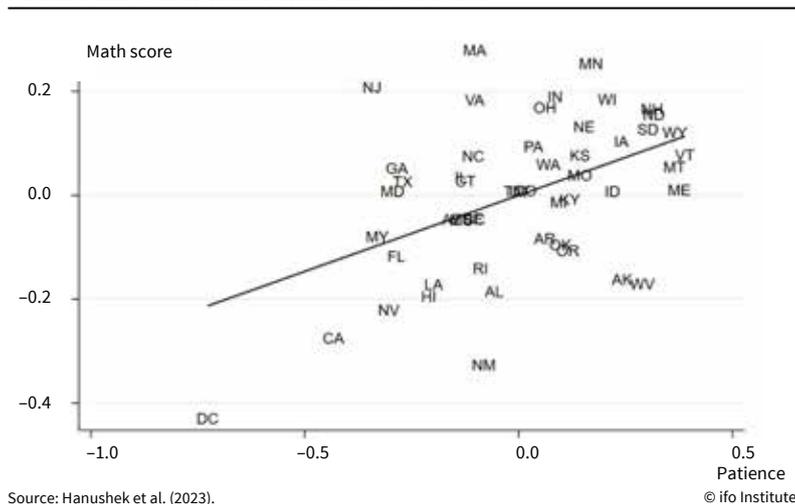
Figure 3 Patience and Student Achievement across Italian Regions



Source: Hanushek et al. (2023).

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Figure 4 Patience and Student Achievement across US States



Source: Hanushek et al. (2023).

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book-derived measures of patience provide a powerful explanation of variation in student outcomes across Italian regions and US states. This new perspective on student performance helps to explain why, for example, north-south differences in student outcomes in both countries have been very stable over time even in the face of national efforts to equalize performance.



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When concerned about within-country differences in student achievement, policymakers might look beyond proximate factors such as school spending or even family educational background to take possible differences in patience into account. Institutional features of schooling such as reliance on parental choice or test-based accountability are less tied to aggregate preferences (Hanushek et al. 2022). Thus, institutional reforms of school systems appear a viable policy mechanism for improvement that does not necessarily depend on changing preferences (Woessmann 2016). Moreover, while cultural traits are considered hard to change (e.g., Guiso et al. 2006; Bisin and Verdier 2011), recent evidence shows that traits such as patience are malleable, especially at a young age, and can be improved through specific interventions (e.g., Bird 2001; Alan and Ertac 2018; Jung et al. 2021). Hence, policies aimed at increasing patience may be an avenue for addressing educational investments and regional deficits in student outcomes.

REFERENCES

- Alan, S. and S. Ertac (2018), "Fostering Patience in the Classroom: Results from Randomized Educational Intervention", *Journal of Political Economy* 126, 1865–1911.
- Angerer, S., J. Bolvashenkova, D. Glätzle-Rützler, P. Lergetporer and M. Sutter (2023), "Children's Patience and School-Track Choices Several Years Later: Linking Experimental and Field Data", *Journal of Public Economics* 220, 104837.
- Bailey, M., D. M. Johnston, M. Koenen, T. Kuchler, D. Russel and J. Stroebel (2022), "The Social Integration of International Migrants: Evidence from the Networks of Syrians in Germany", *NBER Working Paper* 29925.
- Becker, G. S. (1964), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, NBER, New York.
- Bigoni, M., S. Bortolotti, M. Casari and D. Gambetta (2018), "At the Root of the North–South Cooperation Gap in Italy: Preferences or Beliefs?", *Economic Journal* 129, 1139–1152.
- Bird, E. J. (2001), "Does the Welfare State Induce Risk-Taking?", *Journal of Public Economics* 80, 357–383.
- Bisin, A. and T. Verdier (2011), "The Economics of Cultural Transmission and Socialization", in J. Benhabib, A. Bisin and M. O. Jackson, eds., *Handbook of Social Economics*, North-Holland, Amsterdam, 339–416.
- Castillo, M., J. L. Jordan and R. Petrie (2019), "Discount Rates of Children and High School Graduation", *Economic Journal* 129, 1153–1181.
- Chetty, R., M. O. Jackson, T. Kuchler, J. Stroebel, N. Hendren, et al. (2022), "Social Capital I: Measurement and Associations with Economic Mobility", *Nature* 608, 108–121.
- Falk, A., A. Becker, T. Dohmen, B. Enke, D. Huffman and U. Sunde (2018), "Global Evidence on Economic Preferences", *Quarterly Journal of Economics* 133, 1645–1692.
- Figlio, D., P. Giuliano, U. Özek and P. Sapienza (2019), "Long-Term Orientation and Educational Performance", *American Economic Journal: Economic Policy* 11, 272–309.
- Galor, O. and Ö. Özak (2016), "The Agricultural Origins of Time Preference", *American Economic Review* 106, 3064–3103.
- Golsteyn, B. H. H., H. Grönqvist and L. Lindahl (2014), "Adolescent Time Preferences Predict Lifetime Outcomes", *Economic Journal* 124, F739–F761.
- Guiso, L., P. Sapienza and L. Zingales (2004), "The Role of Social Capital in Financial Development", *American Economic Review* 94, 526–556.
- Guiso, L., P. Sapienza and L. Zingales (2006), "Does Culture Affect Economic Outcomes?", *Journal of Economic Perspectives* 20(2), 23–48.
- Hanushek, E. A., L. Kinne, P. Sancassani and L. Woessmann (2023), "Can Patience Account for Subnational Differences in Student Achievement? Regional Analysis with Facebook Interests", *NBER Working Paper* 31690.
- Hanushek, E. A., L. Kinne, P. Lergetporer and L. Woessmann (2022), "Patience, Risk-Taking, and Human Capital Investment across Countries", *Economic Journal* 132, 2290–2307.
- Hanushek, E. A., J. Ruhose and L. Woessmann (2017), "Knowledge Capital and Aggregate Income Differences: Development Accounting for U.S. States", *American Economic Journal: Macroeconomics* 9, 184–224.
- Jung, D., T. Bharati and S. Chin (2021), "Does Education Affect Time Preference? Evidence from Indonesia", *Economic Development and Cultural Change* 69, 1451–1499.
- Obradovich, N., Ö. Özak, I. Martín, I. Ortuño-Ortín, E. Awad, M. Cebrián, R. Cuevas, K. Desmet, I. Rahwan and Á. Cuevas (2022), "Expanding the Measurement of Culture with a Sample of Two Billion Humans", *Journal of The Royal Society Interface* 19, 20220085.
- Putnam, R. D. (1993), *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton University Press, Princeton, NJ.
- Sunde, U., T. Dohmen, B. Enke, A. Falk, D. Huffman and G. Meyerheim (2022), "Patience and Comparative Development", *Review of Economic Studies* 89, 2806–2840.
- Sutter, M., M. G. Kocher, D. Glätzle-Rützler and S. T. Trautmann (2013), "Impatience and Uncertainty: Experimental Decisions Predict Adolescents' Field Behavior", *American Economic Review* 103, 510–531.
- Woessmann, L. (2016), "The Importance of School Systems: Evidence from International Differences in Student Achievement", *Journal of Economic Perspectives* 30(3), 3–32.

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