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EU Industrial Policy Report 2024

Luiss Hub for New Industrial Policy
and Economic Governance (LUHNIP)

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Luiss Hub for New Industrial Policy and Economic Governance (LUHNIP)

The Luiss Hub for New Industrial Policy and Economic Governance (LUHNIP) is an interdisciplinary, non-partisan research hub located within the Luiss Institute for European Analysis and Policy, at Luiss University in Rome. LUHNIP was established in 2023 with support from the Berlin-based think tank Dezernat Zukunft. LUHNIP focuses on topics linked to industrial policy and economic governance issues in Europe and Italy. As a member of the European Macro Policy Network (EMPN), LUHNIP connects with researchers and think tanks across Europe to advance the continent's fiscal, monetary, and economic architecture. LUHNIP's work bridges academic research and policy advocacy, aiming to provide expert knowledge and influence public debates. Its core activities include the production of technical reports, policy briefs and policy papers analyzing supranational industrial policies in the EU and exploring evolving industrial policy dynamics in Italy.

European Macro Policy Network (EMPN)

Founded in 2021 by the Berlin-based think tank Dezernat Zukunft, the European Macro Policy Network (EMPN) brings together 13 economic think tanks and research institutes from across Europe. The EMPN team includes former Ministry of Finance officials, alongside economists, academics, and EU affairs specialists. The EMPN develops policy proposals, publish research papers, and advocate for essential reforms in European fiscal, monetary, and industrial policies, with the goal of fostering a more prosperous, sustainable, and sovereign European Union.

Foreword

Stefano Manzocchi, Deputy Rector for Research, Luiss University – Rome

The European experiment is at a crossroad, and the challenges facing the EU industrial, competition and innovation policies are clear evidence of that. Two recent reports, by Enrico Letta on the state of the Internal Market and by Mario Draghi on the future of European competitiveness, show how the economic dimension of the Union is key for the social, cultural, and democratic developments of our peoples. Far from supplying a restrictive, myopic view on the destiny of Europe, a far-reaching and well-informed economic perspective on how the Union has evolved in the global context provides hints on the future quality of our citizenships.

Therefore, I am very glad and proud that the Luiss Hub for New Industrial Policy and Economic Governance (LUHNIP), at the Luiss Institute for European Analysis and Policy (LEAP), has just issued its first Report on EU Industrial Policy. The report could have not been timelier. As you can read, this is a truly interdisciplinary effort which combines several approaches to yield an exhaustive assessment of where we are and where we could go, and how we should act to match the various challenges of the global industrial environment.

The Report lays the ground for three crucial conversations at the intersection of academia and practice.

First, we need a stock-tacking exercise to understand where we stand. What is the legacy of the EU's industrial policy? And on which legal and institutional foundations has it – and will it – rest in the EU? How can we build on and move beyond this legacy, including moving ahead toward a novel understanding of competition policy to meet the new and multifaceted challenges of the present? Relevant to this conversation are the first three chapters of the Report, touching upon the historical development of EU industrial policy, its legal foundations and the democratic accountability of industrial policymaking in the EU. Also relevant in this respect is chapter 7 on the territorial dimension of industrial policies.

The second conversation pertains to the current scenario. As usual in its history, it is in crisis times that Europe has embarked in major policy and regulatory changes. This time, the crisis which begun with the Covid-19 pandemic has culminated with the energy and inflation crisis. The challenges were abrupt, and Europe shifted from an almost purely regulatory environment to a much more interventionist stance, and a looser approach to state-driven interventions. However, such rapidity inevitably brought about imbalances that now need to be assessed: a new institutional and financial equilibrium must be found to contrast fragmentation and maximize the growth impact of industrial policies, as well as their contribution to continental competitiveness. A large section of the report addresses these issues. Chapter 4 analyses the loosening of the EU state aid regime, addressing the problem of national subsidies and the risks of fragmentation in the European Single Market. Chapter 5 engages with the problem of institutional coordination in the current EU industrial policy landscape to elaborate on the avenues for coordination between the European Central Bank, the European Investment Bank and the European Commission in support of the new EU industrial policy. Chapter 6 provides an empirical analysis of the spatial dimension of EU industrial policy, with an eye to uncovering the challenges posed and opportunities offered by the green transition at the regional level across Europe.

The third conversation we need to engage with regards Europe's future in key sectoral and policy domains. Energy, defense and digitalization are crucial sectors

for the future of Europe. Policies in these domains are poised to generate effects for years to come. The incisiveness of such policies today will be key in determining economic growth and security in the Europe of tomorrow – not to mention our capacity to respond to the challenges of climate change. Chapters 8-13 of this report offer material about how decisions that are taken today can impact the next stage of EU development. Chapter 8 provides an in-depth analysis of Europe's industrial policies for the twin transition. Chapter 9 tackles the crucial issue of skills shortages in the new sectors linked to the twin transition, while chapters 10, 11 and 12 engage with sectoral industrial policy in digital (AI), energy and defense respectively. Chapter 13 concludes the report by broadening the perspective and discussing the changes Europe needs to embrace, in order to strengthen its competitiveness and enhance economic security.

The construction of Europe has always been about the balance of short-term concerns and long-term ambitions. This junction of European history requires a good amount of forward and perspective thinking.

While I congratulate LUHNIP, the report's coordinator, and the report's contributors, I encourage the dissemination of its findings and its suggestions beyond the academic boundaries, through an interaction with industrial, social, and political actors. There is much food for thought here, and it deserves to be widely debated.

List of Contributors

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Filippo Bontadini is Assistant Professor in Applied Economics at the department of Business and Management at Luiss University. He is also Research Fellow at the Luiss Institute for European Analysis and Policy. He has worked as a researcher on the EUKLEMS-INTAN Prod project and on the Global INTAN-Invest database. In addition, Filippo is an Economic Advisor on the Joint Task Force of the OECD and the Italian Ministry of Economics and Finance for Multilateral Policy Support. Previously, he has been a Research Fellow at the OFCE-Sciences Po and has obtained his PhD at the Science Policy Research Unit (SPRU) at the University of Sussex, where he is now an Associate Fellow.

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Paul Dermine is professor of European law at the Université libre de Bruxelles (Belgium). He has previously worked as a référendaire at the Court of Justice of the European Union, and held research positions at the European University Institute (Max Weber Fellowship), Maastricht University (PhD Fellowship), KULeuven, Hertie School of Governance (visiting researcher), and NYU Law (Hauser Global Scholarship). His work focuses on Eurozone governance and EU institutional law. He is the author of The New Economic Governance of the Eurozone – A Rule of Law Analysis (CUP, 2022) and Le plan de relance NextGenerationEU de l'Union européene – analyse constitutionnelle d'une initiative historique (Larcier, 2023).

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Donato Di Carlo is an Assistant Professor at the LSE European Institute and the founder and director of the Luiss Hub for New Industrial Policy and Economic Governance (LUHNIP) at Luiss University in Rome. His research focuses on comparative political economy, industrial policy, economic regulation and EU economic and monetary integration. He holds a PhD from the Max Planck Institute for the Study of Societies and has previously held academic positions at the European University Institute and Luiss University.

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Niccolo Durazzi is an Associate Professor in Political Economy of Social Policy, School of Social and Political Science, University of Edinburgh. His research focuses on public policies supporting knowledge-based economies, especially education, skills, and labor market policies. He is currently leading a project on "The Political Economy of Knowledge-based Growth," funded by the Leverhulme Trust.

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Alexandre Marin holds a Master's degree in EU Law from IEP Strasbourg and the Law Faculty of Strasbourg and studied at Sciences Po Paris (Ecole d'affaires pub-

List of Contributors

liques). Early in his career, he worked as temporary staff at the French Ministry of Finance. For the past three years, he has served as the Head of European Affairs at Riva Group, focusing on energy, industrial and trade policy. Additionally, he chairs the Electricity Task force and is the vice-chair of the Energy Committee at EUROFER, the European federation of steel producers.

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Introduction: EU Industrial Policy Report 2024

Donato Di Carlo[a]

The *EU Industrial Policy Report 2024* by the Luiss Hub for New Industrial Policy and Economic Governance (LUHNIP) is presented at a time when the European Union (EU) navigates an era marked by profound geopolitical shifts, socioeconomic transformations, and environmental imperatives. In recent years, geoeconomic competition by China and the United States has put the European model, based on free competition and open markets, to the test. At the same time, the war in Ukraine is now forcing the European Union to strengthen its defense industrial capabilities to ensure its own security. Finally, the industry's twin transition requires significant new financial resources and regulatory measures. Simply put, the scale of these challenges means that the question of the future of EU industrial policy is crucial if Europe is to maintain its influence at global level, strengthen the competitiveness of its economy, while keeping its social model. These challenges have been recently highlighted by the high-level reports on the future of the Single Market by Enrico Letta[b] and European competitiveness by Mario Draghi[c] and are now at the heart of the mandate of the new Von der Leyen II Commission.

The Letta Report underscores the need for an overhaul of the European Single Market, adapted to a "larger world." The Single Market was originally designed in a period when Europe was a global economic powerhouse and the rest of the world was relatively closed, in comparison to the EU. The Single Market successfully facilitated economic integration and cooperation within the EU border, brining EU at the forefront of trade and capital internationalization, while at the same time setting the standards for the latecomers. Today the picture is very different. The world is more integrated, more open, and strategic advantages are not necessarily within European countries. Aptly, Letta's report calls for new strategies to address the increasing complexities of a larger, more integrated world. It argues that sectors like energy, finance, and digital communications, once considered too strategic to be integrated at the EU level, must now evolve into truly European dimensions. Without this shift, Europe risks falling behind in global competitiveness, especially when compared to the United States and China. The report also calls for introducing a "fifth freedom"—the freedom of research and innovation—as essential to driving Europe's future competitiveness. This concept emphasizes the need to embed research, innovation, and technological advancement within the core of the Single Market, aligning with efforts in digital and green transitions. In other words: the Single Market must be more than just a platform for trade. It should become a catalyst for the EU's strategic autonomy and long-term growth.

In turn, the Draghi Report raises similar concerns, painting a stark picture of Europe's lagging productivity growth compared to other global powers like the US and China. Despite Europe's strong foundations—such as an open economy, strong social inclusion, and the Single Market—the continent's shrinking and aging population, high energy prices, and weakening trade openness are hampering growth. In turn, this casts a dark shadow on perspective growth and the ability for European countries to defend their values as embedded in their welfare state. Draghi bluntly emphasizes that Europe's ambitions, from maintaining its social model to achieving strategic autonomy, are at risk unless there is a radical boost in productivity and investment in innovation and green technologies. A similar endeavor requires, the report argues, annual investments of around 5% of GDP, mirroring post-war reconstruction levels. Among others, Draghi clearly highlights three key objectives Europe should aim to achieve in the years to come: innovation and technological leadership, energy decarbonization, and the reduction of strategic dependencies in an increas-

[a]Founder and director of the Luiss Hub for New Industrial Policy (LUHNIP), Assistant Professor at the LSE European Institute, ddicarlo@luiss.it.

[b]See the report by Enrico Letta, April 2024, "Much More than a Market, Speed, Security, Solidarity: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens." Available at: https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf.

[c]See the report by Mario Draghi, September 2024, "The future of European competitiveness – A competitiveness strategy for Europe." Available at, https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en#paragraph_47059.

ingly volatile global environment.

Many of the same long-term concerns raised in both the Letta and Draghi high-level reports are emphasized by Ursula von der Leyen's *Political Guidelines for the Next European Commission*[d] in her vision for *A Union that Strives for More*. Achieving the major ambitions of the European Green Deal, of bolstering competitiveness and economic security and achieving open strategic autonomy will require a major overhaul of Europe's industrial policy. This cannot but come in conjunction with significant investments in innovation, clean technologies, and green infrastructure—areas also highlighted by Draghi and Letta.

As Ursula von der Leyen begins her second term, these challenges and ambitions form the backdrop of LUHNIP's *EU Industrial Policy Report 2024*.

The EU Industrial Policy Report 2024

Building on this broader context, the report aims to contribute to the current discussion on the future of EU Industrial Policy by providing analyses, as well as viewpoints from different authors, on various dimensions of its past, current and future evolution. To this end, the LUHNIP EU Industrial Policy Report 2024 brings together contributions from a truly interdisciplinary team, composed by legal scholars, political scientists, political economists, economists, economic historians, company managers and policy practitioners to reflect on some of the major issues concerning EU industrial policy.

The report tackles four thematic pillars that we believe are key to implementing a new EU industrial policy, namely:

- The legal foundations and accountability of the changing EU industrial policy landscape.
- The governance of EU industrial policy and patterns of inter-institutional policy coordination.
- Intra-EU territorial inequalities and the spatial dimension of EU industrial policy.
- Sectoral industrial policies for open strategic autonomy and the twin transition.

Moving from these broader dimensions of EU industrial policy, the report offers thirteen thematic chapters, each aimed at tackling specific policy issues within the report's four thematic pillars.

More specifically, the report begins with a historical chapter which sets the current EU industrial policy momentum into a broader, diachronic perspective. Chapter one by Dimitri Zurstrassen and Sanne van der Lugt explores the lessons the European Union could draw from its past industrial policy failures and successes. The authors provide a birds' eye overview of some of the major EU industrial policy initiatives from the 1960s to 2019 – focusing particularly on Europe's struggles to compete with China, Japan and the United States in high-tech sectors. The authors argue that the EU's failure to adopt a coherent, long-term industrial strategy has led to significant foreign technological dependency, particularly in sectors critical to today's global competitiveness. To redress these unfortunate developments, the chapter calls for the creation of an inter-DG (Directorate General) task force within the European Commission to systematically analyze competitors' industrial policy strategies and identify strategic industries that need protection and investment. Additionally, the

[d] See, "A Union that strives for more: My agenda for Europe" by candidate for President of the European Commission, Ursula von der Leyen. Available at: https://commission.europa.eu/document/download/aa3bc4a8-50b7-425a-a81c-e7360e01a24d_en?filename=political-guidelines-next-commission_en.pdf.

authors recommend enhanced coordination between Member States and the creation of new EU industrial policy tools to bolster Europe's industrial base and mitigate its reliance on foreign actors and technology.

In chapter two, Paul Dermine and Maria Patrin examine the fragmented legal framework that governs EU industrial policy. While the EU's role in industrial policy is de jure limited to a supportive function, the authors argue that several adjacent policy fields—such as state aid, competition policy, and cohesion policy—can de facto be leveraged to craft a more integrated and effective industrial strategy. However, the lack of legal clarity and coordination between these fields undermines the efficiency of EU initiatives. Dermine and Patrin propose a revision of the EU Treaties to establish a truly shared competence for industrial policy. This would allow for the adoption of harmonizing measures and reduce the reliance on second-order legal bases. Additionally, the authors advocate for reforms to the EU's budgetary principles, including the development of debt-based fiscal capacities, to support the EU's long-term investment needs.

In chapter three, Sebastian Diessner and Christy Ann Petit tackle the issue of democratic accountability in EU industrial policymaking. As industrial policy decisions often involve complex trade-offs and have far-reaching distributive consequences, the authors argue that stronger parliamentary oversight is needed to ensure that these decisions are made transparently and democratically. The authors focus specifically on the role of the European Parliament, particularly the Industry, Research, and Energy (ITRE) and Economic and Monetary Affairs (ECON) committees, in scrutinizing industrial policy. Diessner and Petit recommend the creation of an ITRE-ECON working group tasked with conducting regular industrial policy reviews and issuing bi-annual reports. They also call for the adjustment of ITRE's mandate to include more dossiers related to competition policy, thereby strengthening the European Parliament's role in overseeing Member States' industrial policymaking.

In chapter four, Donato Di Carlo, Andreas Eisl, and Dimitri Zurstrassen focus on the growing fragmentation within the EU Single Market, driven by the increasing use of state aid by Member States in response to crises such as the COVID-19 pandemic and the energy shock following Russia's invasion of Ukraine. The chapter highlights the risk of subsidy races and market distortions as different Member States have been able to take advantage of the state aid regulatory flexibilities in different ways and to different degrees. The authors propose phasing out temporary crisis frameworks like the Temporary Crisis and Transition Framework (TCTF) by 2025 and consolidating state aid instruments into a more coherent regime based on a strengthening of the European approach (in particular the logic of IPCEIs). They also recommend creating a European Competitiveness Fund to co-finance industrial projects, ensuring that all Member States, regardless of their fiscal capacity, can contribute to and benefit from the EU's industrial strategy.

In chapter five, Daniel Mertens and Matthias Thiemann examine the role of the European Commission, the European Central Bank (ECB), and the European Investment Bank (EIB) in financing EU industrial policy. The authors argue that the lack of strategic coordination between these institutions has hampered Europe's ability to effectively support the green and digital transitions. To address these shortcomings, Mertens and Thiemann propose fostering closer cooperation between the ECB and EIB, suggesting that the ECB purchase EIB bonds to expand concessional loans for industrial projects. They also recommend establishing a European Industrial Policy Board that includes national ministries and engages in a feedback loop to facilitate the formulation and implementation of industrial policy. Finally, they advocate for the creation of a green credit register to support decarbonization efforts, aligning financial and industrial policies to achieve Europe's climate goals.

In chapter six, Dario Guarascio, Jelena Reljic, and Annamaria Simonazzi explore the risk of deepening economic divides between the EU's core and periphery. The green transition offers both opportunities and challenges, as wealthier Member States are better equipped to invest in green technologies, while poorer regions may struggle to keep up, exacerbating existing inequalities. The authors map the disparities in industrial structure, green technological capabilities, and energy dependency across EU economies, highlighting how the green transition could lead to further economic divergence within the EU unless targeted interventions are made. The authors propose large-scale EU-funded investments in key sectors such as public transport, particularly in lagging regions, and call for industrial alliances coordinated by the European Commission to ensure a fairer territorial distribution of economic resources. The chapter further recommends the introduction of place-based conditionalities in EU industrial policy interventions to direct investments toward vulnerable regions, helping to redress the EU's structural inequalities.

In chapter seven, Vassilis Monastiriotis and Tea Gamtkitsulashvili emphasize the need to take the territorial dimension of industrial policy seriously by better integrating EU industrial policy with the EU's cohesion policy. While cohesion policy aims at territorial, social, and economic cohesion, industrial policy has evolved into a strategy focused on innovation and global competitiveness. The authors highlight the significant differences in governance, fund allocation, and thematic priorities between these two policy areas, which often operate in isolation from one another. They propose a more "territorialized" industrial policy that considers regional disparities and allocates resources to areas lacking "excellence," while also advocating for a more strategic approach to cohesion policy that aligns it with the EU's broader industrial objectives.

In chapter eight, Filippo Bontadini, Valentina Meliciani, and Maria Savona examine the relationship between the EU's industrial policies and the twin transition toward a green and digital economy. Using an economic complexity approach, the authors analyze which EU countries are best positioned to develop a comparative advantage in green and digital products. They find that while large manufacturing countries like Germany and Italy are well-placed, smaller countries such as Sweden and Czechia also have strong incentives to specialize in these products. However, they caution that proximity to green and digital products is not enough to secure comparative advantage. The authors recommend a systemic approach to industrial policy that fosters technological ecosystems and complementarities between regions, ensuring that all Member States can benefit from the twin transition.

In chapter nine, Niccolo Durazzi, Patrick Emmenegger, and Alina Felder address the critical issue of skills shortages in the context of the twin transition. The authors argue that Europe's ability to achieve the twin transition depends critically on the development of appropriate human capital. While the EU has promoted various initiatives to address the skill gaps across the Member States, particularly in vocational education and training (VET), these efforts have been constrained by the EU's limited competence in education policy and resistance from national actors. The authors suggest that instead of aspiring for a unified European VET system, the EU should adopt a more place-based approach, supporting national VET models and facilitating the recognition of VET qualifications across Member States. They also recommend expanding STEM education in countries that are leading in green technology production, helping to bridge the skills gap.

In chapter ten, Maria Savona turns her attention to the digital realm of EU industrial policy, focusing especially on the governance challenges posed by emerging technologies like artificial intelligence (AI). Savona argues that the rise of digital automation technologies, particularly those reliant on data, has created significant

asymmetries between individual data subjects (consumers and workers) and large tech companies, platforms, and governments. These asymmetries are exacerbated by uneven access to digital infrastructure and disparities in data governance across EU Member States. Savona calls for stronger governance mechanisms for data sharing, both at the individual and business-to-business levels, and advocates for a more equitable distribution of digital infrastructure. She also highlights the need for further research and regulation to ensure that the EU's digital transition does not exacerbate already existing inequalities.

In chapter eleven, Alexandre Marin addresses the energy dimension of the twin transition of European industry, focusing on the EU's energy policy challenges in the context of decarbonization and strategic autonomy. The chapter highlights the structural vulnerabilities in the EU's energy policy, particularly its dependence on imported natural gas and the impact of high energy costs on industrial competitiveness. Marin calls for better coordination of national energy policies, the expansion of renewable and nuclear capacities, and targeted interventions to shield energy-intensive industries from rising energy costs. He also emphasizes the importance of developing flexibility instruments to support industries in managing energy price volatility.

In chapter twelve, Samuel B. H. Faure explores the evolving landscape of EU defense industrial policy in response to rising geopolitical risks, particularly in the wake of Russia's invasion of Ukraine. Faure argues that Europe must strengthen its defense industrial base to ensure strategic autonomy and reduce its reliance on foreign military technologies. He recommends creating a formal EU Council configuration for defense ministers, enabling more coordinated decision-making at the EU level. Faure also calls for a €100 billion investment plan in the defense sector, financed through Eurobonds, and emphasizes the need for the successful implementation of major armament programs to enhance Europe's military-industrial capabilities.

The report is concluded by chapter thirteen, where Paolo Guerrieri and Pier Carlo Padoan synthesize the key challenges facing Europe in terms of competitiveness and economic security. The authors argue that the EU must revitalize the Single Market, particularly in digital services, to remain competitive in the global economy. The authors also call for the establishment of a European Competitiveness Fund to finance common industrial policy initiatives and strengthen Europe's technological leadership. In the defense sector, Guerrieri and Padoan recommend pursuing greater autonomy in advanced technologies and production capabilities. To achieve these ambitious goals, they emphasize the need for substantial investments and coordination between national and EU-level policies.

As LUHNIP's director, I would like to express my immense gratitude to all the many colleagues who have authored the chapters and contributed to the report's realization. I would like to thank our funders, the Berlin-based think tank Dezernat Zukunft who have made possible the creation of LUHNIP in the very first place. Our gratitude goes also to the European Macro Policy Network (EMPN) for their constant support. I would like to thank Luiss Guido Carli and the Luiss Institute for European Analysis and Policy (LEAP) for hosting us. I am personally grateful to our LUHNIP colleagues Romain Cohen, Francesca Linardi, Giulio Petrillo, Serge Tseytlin, and Dimitri Zurstrassen for their hard work on assisting in the production of the report. Last but not least, I am highly indebted to Marco Simoni for his relentless support to our activities and constant personal encouragement.

1. Learning from the past? What should Europe learn today from its past industrial policy challenges?

Dimitri Zurstrassen[1] *& Sanne van der Lugt*[2]

Executive summary

This policy chapter analyses the evolution of the European Union's industrial policy in the face of foreign competition from the 1960s to 2019 and the lessons to be drawn from this experience. The first part analyses the different EU instruments in terms of industrial policy vis-à-vis those of Japan and the United States in the 1950s and 1960s. It shows that the deficiency of the EU's instruments compared to the two other economic powers during those decades led to a strengthening of the competitiveness of Japanese and US industries at the expense of European high-tech companies. At the same time, the absence of an EU-wide industrial policy at the time for those sectors led to significant foreign technological dependency of European companies. The second part of this policy chapter analyses the response of EU institutions to US and Japanese industrial competition from the 1970s to the 1990s and its impact on the competitiveness of EU companies. It demonstrates that the strengthening of horizontal instruments in the 1980s and the strategy of promoting open markets led to the substantial growth of manufacturing output but failed to sufficiently materialise in terms of technological innovation and productivity growth. The main reasons for this were the late adoption of EU industrial policy instruments to improve the competitiveness of high-tech sectors and the lack of investment of European companies in plants and equipment. Finally, the EU's horizontal and "open markets" strategy led to increasing foreign industrial and technological dependence of European companies. The third part of the chapter describes the EU's industrial policy strategy and assesses its results in the face of increasing Chinese industrial competition from 2000 to 2019. It shows that the pursuit of the EU's industrial policy strategy implemented during the 1980s and the 1990s did not enable European industry to meet the "Chinese challenge". The main factors explaining this failure are, first, the lack of an EU approach to identify the strategies of other industrial powers and their companies on a long-term basis. Then, the absence of EU-wide instruments for effective coordination between the Member States forced European companies to make "intelligent" investments to improve the competitiveness of the EU's industry. Finally, there are no effective tools at the EU level to efficiently mitigate foreign industrial and technology dependency. To solve these problems, we propose, first, to create an inter-DG task force to analyse competitors' strategies and identify strategic vital industry processes to develop and protect EU competitiveness. Then, we propose to mobilise investment for European industry and coordinate business strategies to authorise the Commission to issue opinions and grant loans to increase the investment of European companies based on the new task force's work. Finally, if the Commission continues to promote access to foreign markets and the fight against protectionist practices at a multilateral level, the institution should be able to automatically apply provisional reciprocity measures in the event of foreign protectionist actions. These reciprocity measures include the application of safeguard clauses and the blocking of problematic agreements between companies for EU economic security.

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1.1. Introduction

Today, there is a broad consensus among the various European economic and political actors that the European industry suffers from a major lack of competitiveness in the face of its two biggest competitors, China and the United States. In a recent report, BusinessEurope warned that the "European economy was falling behind given that in 2023 the EU GDP grew by 0,5% only vs 3,1% for the US and 5,2% for China" (BusinessEurope, 2024). In its latest report on Competitiveness and Industry, the European Round Table for Industry (ERT), for its part, called for Europe's business case to be rebuilt as a matter of urgency to avoid getting out of business (ERT, 2024). On the public institutions side, the European Commission expressed its concern in 2023 that "since the mid-1990s, the average productivity growth in the EU had been weaker than in other major economies."[3]

Many competitiveness indicators are in red: the EU is losing out on the latest technological developments that could enable its future growth in areas such as quantum computing, artificial intelligence and biotechnology.[4] It depends on imports of raw materials and products essential to the dual digital and environmental transition, such as lithium and semiconductors. It is also highly sensitive to fluctuations in the global energy market and suffers from a significant lack of investment in digital and environmental transition (Letta, 2024). Finally, European industry is overdependent on foreign advanced technology.[5]

To explain this situation, historical analysis is essential. It enables national governments and European institutions to understand the mistakes of the past and avoid repeating them. EU technological dependence and backwardness have been constant problems since the 1960s. The investment gap between the European industry and its main competitors was already highlighted by the Commission in the 1970s in strategic communications on industrial policy.[6] Finally, the issue of the current increase in competition from Chinese producers in advanced technologies driven by the outsourcing of European production and the Chinese aim to move up the value chain can be compared to the situation in the 1970s and 1980s when European producers had to face increased competition from Japan in strategic industries such as the automotive and high-tech sectors (Keck et al., 2013).

In this policy chapter, we will first describe the historical deficiencies of EU industrial policy governance[7] in comparison with its main competitors (Japan and the US in the 1960s to the 2000s and currently China and the US). We will then analyse how the EU responded to increased competition from these economic powers from the 1960s to today to assess the success and failures of the EU's industrial policy. Finally, we will provide, based on this analysis, policy recommendations for the new Von der Leyen II Commission.

1.2. A structural initial deficiency in the EU's industrial policy instruments in comparison with the Community/EU main competitors

Originally, EU policies in favour of European industries differed per industry, given the existence of different treaties. In the coal and steel industries, the ECSC High-Authority (absorbed by the EEC Commission in 1967) had broad powers of intervention under the Treaty of Paris (1951).[8] In addition to measures to manage the common market for steel and coal, it could also apply a series of interventionist measures such as drawing up yearly forecasting programmes, five-year general objectives and long-term orientation studies and granting investment loans to help companies in their growth strategies. Furthermore, in the event of a crisis, the Commission could apply mandatory production quotas and minimum prices. Finally, the Commission had the power to implement various research projects to foster steel technology and production but also to improve the working conditions of steelworkers. To apply these policies, the ECSC Treaty provided the Commission with own financial resources thanks to a tax levied on the production of crude coal and steel in the EU (Art. 49 ECSC).

[3] European Commission, COM(2023) 168 final, Long-term competitiveness of the EU: looking beyond 2030, 16 March 2023.

[4] Ibid.

[5] European Commission, SWD(2024) 77 final, First annual report on key findings from the European Monitor of Industrial Ecosystems (EMI), 14 February 2024.https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52024SC0077

[6] HAEC, COM(70) 100, La politique industrielle de la Communauté, 1970; HAEC, COM(78) Report on structural aspects of growth, 22 June 1978.

[7] In this policy chapter, the term "EU" will be used to refer to the various European Communities (ECSC, Euratom, EEC) in place until the entry into force of the Maastricht Treaty in November 1993 and the European Union to make the text easier to read.

[8] Traité instituant la Communauté européenne du charbon et de l'acier, 1951. https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=celex%3A11951K%2FTXT

For other sectors, except for the nuclear sector regulated by the Euratom Treaty, no such provisions to apply an interventionist EU industrial policy existed. The EEC Treaty made no explicit reference to the establishment of an EU industrial policy and contained no specific provisions on the subject. It was a legal text that established a framework for action that was flexible enough to adapt to the different economic approaches advocated by European governments (Noël, 1979, p. 33; Warlouzet, 2019, p. 81). As a result, industrial policy remained largely a national competence within the European Union until the onset of the economic crisis in the 1970s (Bussière, 2014; Warlouzet, 2008). Policies to promote national champions were pursued by the various Member States, with little coordination between them (Defraigne, 2004). At the same time, State aid was granted to European industry in the 1950s and 1960s and mergers between companies took place without strong control from the Commission (Zurstrassen, 2022, 2023; Warlouzet & Witschke, 2012). The European market remained nationally fragmented before the 1980's when the Commission made significant progress towards completing the common/single market (Bussière, 2014; Warlouzet, 2019b).

During the same period, Japan and the United States applied active industrial policies to strengthen the competitiveness of their national companies. In the first country, the MITI (Ministry of Trade and Industry) had broad powers of intervention. It could provide administrative guidance to influence the investments of Japanese firms, direct investment subsidies, accelerated depreciation, tax breaks and other incentives to selected industries (Johnson, 1982; Hart, 1992). At the same time, it could control all foreign exchange and imports of products and technology. Every foreign investor wishing to license the technology, share patents or acquire a share in a Japanese company had to receive approval from the MITI supervised Foreign Investment Committee (Vestal, 1995, p. 25; Flath, 2005, p. 196). Also, the MITI could order the creation of rationalisation cartels and industrial conglomerates financed by the State (Johnson, 1982; Hart, 1992). Finally, the Japanese industry could count on a large system of public banks to finance its investments. For example, the Japanese Development Bank, created in 1951 and under the supervision of the Ministry of Finance, could borrow funds, issue its own bonds and provide loans to national companies (Millestein & Zysman, 1983; Suzuki, 1988). These interventionist industrial strategies significantly boosted the competitiveness of Japan's basic industries in the 1950s and 1960s (steel, shipbuilding), followed by their high-tech sectors from the 1970s onwards (Hart, 1992; Krugman, 1986; Yonekura, 1994).

In the US, the industry could benefit from the intervention of the Department of Defence's public agencies and no legal restriction on public funding. The Defense Advanced Research Projects Agency (DARPA) and the National Aeronautics and Space Administration (NASA) developed key dual-technology projects which allowed for the significant development of US high-tech industries in the 1950s and 1960s (Dertouzos et al., 1989). Combined with the effects of scale, thanks to the existence of the world's largest domestic market, a very skilled workforce, and a high per capita income, the public agencies' intervention led the US high-tech companies to significantly increase their foreign direct investment and rapidly dominate the world market (Dertouzos et al., 1989). At the end of the 1960s, the US duopoly - IBM and Honeywell - dominated 70% of the European market and increased the number of their subsidiaries in the continent, leading the European industry to greatly depend, in the technological sector, on these companies.[9]

1.3. The partial failure of the attempt to catch up with the United States and Japan (1968-2010)

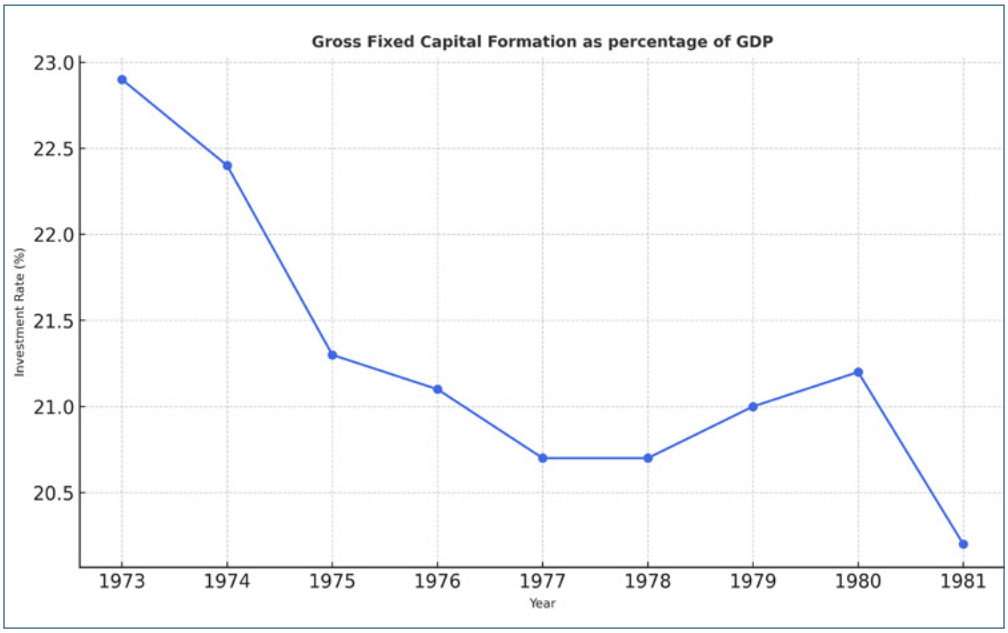
The intensification of foreign competition between the 1960s and the 1980s and the effects of the economic crisis on European industry led the EU institutions to formulate new industrial policy tools. From the mid-1970s, new research programmes, such as the multiannual framework programmes, ESPRIT (for the IT industry) or RACE (for telecommunications) programmes (Van Laer, 2007), were created. Unlike the Japanese and US programmes, these were open to companies from third countries, the only condition being that they had to operate in Europe.[10] At the same time, to fill the investment gap between Japan and the US, in 1978

[9] HAEC, COM(70) 100, La politique industrielle de la Communauté, 1970.

[10] HAEC, COM(79) 650, European Society faced with the challenge of new information technologies: A Community response,26 November 1979; HAEC, INV 15/2019 487, Note from F. Danis (Cabinet Davignon). Compte rendu de l'entretien de M. Davignon avec M. Maisonrouge le 25 janvier 1980, 29 January 1980.

the Commission created a "New Community instrument" to enable the institution to borrow up to a maximum of ECU 1 billion to finance investment projects enabling national economic policies to converge.[11] Initially focused on the infrastructure and energy sectors, in 1982 its use was extended to all productive investments.[12] In parallel, the acceleration of the completion process of the Single Market was promoted to increase the size of European companies and the level of their investment. Also, it led to the creation of standards at EU level, favouring preferential access to the Single Market for European firms (Zurstrassen, 2023).

Figure 1.1: Evolution in the rate of fixed investment (gross fixed capital formation/GDP in %) in the Community between 1973 and 1981)



Source : Zurstrassen, 2023.

The corollary of this strategy was the strengthening of EU competition policy. Special sectoral frameworks were adopted to make the granting of State aid to traditional industries (shipbuilding, steel, textile) conditional on enabling firms to make the necessary adjustments to increase their competitiveness. State aid for high-tech sectors was authorised in principle and subsidies for the promotion of R&D limited in intensity and at the pre-competitive stage (Zurstrassen, 2023). At the same time, there was intense action from the Commission to dismantle national monopolies in strategic industries such as telecommunications (Thatcher, 2001; Baskoy, 2008). Finally, protectionist trade policies were gradually abandoned in the 1980's in favour of policies more focused on the liberalisation of third-country markets and the fight against unfair competition at the multilateral level (Zurstrassen, 2023). This resulted in a reinforcement of an EU anti-dumping law and a favourable approach to all foreign direct investment due to the benefits they would bring in terms of creation of jobs and economic growth (Zurstrassen, 2023). Also, FDI control at the EU level or the collection of information on FDI in the EU was rejected to avoid accusations of protectionism from third countries.[13] It led the Japanese industry to invest in the building of plants in strategic industries, such as the automotive industry, in countries more open to FDI such as the UK.[14] The consequence was the EU's higher dependency on foreign actors for products and technology and the disappearance of existing national champions (Pardi, 2016).

The trend towards strengthening horizontal industrial policies and promoting a strategy of liberalising trade and strengthening competition policy continued within the European Union during the 1990s and 2000s. In line with the principles set out in its communications on industrial policy since 1990 and with the provisions of the Maastricht Treaty, the EU's actions in this area were to remain horizontal. They aimed to create a favourable regulatory environment for business and industry activities and to strengthen 'intangible' factors such as inno-

[11] JO L 298 of 25 October 1978, Council decision 78/870/EEC of 16 October 1978 empowering the Commission to contract borrowings in order to promote investment within the Community, 25 October 1978.

[12] JO L 78/19, Council Decision 82/169 of 15 March 1982 empowering the Commission to contract loans for the purpose of promoting investment within the Community, 25 October 1978.

[13] HAEC, BAC 44/ 04 307, Note from Alexis Jacquemin to President Delors. Bref bilan des premières réunions du GISE, 27 September 1990.

[14] HAEC, II/200/89, 1992 : Investissements étrangers et délocalisations, 1989.

vation and human capital (Zurstrassen, 2023). The consequence of adopting this approach was the decision to put an end to the ECSC treaty in the 1990s without creating new industrial policy tools to strengthen the competitiveness of EU industry (Zurstrassen, 2022; Cohen & Lorenzi, 2000). In terms of competition policy, the 1990s and 2000s saw the continuation of the strategy of tightening EU control on sectoral State aid, relaxing the loosening of the European discipline on the supervision of horizontal subsidies (aimed at promoting R&D, environmental protection, vocational training), but also in favour of SMEs (Dimitri Zurstrassen, 2023).

The results of the EU's industrial policy strategy between the second half of the 1970s and the beginning of the 2000s are mixed. If manufacturing output in the EU grew substantially in real terms from the 1990s to the 2000s,[15] in terms of investment in plant and equipment, the EU failed to catch up with the US in the 1990s in terms of technological innovation.[16] In addition, the gap in productivity growth widened with the US from the mid-1990s.[17] This was particularly due to the weak investment in ICT in the EU compared to the US and the strong performance of this sector in the latter country.[18] Also, if the restructuring policies of the basic sectors (shipbuilding, steel, textiles) and ECSC interventionist tools allowed these sectors to be more competitive in front of developing countries at the end of the 1990s, the dominant position of the Asian countries' industries in many segments of shipbuilding widened. Finally, the privatisation process led to an increasing dependence on the strategy of foreign actors like Mittal Steel with major consequences for European industrial facilities and employment in the 2000s and 2010s (Zurstrassen, 2022).

In the IT and electronic sectors, the share of the world market held by European companies in the sector and the trade balance for high technology products fell sharply between the second half of the 1980s and the 2000s.[19] Also, foreign technology dependency increased. One of the reasons for this is that the catch-up strategy initiated by the Commission in the 1970s and 1980s was implemented too late to be successful. This delay was caused by the Member States' opposition to transferring powers to the Commission in these strategic sectors and the rivalries between the European companies during the 1970s (Van Laer, 2010; Griset, 2019). When the EU succeeded in designing a comprehensive strategy for the high-tech sectors in the first half of the 1980's, the market was dominated by Japanese and US companies thanks to their industrial targeting strategies.[20]

In addition, the need for EU companies to rapidly acquire the necessary technology to face increased world competition in the sectors forced them to sign technological cooperation agreements with Japanese and US companies throughout the 1980s and 1990s, to the detriment of cooperation between EU companies (Jacquemin, 1991; Cohen & Lorenzi, 2000, p. 115). The latter were minor partners in most of those agreements, creating a high level of technological dependence, with an important risk for the EU's economic security and jeopardising the competitiveness of the European industry.[21]

While research programmes have made it possible to boost the competitiveness of European industry overall and increased cooperation between companies (Carocostas & Muldur, 1998), the technological investment efforts in the EU did not result in innovation and commercial success compared with the US and Asian economies (Muldur, 2000). In the telecommunications sector, the strategy of defining global standards is considered a success, since the GSM standard promoted by the Commission has been adopted globally (Eckert, 2024). However, the destruction of the historic national monopolies and the adoption of a strict approach in terms of merger policy led to a fragmentation of the market (Cohen & Buigues, 2014, p. 286).

[15] European Commission, SEC(2005) 1215, Annex to the Commission communication Implementing the Community Lisbon Programme, 17 October 2005.

[16] European Commission, COM(2002) 714 final, Industrial Policy in an Enlarged Europe, 11 December 2002.

[17] European Commission, COM(2002) 262 final, Annual economic review 2003.

[18] European Commission, Annual EU economic reviews 2001, 2003.

[19] European Commission, COM(2000) 6, Towards a European Research Area, 18 January 2000.

[20] HAEC, BAC 344/99 133, Background Note from Jean-François Marchipont. Conseil "industrie" du 15.10.1990, 9 October 1990.

[21] HAEC, DG XIII-1, Strategic Dependency and Corporate Alliances, 29 June 1990.

1.4. The European Union in the face of Chinese industrial competition: the same strategy for further deindustrialisation and technological dependency (2000-today)

1.4.1. The EU and the geopolitical changes of the 2000s: the mixed results of the horizontal and open industrial policy strategy

During the 1990s and early 2000s, liberalisation programmes continued in Europe. European leaders envisioned Europe as a knowledge-based economy with sustainable economic growth and more and better jobs.[22] This meant outsourcing the labour-intensive and dirty jobs in manufacturing. Call centre tasks and IT services were mostly outsourced to India because of the good command of the English language and low wages in India, and labour-intensive jobs were outsourced to countries with low wages in East Asia. India emerged as a global power in services, while China became 'the Factory of the World'. The EU promoted a trade policy strategy to open international markets and strengthen the multilateral system. The European Commission was one of the strongest promoters of the accession of China to the WTO in 2001, aiming to reduce their protectionist policies by complying with multilateral rules (Christiansen et. al., 2019).

The strengthening of the Chinese manufacturing base was the result of a long-term strategy to achieve industrial and technological self-sufficiency (Ling & Naughton, 2016). In 1978, Deng Xiaoping announced the "Open Door Strategy" to attract foreign capital and businesses. At first, most capital and businesses were from the neighbouring regions: Hong Kong, Macau and Taiwan. European companies that had outsourced their production to these regions before were attracted to this new low-wage country. First, it was for production for the home market, but when the Chinese economy started to flourish, western investors noticed the enormous potential of the Chinese consumer market. In exchange for access to the Chinese market, European firms were willing to share some of their technological know-how, firmly believing that Chinese firms would never catch up "because the Chinese were not innovative" (Abrami et al., 2014).

The rise of inward FDI significantly increased the competitiveness of Chinese companies, because Deng Xiaoping had introduced elements of capitalism without giving free rein to the market. He had seen in other countries that were forced to open their markets in exchange for IMF loans that foreign companies would quickly outcompete local companies. Therefore, foreign companies with advanced technologies could only start a business in China by establishing a joint venture with a Chinese company in which the foreign company could only have a minority share. This way, Chinese engineers could work closely together with foreign engineers and acquire new knowledge. The moment a Chinese firm managed to develop a similar product, the Chinese government forced Chinese firms to buy the locally produced product and made it expensive to import similar foreign products (Arthur R. Kroeber, 2016). This copycat strategy helped Chinese companies to leapfrog and to avoid foreign firms taking over the Chinese market. Deng Xiaoping combined some elements of capitalism with a socialist planning strategy through the implementation of five-year plans (in effect from four years after the establishment of the People's Republic of China in 1949 to now) and the granting of large subsidies to promote the domestic industry. This opening-up strategy in combination with state planning and state support led China to become the most important supplier (by value) of textiles and clothing to the European Union in the 1990s[23] and the world's largest steel producer (In der Heiden, 2013). The moment Chinese companies were able to compete with foreign companies, the market was opened for wholly foreign-owned companies (Carlo Fischione et al., 2024; Sanne Van Der Lugt, 2018).

[22] European Council, Conclusions of the Lisbon European Council, 23 and 24 March 2000.

[23] European Commission, General report on the activities of the European Union 1995, 1996. https://op.europa.eu/en/publication-detail/-/publication/b0879619-0be3-4a3e-af29-5cec7e99c5c3/language-en

After 5 years of implementation, the Lisbon Strategy did not deliver the expected results. The employment rates in the EU, even if they increased during the decade, remained below the targets set. Labour productivity also did not increase to the expected levels because of weak investment and a slow factor productivity growth rate.[24] Some of the major problems with this strategy were the existence of too many targets, their voluntary nature and conflicting priorities (Kok, 2004: 6). At the same time, the Single Market remained fragmented due to the general "single market fatigue" in the 2000s (Monti, 2010). Finally, in the automotive sector, national industrial policy and specific companies' choices led the EU industry to keep combustion engines, while CO2 emissions targets defined in 1999 were not reached (Klebaner and Ramirez-Perez, 2022: 316; Rugraff, 2019).

1.4.2. The 2010s: an EU industrial policy strategy ill-suited to the Chinese expansionist industrial policy strategy

The effects of the 2007-2008 world economic and financial crisis on European industry and the rising competition from emerging economies posed a new challenge to the EU's industrial policy strategy. The economic downturn led to a significant decrease in demand and the EU's industrial production.[25] Towards the end of the 2000s, emerging economic powers like Brazil, China and India were closing the gap with industrialised countries in terms of productivity and innovation. China, in particular, significantly increased its shares in high-skill industries and its exports of these products to the EU during that period.[26]

The EU's response to these challenges was the Europe 2020 strategy adopted in 2010. Like the Lisbon Strategy, it contained various non-legally binding targets to be transposed into national objectives.[27] These were to be achieved through the application, as before, of horizontal industrial policy measures, a strict sectoral State aid policy control and an open trade policy strategy. Priority industrial sectors for EU intervention were defined in the first half of the 2010s to which horizontal measures were to be applied.[28] New funds, like the European Fund for Strategic Investment (EFSI), were also created to increase the level of investment of companies after its decrease during the economic and financial crisis. However, these funds mobilised only existing EU funds. The EFSI, for example, mobilised small available resources from the EU budget (€16 billion) and the EIB's funds (€5 billion), which were to attract €300 billion in additional investment.[29] Even when the objective set was achieved in 2018,[30] the amount of mobilised investment was insufficient to cover the needs for the dual transition and the strengthening of the competitiveness of European industry (Sapir et al., 2014; Rubio, 2016).

The contrast between the EU's industrial policy strategies and the tools used by the Chinese government at the time is striking. In China, a global industrial strategy was designed since the global economic and financial crisis to alleviate its effects on Chinese firms and reach industrial and technological sovereignty. It included, first, measures to stimulate investment after the financial crisis: a RMB ¥4 trillion (+- €500 billion) stimulus package. This provided Chinese companies with experience in realising large-scale infrastructure projects, but it also led to the creation of large industrial overcapacities. To deal with this problem, among other solutions, the Chinese government launched in 2013 the One Belt, One Road Initiative (BRI) (which later became the Belt and Road Initiative (BRI)), allowing the country to deploy some of that excess capacity abroad. The aim was also for China to strengthen ties with the neighbouring countries tempted by closer cooperation with the EU and the USA.

The Made in China 2025 (MIC2025) strategy, launched in 2015, for its part, aimed to transform the country from being the 'Factory of the World' (producing cheap, low-quality goods due to lower labour costs and supply chain advantages) to an 'innovation-driven' production of higher-value products and services (Dufour, 2019). To achieve this, the Chinese government selected key technologies and industries to focus its policies on. High-tech companies in these industries received tax benefits, and the state funded R&D and encouraged mergers and acquisitions of foreign technology firms in these industries. The ambitious objective of MIC2025 is to ultimately conquer foreign markets globally (Defraigne, 2022; Dufour, 2019).

[24] European Commission, COM(2006) 697 final, European competitiveness report, 2006.

[25] European Commission, COM(2010) 614 final, An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage, 28 October 2010.

[26] European Commission, European Competitiveness Report 2009, 2009.

[27] European Commission, COM(2010) 2020 final, Europe 2020. A Strategy for Smart, Sustainable and Inclusive Growth, 3 March 2010.

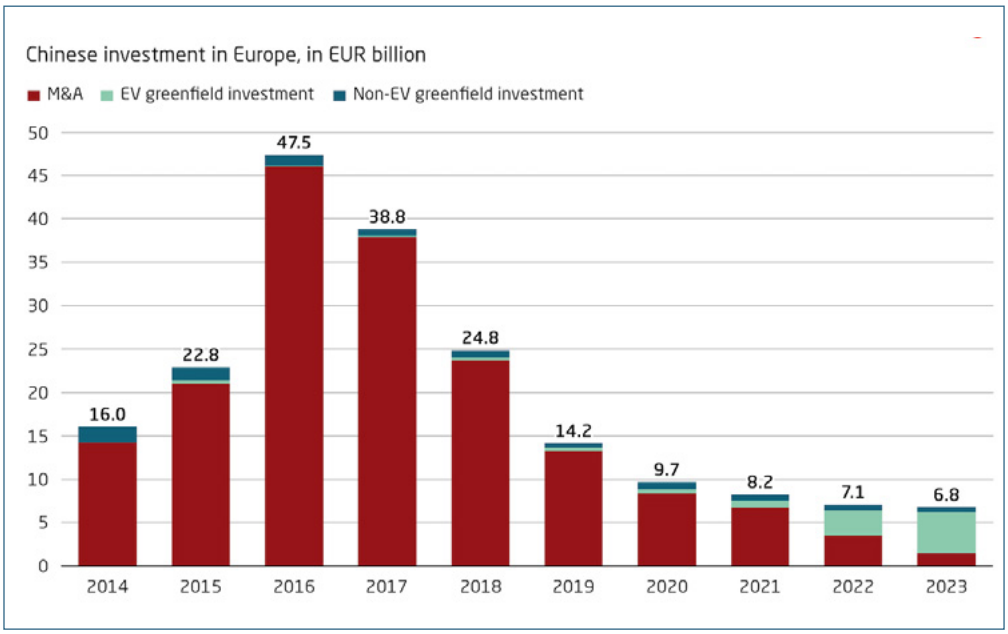
[28] European Commission, COM(2012) 582 final, A Stronger European Industry to Drive Growth and Economic Recovery,10 October 2012.

[29] European Commission, COM(2014) 903 final, An investment plan for Europe, 26 November 2014.

[30] https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4469

This Chinese expansionist industrial strategy led to a significant rise in Chinese FDI in the EU. While European investment flows into China historically outpaced Chinese outbound flows, the tide has turned rapidly since 2014.[31] In 2018, Bloomberg reported that, according to their research, approximately 360 European companies had been taken over by Chinese firms between 2008 and 2018, from Italian tire maker Pirelli & C. SpA to Irish aircraft leasing company Avolon Holdings Ltd.[32] By 2018, Chinese entities also partially or wholly owned at least four European airports, six seaports, wind farms in at least nine countries and 13 professional football teams.[33] In 2016, greenfield Chinese investment in the EU was more than four times higher than European FDI in China. But the share of Chinese FDI in Europe, at 2.2 per cent, remained low relative to the United States' 38 per cent and Chinese investments in Europe rapidly declined after their peak in 2016.

Figure 1.2: Chinese investments in Europe, in EUR billion



Source: Rhodium Group & MERICS, 2023[34]

The peak in 2016 can be explained by the financial crisis and the political responses to it in Europe. In Southern Europe, Chinese companies have leveraged the economic crisis and its consequences to focus on large-scale privatisation processes and post-crisis restructuring. In Western Europe, Chinese investors targeted struggling tech companies and research and development networks.[35] According to a study by the Bertelsmann Foundation, 64 per cent of the German companies sold to China between 2014 and 2017 belonged to the sectors prioritised by the MIC2025 strategy (Jungbluth, 2018, p. 17).

[31] See "China Going Global Investment Index 2015", Economist Intelligence Unit, available at: https://www.eiu.com/public/topical_report.aspx?campaignid=chinaodi2015

[32] See "China's Empire of Money Is Reshaping Europe", Bloomberg, available at: https://www.bloomberg.com/graphics/2018-china-business-in-europe/

[33] See "China's Empire of Money Is Reshaping Europe", Bloomberg, available at: https://www.bloomberg.com/graphics/2018-china-business-in-europe/

[34] https://merics.org/en/report/dwindling-investments-become-more-concentrated-chinese-fdi-europe-2023-update

[35] See "Mapping China's Investments in Europe", The Diplomat, 14 March 2019, available at: https://thediplomat.com/2019/03/mapping-chinas-investments-in-europe/

Table 1.1: List of acquisitions of strategic EU companies by Chinese firms (2010-2020)

Year	Sector	EU Company Acquired	Chinese Firm	Share
2012	Car industry	NEVS	SAAB	100%
2013	Defense	Ziegler GmbH	CIMC	100% The Chinese State owns 54 percent of the shares of CIMC.
2015	Semiconductors	RF Power Division	Beijing Jianguang Asset Management Co., Ltd (JAC)	100% acquired for $1.8 billion
2015	Semiconductors	Bipolar Power Device (RENESAS)	Beijing Jianguang Asset Management Co., Ltd (JAC)	Joint control
2016	Robotics	Kuka	Midea	100% since 2022
2017	Semiconductors	Standard Products Division	JAC, Wise Road Capital	100% (division)
2017	Agriculture	Syngenta	ChemChina	100%
2018	Semiconductors	Nexperia	Wingtech Technology partially state-owned Chinese company.	100%
2018	Car industry	Daimler Benz (Daimler AG)	Zhejiang Geely Holding Group's (owns already Volvo and Lotus)	Stake=10%
2024	Car industry	OSA Peugeot Citroen	Donfgeng Motor Group	14%

Source: LUHNIP's elaboration based on authors'research.

The combination of China's industrial policies since 1978 (forced joint ventures with Chinese firms, forced to buy homegrown, stimulating Chinese companies to acquire advanced technology by buying foreign companies and to invest heavily in R&D for strategic technologies) also enabled its companies to advance rapidly and outpace Europe and the US in most strategic technologies (Australian Strategic Policy Institute, n.d.). Good examples of industries in which Chinese companies made rapid advances and outperformed EU and US companies are: telecom equipment, electric vehicles, V2X, MRI, and solar panels (Carlo Fischione et al., 2024; Hyun Jin Julie Yu et al., 2014; Sanne Van Der Lugt, 2018; Sanne Van Der Lugt et al., 2023).

1.5. Conclusions and policy recommendations

The analysis of the evolution of the EU's industrial policy strategies in the face of external competition from the 1960s to 2019 provides several lessons for the future. First, the strategy to rely, essentially, on EU companies' strategies and indicative and voluntary targets for the adaptation of Member States's industrial policies did not allow European companies to sufficiently improve their competitiveness to mitigate foreign competition. History shows that the EU needs a long-term industrial strategy based on the strengthening of horizontal industrial policy tools, but also the implementation of a "smart planning" strategy to allow for the twin transition of its companies and reduce industrial and technological dependence.

To solve this problem, we first recommend the European Commission to set up an inter-DG task force to track the evolution of industrial strategies of the main economic powers' companies and governments. This task force should analyse the strategies announced by the global economic powers and identify the strategic and vital industry processes in the EU that need to be protected and supported. Furthermore, this task force should especially identify what the big powers need from the EU (for example: EUV and DUV-machines from ASML, TNT from Poland, etc.), so that the EU knows what to protect and how to strengthen its negotiation position in cases of trade disputes.

At the same time, the EU should strengthen its industrial policy tools to be able to compete with China and the US. Our analysis shows that the lack of investment in strategic European industries has been a recurrent problem since the 1970s that has never been completely solved. The urgent need to mobilise investment for European industry to meet the current challenges (Draghi, 2024) should not only be resolved with market-based solutions (the creation of a Capital Markets Union), but also by strengthening the coordination of the companies' investment strategies and the public financial instruments at the EU level. The ECSC model, which provided for the Commission to give its opinion on companies' investment projects and helped to fund them based on five-year EU industrial policy objectives, should be a source of inspiration to face today's challenges. Just like EU national governments and the EU's economic competitors, the European Commission should be able to subsidise European industries with the creation of new own resources or the reinforcement of the EU budget, which would allow the EC to achieve EU-wide objectives, reach the necessary level of investment and avoid the fragmentation of the Single Market. The possibility for the Commission to issue opinions on company investments (non-binding but conditional on European funding) based on the work of the new intra-DG task force would make it possible to avoid investments not meeting the EU objectives.

Finally, if it is essential for the EU to continue to promote open markets and multilateral solutions, it should apply the reciprocity principle more consistently when competitors adopt interventionist industrial and protectionist trade policies. The EU's current open strategic autonomy scheme to remain "open but act autonomous if necessary"[36] must be rigorously applied to avoid the deindustrialization and greater external dependency of European industries. To achieve this objective, we propose the application of automatic safeguard clauses by the European Commission on foreign imports when the EC perceives a risk of unfair competition. Further action or the cancellation of action will then have to be confirmed as quickly as possible by the European Commission and the Council of the EU.

[36] European Commission, COM (2021) 66 final, Trade Policy Review – An Open, Sustainable and Assertive Trade Policy, 18 February 2021.

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2. Legal Foundations for a New EU Industrial Policy

Paul Dermine[37] *& Maria Patrin*[38]

Executive Summary

The legal framework of industrial policy under the EU Treaties is disunited. The EU's competence in the industrial field is of a mere supportive, complementary nature and several primary law principles fundamentally inhibit the pursuit of activist industrial policies in Europe. However, this weak competence is supplemented by a number of resources and legal bases which formally belong to distinct, neighbouring policy fields (such as state aid and competition policy, the EU budget, cohesion policy or economic governance), but can be mobilized to support supranational initiatives and bring about an autonomous EU industrial policy. In our view, this fragmented legal framework creates issues of consistency and coordination, which undermine the overall efficiency and legitimacy of EU industrial policy. Furthermore, in the absence of dedicated EU competence, mobilised second-order policies only partially fulfill their aim and do not allow for the pursuit of an integrated EU industrial policy agenda. On the basis of the analysis undertaken in this chapter we present four main recommendations to strengthen the legal premises of a supranational EU industrial policy, combining policy-related and funding-related aspects. In the framework of a revision of the Treaties we advance two different suggestions. First, we propose to create a truly shared competence for industry: industrial policy would be moved from Art. 6 to Art. 4(2) TFEU and Art. 173 TFEU would be amended to allow for the adoption of harmonising measures. The principle of pre-emption would regulate the relationship between the EU and the national level. There would be less of a need to resort to second-order legal bases. Second, we suggest adjusting the current principles which constrain the development of new budgetary instruments: the development of ad hoc, debt-based fiscal capacities and the emergence of a permanent EU fiscal capacity would require an amendment of the principle of budgetary balance, enshrined in Article 310(1) TFEU. Within the current legal framework, we propose: to leverage a reformed cohesion policy to conduct an EU-led and place-based industrial policy (under a cohesion policy legal basis EU legislation could regulate the rules and criteria for the allocation of funding, while the choice of projects to be financed would be identified at the local level, similar to cohesion funds and to NGEU); and to exploit the full potential of supranational funding through the EU budget (existing financial flexibilities under the current MFF could be placed at the service of the Union's industrial strategy). Such an increase of the EU budget could occur via extended national contributions or the creation of new own resources.

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2.1. Introduction

Despite the relative openness and flexibility of the original Treaties as to the type of economic policies the Member States and the EU can pursue, the subsequent evolution of EU law has consecrated a political-economic model under which space for activist industrial policies has become quite restricted. Four constraining factors can be identified. First, from the 1980s onwards, the EU has developed a fairly rigid state aid control regime limiting vertical interventions of Member States in their economies. Second, the competition principle has progressively gained an overarching status in the EU, which has, among others, materialized in the liberalization of public monopolies and stringent merger control, preventing the emergence of "European champions". Third, free movement, which the EU has fully embraced both internally (with the internal market) and externally (with a liberal trade policy), has further constrained Member States' ability to protect and support their industries and economies against foreign pressures. Last but not least, the architecture of the euro negotiated in Maastricht, and its focus on stability, its market orientation and its rules-based nature, have further constrained the space for proactive industrial policies in Europe, not only by limiting the Union's economic and budgetary powers under the EMU, but also by subjecting national public finances to stringent rules. In a nutshell, the neoliberal turn in Europe, the rise of the Regulatory State, combined with the political difficulties and sovereignty concerns associated with further fiscal integration and redistribution in the Union, have produced a rather hostile political and legal landscape for market activism and integrated industrial policy in Europe.

Originally, the Treaty establishing the European Economic Community did not contain any provisions explicitly devoted to industrial policy. Starting from the 1970s, however, international competition and the challenges of globalisation prompted a more interventionist attitude. With the revision of the Treaty of Maastricht a competence for industrial policy was created (currently Art. 6(b) TFEU) and a corresponding article inserted in the Treaties (currently Art. 173 TFEU). Art. 6(b) and Art. 173 TFEU however assign a so-called "weak competence" to the EU in the field of industry, whereby the Union can only "carry out actions to support, coordinate or supplement the actions of the Member States" and any harmonisation of Member States' laws or regulations is ruled out. Art. 173 TFEU provides a list of industry-related actions that both the Union and the Member States shall aim at, including: adjustment to structural changes; fostering a favourable environment for the development of and cooperation between undertakings, especially SMEs; fostering innovation, research and technological development. In these sectors the Union can adopt legislation through the ordinary legislative procedure, but those acts cannot entail harmonising measures nor lead to a distortion of competition" (173(3) TFEU). Although the use of Art. 173 TFEU as a legal basis for legislation is rather limited, it has in the past allowed for the adoption of acts in the field of cultural industry and information society[39] and in support of SMEs.[40]

In addition, Art. 173.3 TFEU also establishes that "the Union shall contribute to the achievement of the objectives set out in paragraph 1 through the policies and activities it pursues under other provisions of the Treaties". It foresees a broader action for the Union under other related competences whereby harmonising measures can be adopted. Thus, to a weak "official" competence in industrial policy the Treaties flank a number of second-order harder competences that allow Member States to regulate some aspects of it. Some of these provisions can be seen as constraining the space for EU and national industrial policy. Competition policy, state aid and trade policy aim to stimulate a market-based development of EU industries while inhibiting active intervention by public authorities. EU economic policy also tends to curtail the choices of Member States in the field of industrial policy through budgetary constraints. Other Treaty provisions on cohesion, research, development and innovation policies, conversely, provide for active support to industrial development, acting on the framework conditions that could stimulate it. Most recently, interest for such industry-supporting legal bases has intensified, spurred by several internal and external factors, such as the eurozone crisis, the transition towards an environmentally sustainable economy, aggressive competition from external trade partners and, last but not least, the pandemic and the war in Ukraine.

[39] Decision No 1041/2009/EC of the European Parliament and of the Council of 21 October 2009 establishing an audiovisual cooperation programme with professionals from third countries (MEDIA Mundus).

[40] Decision No 1639/2006/EC of the European Parliament and of the Council of 24 October 2006 establishing a Competitiveness and Innovation Framework Programme (2007 to 2013).

The next section of the report analyses these second-order legal provisions and resources that can be leveraged to bring about EU-wide industrial initiatives.

2.2. Beyond Article 173 TFEU: Second-order legal resources for EU industrial policy

This section examines second-order legal bases, i.e. Treaty provisions which, although not directly devoted to industrial policy, can be mobilized to bring about industrial initiatives in the EU. In turn, we examine (i) internal market provisions, (ii) state aid policy and the EU budget, and (iii) economic and cohesion policy.

Table 2.1 Second-order legal bases for industrial policy

Constraining legal bases		Enabling legal bases	
Art. 107 TFEU	A rigid state aid control regime	Art 114 TFEU	Harmonising measures under the internal market
Art. 101-103 TFEU	The competition paradigm	Article 107(3)(b) TFEU	The EU budget and state aid exemptions
Art 26 TFEU and ff	Free movement under the internal market	Art 121 TFEU	Economic policy & the European Semester
Art. 119 TFEU and ff; Art. 310(1) TFEU	EMU and the Maastricht consensus	Art 174-175 TFEU	Cohesion policy
Art 207 TFEU	Trade policy	Art. 179 TFEU and ff.	R&D and innovation policies

2.2.1. Internal Market

As noted, Art. 173 TFEU excludes the harmonisation of national legislation as well as any action that could jeopardise the internal market. Yet, the internal market has historically also provided the legal framework to adopt measures that indirectly or directly affect industrial policy and increase the competitiveness of European industries in specific sectors. The objective to promote and protect the EU internal market has recently become a leverage for strengthening the EU's industrial policy, especially in the wake of 'structural changes', such as climate and technological transitions and increasing unfair international competition. In the framework of the European Green Deal, Art. 114 TFEU - the internal market provision that allows for the adoption of harmonisation measures - provides the legal basis for the Commission proposal for the European Net Zero Industry Act.[41] Similarly, pressures coming from a challenging geopolitical and international trade environment have led to further industrial policy initiatives at the EU level. The notion of "open strategic autonomy" has redirected EU trade policy towards the need to ensure the resilience of the internal market by alleviating trade dependencies. In this context, the European Commission has identified 'sensitive ecosystems' (such as health, aerospace and defence, electronics, renewables, digital, or energy-intensive sectors) requiring the development of internal capacity, and brought forward legislative initiatives based on Article 114 TFEU, such as the European Chips Act, providing for harmonising measures for the semiconductor ecosystem, or its proposal for a Regulation on Critical Raw Materials.[42]

[41] Proposal for a Regulation of the European Parliament and the Council on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act), COM/2023/161 final.

[42] Regulation (EU) 2023/1781 of the European Parliament and of the Council of 13 September 2023 establishing a framework of measures for strengthening Europe's semiconductor ecosystem and amending Regulation (EU) 2021/694 (Chips Act); Proposal for a Regulation of the European Parliament and the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020, COM/2023/160 final.

Increasing recourse to internal market provisions to adopt industry-related legislation marks an interesting shift compared to the precedent market-oriented and neoliberal approach. Provisions that were typically used to foster market-enhancing and negative integration are increasingly repurposed as market-correcting measures. The necessity to reconfigure the balance between free market competition and support for EU industries emerges clearly as one of the priorities for the future, and stands for instance at the core of Enrico Letta's recent report on the future of the Single Market (Letta 2024).

2.2.2. State aid & the EU budget

Beyond regulation, funding can be another crucial channel to shape and support industrial strategies. Financial space to fund industrial policy in Europe has historically been quite restricted, a result of rigid state aid and fiscal policy rules inhibiting national support, combined with a limited and constrained EU budget. Over the past few years, the EU has however been quite active in developing new ways to pay for its industrial policy both at the national and supranational level.

When it comes to the national level, we are witnessing a structural reorientation of EU state aid control towards a general relaxation of the rules to support national investment and aid in favour of strategic industrial sectors. Most notably, the Commission has adopted its Temporary Crisis and Transition Framework.[43] As a major component of the Union's Green Deal Industrial Plan for the Net-Zero Age,[44] the framework, which is valid until the end of 2025, seeks to simplify and accelerate the granting of targeted aid for renewable energy deployment, decarbonizing industrial processes and the production of strategic net-zero technologies. As a direct response to the American IRA, it also opens the possibility for Member States to match aid and subsidies offered by third countries. Along similar lines, the Commission has also sought to ease and incentivize the provision of aid to so-called 'important projects of common European interest' (IPCEI) under Article 107(3)(b) TFEU - a provision present in the Treaties since the establishment of the European Economic Community in Rome in 1957 but barely used afterwards.[45]

EU industrial policy cannot and must not solely rely on national financial support. Considering that national budgetary spaces for state aid and fiscal support diverge greatly,[46] such a situation could jeopardize the equity and integrity of the Single Market, hurt smaller and poorer Member States, and put Member States against one another in an unintended subsidies race. There is thus a principled need to complement national resources with new supranational capacities through the Union's budget to compensate for national disparities.

Yet, the EU budget has historically been a limited and constrained policy tool. While its initial supportive role to European industries should not be overlooked, it has long lacked both the critical mass and the reactivity to bring an ambitious and self-standing EU industrial policy to life. Important initiatives have however been undertaken over the past few years, substantially boosting the Union's financial firepower and endowing it with the means to fund and develop autonomous industrial initiatives. First, the EU has sought to free new budgetary margins within its ordinary budget by expanding programmes devoted to industrial policy (such as Horizon Europe, the Innovation Fund or InvestEU) and by ensuring better coordination and agility (most notably through the STEP platform). More decisively, the post-pandemic recovery plan, NextGenerationEU, has transformed EU public finances and opened new possibilities. Its main operational channel, the Recovery and Resilience Facility (RRF) and the model it embodies, i.e. an *ad hoc*, debt-based fiscal capacity dedicated to the implementation of EU policies (such as industrial policy), now forms an integral part of the Union's toolkit and could be mobilized again, in other contexts and for other purposes. This is, in a way, already happening. With RePowerEU, the EU has repurposed portions of NGEU monies to support reforms and investments in favour of energy security, autonomy and efficiency. Pending proposals offer to replicate the NGEU model and enable new supranational borrowings

[43] Consolidated text: Communication from the Commission Temporary Crisis and Transition Framework for State Aid measures to support the economy following the aggression against Ukraine by Russia (available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX-%3A02023XC0317(01)-20231121). The Framework prolongs and amends the Temporary Crisis Framework adopted in the aftermath of Russia's war on Ukraine to enable Member States to support their economy (available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX-:52022XC1109(01)&from=EN).

[44] Communication from the Commission to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions "A Green Deal Industrial Plan for the Net-Zero Age", COM(2023) 62 final (available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX-:52023DC0062).

[45] See Communication from the Commission, Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (2021/C 528/02) (available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC1230(02). For an updated list of approved IPCEI, see the official website: https://competition-policy.ec.europa.eu/state-aid/ipcei_en.

[46] See European Commission, State Aid Scoreboard 2023 (available at: https://competition-policy.ec.europa.eu/document/download/0b2037c5-c43f-4917-b654-f48f74444015_en?filename=state_aid_scoreboard_note_2023.pdf).

[47] See Commissioner Thierry Breton, "A European Sovereignty Fund for an Industry 'Made in Europe'", Statement, 15 September 2022, available at: https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_5543.

supporting EU action in various policy areas, including industrial policy. The aborted project of a Sovereignty Fund, put forward by Commissioner Breton in September 2022 to boost investment in strategic sectors, is one example.[47] Along similar lines, Von der Leyen's political guidelines for the next Commission propose the creation of a (still rather vague) European Competitiveness Fund, which would support investments in strategic technologies.[48]

2.2.3. Economic policy & cohesion

Contemporaneously, and as a direct consequence of the COVID-19 pandemic and the adoption of NGEU, EU economic policy and cohesion policy are undergoing profound mutations. Their reach has widened to encompass industrial issues. They are thus increasingly central legal resources for stronger EU action in the industrial field.

While the EU's competence in economic policy remains one to coordinate (Articles 5 and 121 TFEU), the establishment of the European Semester after the Eurocrisis, combined with a consolidated Stability and Growth Pact, have greatly strengthened EU economic governance, expanded its material scope, and turned it into an increasingly effective system for controlling and co-directing national fiscal and economic choices. As a result, the EU economic governance framework both supports and constrains the enactment of industrial policy at the level of the Member States. It constraints it because it limits the Member States' leeway in fiscal policies through their adherence to the Growth and Stability Pact and through the Macroeconomic Imbalanced Procedure. By the same token, the coordination and monitoring within the Semester is a leverage for reforms that can boost industrial competitiveness and increase the convergence of the Member States' economic performance.

Economic convergence has also been the key driver for the development of the EU's cohesion policy, aiming at reducing disparities between the economic conditions of the European regions. The advantage of cohesion policy is that it combines EU-driven financing with a bottom-up approach to industrial development that builds upon local needs. Furthermore, its broad thematic reach ('economic, social and territorial cohesion', following Article 174(1) TFEU), lends itself to mobilising funding strategically and flexibly, also in support of the Union's industrial priorities. Recently, we have been witnessing a renewed interest in the potential of cohesion policy to act as a driver of industrial development. Since the 2014-2020 cycle EU Cohesion Policy has integrated industrial policy concerns requiring the adoption of Smart Specialisation Strategies (S3) as ex-ante conditionality requirements for the disbursement of funds. During the pandemic, cohesion policy provided the main tool for allocating NGEU funding. The RRF, the new budgetary programme dedicated to the implementation of NGEU and the disbursement of its funds, was adopted on the basis of Article 175(3) TFEU. Although the RRF has conveyed funding to investments and reforms in broad priority areas, these priorities include some key factors of innovative industrial policy, such as green and digital transition, productivity, competitiveness, research, development and innovation. Given the unprecedented amount of funding available under NGEU, it can be considered a substantive contribution to the inception of an EU-driven industrial policy, which could be reproduced in the future, either under the next MFF 2028-2034, in the context of a reorientation of cohesion policy, or under other *ad hoc* fiscal capacities. In fact, cohesion policy is currently undergoing a revamping process that is heading in the direction of a more holistic approach to cohesion as a driver of economic growth in the EU as a whole.[49] In other words, from a purely "regional" perspective, cohesion policy is increasingly becoming an "economic" policy, which, in addition to targeting vulnerable regions and regional convergence, is actually aiming at higher levels of economic and social development across the EU.

[48] See Ursula Von der Leyen, 'Europe's choice – political guidelines for the next European Commission 2024-2029', 18 July 2024, p. 12, available at: https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf

[49] For more information, see the European Commission's official website: https://ec.europa.eu/regional_policy/policy/how/future-cohesion-policy_en

2.3. Assessment

The status of industrial policy under the EU Treaties is inherently ambivalent. On the one hand, primary law comprises a number of principles and regimes which fundamentally inhibit the pursuit of activist industrial policies in Europe. Moreover, if the Treaties confer prerogatives to the EU in the industrial field, this competence is of a mere supportive, complementary nature. On the other hand, this weak competence is supplemented by a number of resources and legal bases which formally belong to distinct, neighbouring policy fields (such as state aid and competition policy, the EU budget, cohesion policy or economic governance), but which can be mobilized (and increasingly are) to support supranational initiatives and bring about an autonomous EU industrial policy. It is thus a disunited legal configuration, which offers genuine opportunities for action, but also fails to provide a clear and fully consistent allocation of responsibilities.

In our view, such fragmentation entails a number of risks and challenges. Most notably, it creates issues of consistency and coordination, which undermine the overall efficiency of EU industrial policy. Such inconsistency is first and foremost institutional. The various abovementioned legal bases rely on different institutional and procedural arrangements, which are not aligned. State aid policy and competition policy are to a very large extent solely in the hands of the European Commission, whereas the mobilisation of the internal market, cohesion policy or the EU budget for industrial purposes requires legislative procedures that involve the whole EU institutional apparatus. In such a constellation, interests, policy preferences and veto structures will not always be aligned, and this may undermine the overall consistency of policy action. For example, six small Member States led by Sweden recently called to end the Temporary Crisis and Transition Framework, which in their view risks fragmenting the Single Market, and to return to stricter state aid control.[50]

Fundamentally, the Treaties reflect an ideology which has been dominant for several decades but which has also been shifting following some recent developments (pandemic, war in Ukraine, international trade). The challenges affecting the EU industrial policy are thus partly political and partly legal. Politically, the choice in favour of a supranational EU industrial policy (or of a more interventionist national industrial policy) is not fully accomplished. We are still in the middle of an ideological evolution that revisits the key principles of free competition and of the internal market in the light of new imperatives. Legally, the Treaties provide a framework which is both flexible and rigid. It offers several options to achieve industrial policy objectives, yet it lacks a legal substratus that endows the Union with the tasks and competences – and therefore also the legitimacy – to implement a truly supranational EU industrial policy. Furthermore, the complexity of the Treaty revision process, which requires agreement by all Member States, acts as an obstacle to rethinking the very legal premises of an EU industrial competence. In the absence of dedicated legal bases and faced with the rigid Treaty revision framework, EU institutions do with what they have and are forced to resort to second-order legal bases to implement a supranational industrial policy.

Under the current EU legal framework, EU and national industrial policies are increasingly implemented through the backdoor and by other means. On the one hand, this is a necessary consequence of the transversal nature of industrial policy. Indeed, such industrial policy 'by stealth' is even foreseen by Art. 173.3, which allows the Union to adopt industry-related acts under different legal bases. Yet, the EU's fragmented legal landscape aggravates this issue because industry-related measures are adopted on the basis of legal instruments that are not always appropriate or that have to be considerably tweaked to fit the purpose. Second-order policies thus mobilised only partially fulfill their aim and do not allow for the pursuit of an integrated EU industrial policy agenda. If pushed too far, such a practice risks undermining the principle of conferral, which governs competence allocation in the EU, as the current Treaty's allocation of powers explicitly excludes EU competence in the field and leaves the matter to the Member States (which are in turn bound by internal market and competition rules).

[50] See "Smaller EU countries revolt against state aid spree", Euractiv, 8 March 2024, available at: https://www.euractiv.com/section/economy-jobs/news/smaller-eu-countries-revolt-against-state-aid-spree/

To sum up, although the Treaties offer a number of useful legal resources which can be mobilised to bring about industrial initiatives at EU level, the fairly constraining political-economic model described above still draws several red lines which inhibit the deployment of a fully-fledged EU industrial policy. The legal landscape remains highly fragmented and characterized by an asynchronic relationship between the political ambition to enact a supranational EU industrial policy and the legal constraints under which such a policy must necessarily operate. With the new legislature beginning soon, it remains to be seen what shape such political ambition will take; for instance, the role that an industrial portfolio could have in the new Commission.[51]

2.4. Conclusions and policy recommendations

On the basis of the analysis developed in this chapter we present two sets of recommendations. The first are proposals *de lege ferenda*, which would require a revision of the Treaties. Yet, as we are aware of the difficulties related to Treaty changes, we also present some recommendations on how to enhance the effectiveness and coherence of an EU supranational industrial policy within the current Treaty framework (*de lege lata*). In both cases we couple policy-related recommendations that aim at strengthening the overall governance of an EU industrial policy with funding-related recommendations, with the objective of providing the Union with the tools to enact effective interventions in the field.

In the framework of a revision of the Treaties we propose:

Recommendation 1: To create truly shared competence for industry that would allow for the codification of the de facto competence that the EU has already developed in the field.

Under the proposed Treaty reform, industrial policy would be inserted under Art. 4(2) TFEU on shared competences instead of Art. 6. Art. 173 TFEU would be amended to allow for the adoption of harmonising measures, provided that those measures do not violate the other Treaty provisions on the internal market, competition policy and state aid. Under shared EU competence for industrial policy,[52] the principle of pre-emption - according to which in the field of shared competences the national legislator cannot act if the EU has already adopted legal acts - would regulate the relationship between the EU and the national level and establish a clearer hierarchy. Furthermore, such competence would provide a legal basis to adopt acts in the field of industry through the ordinary legislative procedure, avoiding the phenomenon of circumventing the Treaties through reliance on second-order legal bases. Other legal bases would of course continue to be used when needed, depending on the matter to be regulated. Furthermore, state aid rules would also continue to apply and to prevent the distortion of the internal market. Dedicated shared competence for industrial policy would finally enhance the legitimacy of EU intervention and limit the institutional fragmentation that today affects EU action in the industrial field.

Recommendation 2: To adjust and modify the current principles which limit and constrain the development of new budgetary instruments.

NGEU has shown that the EU Treaties offer a way for the development of *ad hoc*, debt-based fiscal capacities, which could be used again in the future to support the EU's industrial agenda. However, a number of constitutional constraints would complicate this process, and *de facto* prevent the emergence in the EU of a permanent, discretionary fiscal capacity that mature federations are normally endowed with. Most notably, the principle of budgetary balance, enshrined in Article 310(1) TFEU, prevents the EU from financing its budget through deficit and requires any major borrowing to be approved unanimously by the Member States through an amended own resources decision. Any major overhaul of the Union's budgetary powers would require abandoning these legal constraints (however difficult the endeavour might be politically).

[51] Industrial issues enjoy a central position under von der Leyen's political guidelines for her next mandate. Her plan for Europe's sustainable prosperity and competitiveness includes a number of industrial initiatives, such as the abovementioned European Competitiveness Fund, or her proposal for a Clean Industrial Deal. The industrial channel will also be key for the Defence Union project.

[52] These changes would need to be carried out via an ordinary revision procedure.

Under the current legal framework and without the need for Treaty change, we propose:

Recommendation 3: To leverage a reformed cohesion policy to strengthen the governance of an EU-led and place-based industrial policy.

In the framework of the current debate on the future of cohesion policy, several signs hint at a rethinking of the notion of cohesion as a broader "economic" policy tool targeting the competitiveness of the EU as a whole. Such understanding can provide the legal instruments to conduct a coherent supranational industrial policy, which however keeps its roots at the local level and maintains a bottom-up approach that is essential for identifying and responding to the needs on the ground. For its multi-level nature, cohesion policy can indeed combine a supranational approach to industrial policy with strong national and local ownership. Recourse to cohesion policy as a frame for industrial policy would not require any major legal adjustment, as measures could be adopted through the ordinary legislative procedure and implemented similarly to cohesion funds (and the RRF under NGEU). EU legislation could regulate the rules and criteria for the allocation of funding, while the choice of projects to be financed would be identified at the local level and agreed with the European Commission. At the EU level, the ordinary legislative procedure allows for swift supranational decision-making, which also involves the European Parliament, thus enhancing its democratic legitimacy. The bottom-up approach to the identification of projects and the allocation of financing embeds such a policy at the local level, ensuring respect for subsidiarity and protecting the competencies of the Member States in the field. In so doing, cohesion policy could enhance the institutional coherence of an EU industrial policy and avoid the multiplication of strategies and initiatives that currently characterise it. However, the reconversion of cohesion policy into industrial policy risks affecting the very objectives of cohesion policy as a policy of regional development aiming at supporting economically weaker regions, which typically lack a strong industrial basis.

Recommendation 4: To exploit the full potential of supranational funding through the EU budget.

This chapter has insisted on the need to complement national funding with supranational financial capacities in order to preserve the Single Market and the level playing field it establishes. Beyond the mobilisation of the NGEU template evoked above, this could be achieved by placing existing financial flexibilities under the current MFF at the service of the Union's industrial strategy, and by ensuring that the latter is endowed with sufficient means under the next 2028-2034 MFF. Such an increase of the EU budget could occur via extended national contributions or the creation of new own resources. In that context, the experience of the IPCEI could provide a useful model, to be finetuned and adapted in order to upgrade the European approach to industrial policy through joint investment projects combining EU and national funding. In that regard, the new rules of the SGP exclude national expenditure on co-financing of EU programmes from expenditure calculation,[53] and could be relied upon by the EU to promote a more harmonized investment strategy. In parallel, as proposed by the Letta report, efforts to phase out the relaxation of State aid rules, which increasingly distort competition and amplify distortions of the level playing field within the Single Market, and a return to stricter state aid enforcement at the national level should be undertaken.

[53] See most notably, Article 2(2) of Regulation 2024/1263.

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3. Strengthening the Democratic Accountability of the EU's New Industrial Policy through Parliamentary Oversight

Sebastian Diessner[54] *& Christy Ann Petit*[55]

Executive Summary

Industrial policymaking in the EU involves political choices and trade-offs that can have far-reaching distributive consequences. This chapter submits that EU industrial policymakers should therefore be held democratically accountable. In particular, this concerns oversight by the European Parliament over the European Commission, while other relevant actors – including the Council, the Court of Auditors, and the Economic and Social Committee – are also considered in the chapter. The chapter contends that parliamentary oversight should be most stringent in policy areas that are marked by two characteristics: the complexity of the issue at hand and the need for democratic legitimation. Both conditions are fulfilled in the area of EU industrial policy, which is not only notoriously complex (including in the eyes of industrial policymakers themselves) but is also riddled with distributive dilemmas (especially in the area of state aid control). To assess the state of democratic accountability of the EU's industrial policy, the chapter first maps the activities of two key committees in the European Parliament whose mandates included industrial policy measures throughout the 9th legislative term (2019–2024): the Committee on Industry, Research and Energy (ITRE) and the Committee on Economic and Monetary Affairs (ECON). Our mapping of the activities of ITRE in 2019–2024 suggests that, despite some evidence of the committee's legislative oversight functions, its scrutiny of industrial policy initiatives remains too limited to date and thus needs be strengthened in the future. It also reveals that there do not seem to have been joint procedures with the ECON committee throughout the 9th legislative term, which marks a further area for improvement. Our mapping of the activities of ECON in 2019–2024 suggests that, despite 'rules on competition and State or public aid' being listed among the committee's formal responsibilities, this commitment on paper needs to be matched with more concrete action. The committee's main oversight activity consists of an annual own initiative report on competition policy to which the Commission responds in writing and on which the Commissioner in charge is heard in-camera by ECON. However, an annual report can hardly do justice to the dynamic developments that the competition and state aid policy field has been undergoing. Based on this assessment, the chapter introduces four sets of policy recommendations in order to strengthen the democratic accountability of industrial policy in the EU during the 10th parliamentary term (2024–2029). First, we propose the creation of a novel ITRE-ECON working group on the scrutiny of industrial policy and state aid control, tasked with conducting a dedicated Industrial Policy Dialogue. Second, we recommend the new working group to elaborate bi-annual or quarterly EU Industrial Policy Reports to ensure more frequent and fine-grained reporting on industrial policy and state aid. Third, we propose to adjust the ITRE committee's mandate by reassigning research and telecommunications files to another standing committee, while incorporating state aid-related files into ITRE. Fourth, we recommend leveraging inputs from different stakeholders to increase the effectiveness of legislative oversight, including the Economic and Social Committee, the Court of Auditors, and broader arenas such as the Industrial Forum and the Joint European Forum for IPCEIs.

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3.1. Introduction

Industrial policymaking, defined as 'any targeted government intervention aimed at developing or supporting specific domestic firms, industries, or economic activities' (Evenett et al., 2024), involves political choices and trade-offs at the executive level, given its stated intention to alter economic behaviour and to enhance the fortunes of some firms and industries over others. While seemingly technical on the surface, these choices can have far-reaching distributive implications, as they hinge on taxation and spending powers (including tax credits and subsidies). In representative democracies with checks on executive policymaking, industrial policymakers should therefore be held accountable by majoritarian institutions, particularly by the legislative branch (Crum, 2018).

The European Commission, as one of the quasi-federal executive authorities of the European Union (EU), has long monitored and restricted the conduct of industrial policy by national governments in the EU's common market, especially through the enforcement of state aid control. Not least since the COVID-19 pandemic, however, the tension between a more flexible approach to state aid, on the one hand, and preserving the traditional approach to EU competition policy, on the other hand, has been thrown into sharp relief (Bora and Schramm, 2024). Moreover, the EU's new industrial policy relies not only on member state funding via state aid but also on a host of own programmes and schemes financed from EU resources (Di Carlo and Schmitz, 2023).[56] This suggests a 'vertical' turn in industrial policy in the EU (Bulfone, 2023), impacting a broad range of traditional policy areas – both internal, such as the common market, research and innovation, and external, such as trade (see also Dermine and Patrin on second-order provisions in this report). Taken together, these developments raise the question of who controls the controllers – *quis custodiet ipsos custodes?* – now that the EU formulates and pursues its own industrial policy objectives more actively.

This chapter contends that the EU's renewed industrial policy needs to be held democratically accountable, in particular through more stringent oversight by the European Parliament. Drawing on the academic literature on delegation and accountability in multi-level governance systems, we suggest that legislative oversight should be most stringent in policy areas that are marked by two key characteristics: first, the complexity of the issue at hand, and second, the need for democratic legitimation. We show that these conditions are met in the area of EU industrial policy in general and EU state aid control in particular. We then proceed to map the activities of the European Parliament's Committees on Industry, Research and Energy (ITRE) as well as Economic and Monetary Affairs (ECON) in the area of industrial policy throughout the 9th legislative term (2019–2024) and assess the extent to which the EU's renewed industrial policy activism has been scrutinised by legislators. Based on this mapping, and the gaps identified therein, we develop several recommendations for the new parliamentary term (2024–2029). Our main proposal revolves around an ECON-ITRE working group on the scrutiny of industrial policy and state aid control, tasked with paving the way for a dedicated Industrial Policy Dialogue with the European Commission.

3.2. Why parliamentary oversight of industrial policy in the EU?

This section briefly recaps some key insights from delegation theory as to why industrial policy in the EU should be held accountable through legislative oversight. The academic literature on delegation to executive agencies and bureaucracies examines the relationship between (elected) principals and (unelected) agents and makes several predictions about the kinds of policy areas for which we should expect the need for legislative control over the executive to be particularly acute (Kiewiet and McCubbins, 1999; McCubbins and Schwartz, 1994; Strøm, 2000; Blom-Hansen, 2013; Bundi, 2018; Akbik and Diessner, 2024). These predictions revolve around the two main characteristics of complexity and the need for legitimation highlighted above, each of which is briefly explained and then illustrated in the context of EU industrial policy.

[56] In addition, the European Defence Industrial Strategy of March 2024 has seen accelerated developments recently, which are beyond the scope of this chapter.

3.2.1. Complexity

First, the legislature is likely to delegate more authority to – and, by implication, require more stringent means of control over – the executive in complex issue areas. On the one hand, higher complexity requires more specialised expertise, which represents one of the key motivations for delegating competencies to specialised executive agents (Haas, 1964; Majone, 1993). On the other hand, however, the greater the authority and discretion of the executive, the greater the risk that the executive agent will deviate from the preferences of the legislative principal (known as agency loss) (Bawn, 1995). To counter this risk, the legislature can install procedural controls in order to keep the wayward agent in check (McCubbins, 1985; McCubbins, 1989; Blom-Hansen, 2013).

In terms of EU industrial policy, policymakers routinely emphasise how little we know about how to design, implement, and monitor effective industrial policies. The European Commission, for one, regularly highlights existing 'knowledge gaps' in its reports and notes to the Council of Ministers and to the Eurogroup (2024). In the same vein, the International Monetary Fund (IMF) stresses that 'IP [industrial policy] is inherently complex and multifaceted' and that its own evaluations are hampered by numerous '[d]ata gaps', leading it to conclude that 'IMF staff may not have sufficient expertise' to assess industrial policy initiatives on their own (Evenett et al., 2024).

Moreover, the EU's recent rediscovery of industrial policy is marked by a notoriously complex mix of different programmes and schemes, and it is commonly deemed to be hampered by a lack of centralised funding (Allan and Nahm, 2024). As a result, the European Commission predominantly coordinates – and increasingly directs – spending on industrial policy by the member states through the enforcement or relaxation of state aid control (López, 2024). Examples of flexibility granted to member states under the EU competition policy include the State Aid Action Plan of 2009, the COVID-19 Temporary Framework, the Temporary Crisis Framework after the Russian invasion of Ukraine, the Important Projects of Common European Interest (IPCEIs), the Temporary Crisis and Transition Framework in place until end-2025, and the amendment to the General Block Exemption Regulation (GBER) to support the green and digital transitions (also known as the 'Green Deal GBER amendment').[57] On the whole, the condition of complexity – exacerbated by knowledge and data gaps – would seem to be amply fulfilled in the area of EU industrial policy, justifying both the need for delegation *and* for enhanced legislative oversight at the European level.

3.2.2. Democratic legitimation

Second, policy areas in which the need for democratic legitimation is perceived to be particularly high – for instance, due to their distributive consequences or their implications for national security – should attract more and more intense legislative oversight (Scharpf, 1999; Bundi, 2018; Den Boer et al., 2008). In the academic literature on the EU, the question of whether supranational policies are of a distributive as opposed to a regulatory nature – and therefore require more stringent democratic legitimation and oversight – is indeed one of the foundational debates (Majone, 1998; Majone, 2002; Moravcsik, 1998; Moravcsik, 2002; Follesdal and Hix, 2006). The fact that the EU has progressively integrated (re-)distributive 'core state powers' over the years – and has thus moved far beyond the technocratic confines of the regulatory state – is increasingly hard to deny, however (Genschel and Jachtenfuchs, 2014).

In terms of EU industrial policy, the recent push to revive this policy area is riddled with distributive dilemmas which, by implication, calls for enhanced democratic legitimation. In its reports to the Eurogroup, for example, the European Commission recognises major trade-offs that are inherent in industrial policy decision-making, including 'active industrial policy versus market incentives; fiscal trade-offs; free trade in a changing geopolitical context; and innovation versus market power'.[58] The International Monetary Fund, in turn, cautions that industrial policy initiatives and the relaxation of state aid rules risk entailing 'high fiscal costs,

[57] Commission Regulation (EU) 2023/1315 of 23 June 2023 amending Regulation (EU) No 651/2014. These measures are thought to foster access to public and private funding both at EU and national level and are one of the four pillars of the EU's net-zero industrial strategy (see Ragonnaud, 2024, pp. 3-4).

[58] European Commission, Euro Area Competitiveness: State of Play, Challenges and Trade-offs for policy, Technical note to the Eurogroup (2023).

economic inefficiencies and distortions' in the European single market, as stressed in its Article IV consultation for the euro area (IMF, 2023). Indeed, recent evidence suggests that 'the lion's share of State aid is awarded by large countries which can afford it', whereas EU funds and measures 'can hardly compensate for such disparities'.[59] This raises doubts about the level playing field in the EU's single market and, in turn, calls for enhanced democratic accountability.

Taken together, there are compelling reasons for parliamentary oversight of industrial policy, given that both characteristics – complexity and the need for legitimation – do appear to be fulfilled in this policy area. In reality, however, parliamentary oversight of EU industrial policy has frequently been found wanting, at least on the surface. As McNamara (2023, p. 15) suggests, 'the lack of true electoral politics at the EU level means the European Parliament has only had a consultative and de-fanged oversight role necessary for democratic decision-making'. We examine this alleged contrast in the following two sections by means of reviewing the activities of the European Parliament's ITRE and ECON Committees between 2019 and 2024 in order to arrive at a set of recommendations on how to strengthen the parliamentary oversight of industrial policy throughout the new legislative term (2024–2029).

3.3. Assessing the accountability of the EU's new industrial policy throughout the European Parliament's 9th legislative term (2019–2024): controlling the controllers?

3.3.1. The Committee on Industry, Research and Energy (ITRE)

The ITRE Committee's mandate includes responsibility for 'the Union's industrial policy and related measures, and the application of new technologies, including measures related to SMEs'.[60] The scope of ITRE is relatively broad, as it also covers research and innovation, space, energy, nuclear, and IT policies. Any funding programmes and schemes related to these areas are considered a type of industrial policy (and many fall under the Multiannual Financial Framework).

The ITRE activity report for 2019–2024, reflecting on actual committee practices, seems to prioritise (a) energy ahead of (b) industry, research and digital (including space), at least in the way the activities are reported.[61] During the 9th legislative term, the Committee was responsible for 119 procedures, among which 42 ordinary legislative procedures[62] (of those, 13 were related to industry, research and space).[63] The legislative work included – with ITRE as lead Committee – the negotiation of the Chips Act adopted in 2023, the European Defence Industry Reinforcement through Common Procurement Act (EDIRPA) in 2023, the Critical Raw Materials Act (CRMA) in 2023, the Net Zero Industry Act (NZIA) in 2024, the Act in Support of Ammunition Production in 2023, under an urgent procedure, and the Strategic Technologies for Europe Platform (STEP) in 2023. As lead Committee, ITRE also received opinions from other EP committees, including ECON (e.g. on the NZIA and Chips Act) in order to prepare draft legislative reports for the plenary and to determine the EP's first reading position.[64]

When it was not the lead Committee, ITRE provided legislative and non-legislative Opinions to other Committees ('opinion-giving committee')[65] or acted as an 'associated committee' for a combined total of 73 Opinions (ITRE 2024, p. 8).[66] Those Opinions matter in the legislative process as they can include amendments to be tabled in the responsible committee or – when ITRE acts as an associated committee and has shared competence with the lead committee – to be tabled directly in the plenary (e.g., for InvestEU). When a matter falls under ITRE's exclusive competence, the lead committee must accept – without a vote – ITRE's amendments already at the committee stage.[67] The Joint Committee procedure ensures the participation of committees on an equal basis in the preparation of (single) draft reports to interinstitutional negotiations (examples include establishing the EDIRPA together with the sub-Committee on Security and Defence (AFET/SEDE) and the STEP together with the Committee on Budgets (BUDG)). However, there do not seem to have been joint procedures with the ECON committee throughout the 9th legislative term. This is surprising, given the impor-

[59] 'Editorial Comments: Paying for the EU's Industrial Policy', Common Market Law Review 60, no. 3 (1 June 2023), p. 623.

[60] See Annex VI, Point IX (1.), European Parliament, 'Rules of Procedures, 9th parliamentary term - January 2021', available at: https://www.europarl.europa.eu/doceo/document/RULES-9-2021-01-18-ANN-06_EN.html

[61] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 9.

[62] The other procedures were: delegated acts (30), own initiative reports (19), consent and consultation procedures (17), oral questions and motions for resolutions (11).

[63] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 7-8.

[64] Importantly, associated committees contribute to the negotiation process in case of a second reading, which is not the case for opinion-giving committees.

[65] Upon the request of the responsible committee or on its own initiative, with the EP President's authorisation, see Rule 210(2).

[66] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 8.

[67] Handbook on the Ordinary Legislative Procedure, pp. 14-15.

tant role both committees should play in holding the EU's industrial policy to account. This marks an area for improvement in our view (as discussed further in Section 4 below).

ITRE also drew up own initiative reports to provide political stances in 19 files, among which 8 in industry, research and space (e.g., A New Industrial Strategy for Europe and A New Strategy for European SMEs) (ITRE 2024, pp. 46-48).[68] In particular, in an ITRE own initiative report, the European Parliament recalled the 'role of the Industrial Forum and the Alliances in relation to [14] ecosystems' and stressed the 'adequate participation' of civil society as well as consumer organisations and trade unions in defining general and sectoral industrial policies.[69] As regards alliances, ITRE highlights two own-initiative reports in the field of energy industrial policy: one on small modular reactors,[70] which 'shaped the Commission's decision to establish a new Industrial Alliance' (ITRE 2024, p. 43),[71] and one on geothermal energy,[72] to 'fast-track best practices and the effective implementation of legislation' (ITRE 2024, p. 44).[73] While fora and alliances of this kind can be a valuable resource for the inclusion of civil society actors in the formulation of industrial policy priorities ex ante, the ITRE committee's ex post oversight of these and other initiatives remains limited and should thus be strengthened further.

Finally, the Committee held 16 'structured dialogues' and 22 exchanges of views or other meetings with Commissioners (ITRE 2024, pp. 50-52).[74] While these do not reach the standard of other dialogues which are run more regularly in other policy areas (e.g. for the Banking Union or the Recovery and Resilience Dialogues as discussed hereinafter), the ITRE Activity Report does, overall, contain evidence of its legislative oversight. This includes inter-committee work, in contrast to ECON which does not report on joint committees to the same extent. Importantly, any standing committee that assumes responsibility as an associated committee should make this role clear in its reporting (for instance, ITRE was an associated committee to the Joint Committee BUDG-ECON for InvestEU).[75]

3.3.2. The Committee on Economic and Monetary Affairs (ECON)

The ECON Committee's mandate lists 'rules on competition and State or public aid' among ECON's main responsibilities[76] (next to its better-known tasks of economic, financial and monetary policies, banking supervision, payments and capital markets, and taxation). According to the committee's website, '[a]lthough the Parliament's powers are mostly of a consultative nature in the competition field (cf. Art. 103 and 109 TFEU), it is very high on the ECON Committee's political agenda'[77] (ECON 2024b).

This commitment on paper needs to be matched with more concrete action, however. For instance, while the EP's powers in taxation are also mostly of a consultative nature, ECON has nevertheless become very active in this particular policy area, including by setting up a dedicated sub-committee (FISC) in 2020 (with its own activity report detailing those sub-committee's activities).[78] It would be fruitful for ECON to commit a similar degree of attention to competition policy and state aid as well, given the recent and ongoing important developments in this policy field, as outlined above. In reality, however, the ECON activity report on competition is very sparse and lists only one single item (related to two categories of aid in the transport and public sectors for which the Parliament 'was consulted and approved the Commission proposal').[79]

The annex to the activity report suggests two further kinds of activities that ECON engaged in over the period 2019–2024 which are worth noting. First, ECON provided 9 legislative and non-legislative Opinions to other committees on industrial policy files (such as the 'industrial package' including the Chips Act and the Net Zero Industrial Policy Act) and on 'macroeconomic files' that include several industrial policy-related funds (such as the Just Transition Fund and the Social Climate Fund) (see sub-section 3.1. for an explanation of the role of EP Opinions).[80]

[68] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 46-48.

[69] European Parliament resolution of 25 November 2020 on a New Industrial Strategy for Europe (2020/2076(INI)), at 85. & European Commission "Annual Single Market Report 2021 Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Updating the 2020 New Industrial Strategy: Building a Stronger Single Market for Europe's Recovery". European Commission (2021).

[70] European Parliament resolution of 12 December 2023 on small modular reactors (2023/2109(INI)).

[71] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 43.

[72] European Parliament resolution of 18 January 2024 on geothermal energy (2023/2111(INI)). This could replace the Implementation Working Group on Deep Geothermal, with a limited membership. https://setis.ec.europa.eu/implementing-actions/geothermal_en

[73] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024) 44.

[74] Committee on Industry, Research and Energy (ITRE), "Activity Report 2019–2024". European Parliament (2024a) 50-52.

[75] As available on the European Parliament's Legislative Observatory.

[76] Committee on Economic and Monetary Affairs (ECON), "Activity Report 2019–2024". European Parliament (2024a) 5.

[77] "EP Report on the Annual Report on EU Competition Policy", ECON, European Parliament (2024b) Last access 14 August 2024, https://www.europarl.europa.eu/committees/en/econ/econ-policies/tax-competition-statistics-ifrs?tabCode=competition-wg

[78] Committee on Economic and Monetary Affairs (ECON), "Activity Report 2019–2024". European Parliament (2024a) 36.

[79] 'The Commission proposed to exempt two categories of aid from the notification requirement of Article 108(3) TFEU: (i) aid for the coordination of transport and (ii) aid for the reimbursement for the discharge of certain obligations inherent in the concept of a public service. These categories fall under the scope of Article 93 TFEU' Ibid.

[80] Committee on Economic and Monetary Affairs (ECON), "Activity Report 2019–2024". European Parliament (2024a) 57.

Second, the ECON committee hosted a Competition Working Group for 'discussions and exchanges of views (...) on issues related to antitrust measures, merger control and compatibility of State aid with EU competition law'.[81] Importantly, the group lays the groundwork for an annual own initiative report on competition policy to which the Commission responds in writing (typically about six months later) and on which the Commissioner in charge is supposed to be heard in-camera by ECON (up to twice a year). This suggests a regular and structured dialogue on competition policy and, as such, is a relevant basis for the oversight of state aid control. However, an *annual* report (with a response from the Commission another half a year later) can hardly do justice to the dynamic developments which the competition and state aid policy field has been and continues to be undergoing.

Last but not least, ECON has taken a leading role in the formulation and oversight of the Recovery and Resilience Facility (RRF) of NextGenEU and RePowerEU. Together with the EP BUDG Committee, ECON runs a 'Scrutiny of the Recovery and Resilience Facility Working Group', whose main task is to prepare and follow-up on bi-monthly Recovery and Resilience Dialogues (RRDs) with the Commission.[82] This set-up could serve as a blueprint for the oversight of industrial policy more broadly, which should not be limited to RRF activities alone and which could involve the industrial policy expertise of ITRE as well, as explained in the following section. On the whole, while some promising elements for the oversight of state aid control are in place in the ECON Committee, these seem to be employed too sparingly thus far and should therefore be beefed up considerably in order to do justice to the ongoing transformations in this policy field. The ECON-BUDG working group in charge of organising the RRDs may provide relevant inspiration for this.

3.4. Conclusions and policy recommendations

Recommendation 1: ITRE-ECON working group on industrial policy and state aid

We propose the creation of an ITRE-ECON working group on the scrutiny of industrial policy and state aid control, tasked with laying the groundwork for a dedicated Industrial Policy Dialogue. This working group, composed of an equal number of MEPs sitting in the ITRE and ECON Committees, would primarily be concerned with ex post oversight over the Commission in the areas of industrial policy and state aid.[83] Structured dialogues held by EP Committees usually take place with different Commissioners whose portfolios may overlap, and they can also involve other EU institutions or even member state representatives. As the substantive focus of the Industrial Policy Dialogue may lead to crossovers with other economic issues, a consistent approach through constructive collaboration with other working groups and Committees will be essential. The most obvious synergies lie with the existing Economic Dialogues between ECON and the Commission. However, these dialogues have increasingly been complemented or even replaced by the RRDs since 2021.[84] As the latter are supposed to run until 2026 only, it will be of critical importance to leverage and expand their work beyond this timeframe and to scrutinise a broader range of industrial policies. The new Industrial Policy Dialogue would fulfil precisely this function. To establish a solid long-term basis for the scrutiny of industrial policy in the EU, the ITRE-ECON working group should aim to prepare an inter-institutional agreement between the EP and the Commission for the post-2026 period (similar to the agreement between the EP and the ECB completed in 2023, for example). Later iterations of the Industrial Policy Dialogue could be expanded to include representatives from other EU institutions beyond the Commission (such as the COMPET Council or the Eurogroup, for example).

Recommendation 2: Bi-annual or quarterly EU Industrial Policy Reports

As discussed in Section 3.1., the ITRE Committee's current activity reporting does not distinguish between industrial, research and space policies, but instead tends to lump the three together. At the same time, as discussed in Section 3.2., the ECON Committee currently prepares and adopts annual own initiative reports on competition policy only. A new ITRE-

[81] Committee on Economic and Monetary Affairs (ECON), "Activity Report 2019–2024". European Parliament (2024a) 52.

[82] Ibid.

[83] Ex ante oversight, in turn, should be assumed by public and private actors together, including civil society, social partners and industry (see Recommendation 4 below).

[84] Committee on Economic and Monetary Affairs (ECON), "Activity Report 2019–2024". European Parliament (2024a) 46.

ECON working group (see Recommendation 1) would create scope for more regular and more fine-grained reporting dedicated to industrial policy and state aid control, for instance on a bi-annual or quarterly basis. These EU Industrial Policy Reports should seek input from the EP's research services and/or external experts and could form the basis for discussions during the regular Industrial Policy Dialogues, while the latter should remain flexible enough to also accommodate recent developments that fall outside the respective reporting period.

Recommendation 3: Re-scoping the ITRE Committee mandate

The mandate of ITRE has remained unchanged between the 9th and 10th parliamentary terms (see EP Rules of Procedure, Annex VI). In practice, however, the substantive and numerical scope of ITRE has increased substantially when considering the significance of the industrial policy files discussed above and the number of committee members (the 9th term started with 67 members and ended with 78, while the 10th term includes no less than 90 members, which is the largest increase of any committee and makes ITRE the biggest committee beside ENVI). As such, it seems appropriate to re-scope ITRE's mandate, for instance, by reassigning research or telecommunications files to another standing Committee, while incorporating state aid-related files into ITRE. This would require updating the EP Rules of Procedures (which were published only recently)[85] in order to make them more representative of current activities – as happened during the 9th legislature as well – and, more importantly, to enable MEPs to exert full and effective oversight over the files under the remit of their committees.

Recommendation 4: Leveraging inputs from various stakeholders for effective legislative oversight

The EP, as the central player in legislative oversight of the EU's industrial policy, could and should benefit from inputs from other stakeholders, including the European Economic and Social Committee (EESC), the European Court of Auditors (ECA), and broader arenas such as the Industrial Forum and the Joint European Forum for IPCEIs.

First, the EESC, already active in industrial policy,[86] is well placed to continue providing important inputs from civil society into the EU's strategic industrial policy priorities. In terms of monitoring and oversight, the aforementioned ITRE-ECON working group could seek input from the EESC competent sections, such as its Consultative Commissions on Industrial Change or on Single Market, Production and Consumption. In addition, the ECA – as the European institution for audit and financial oversight of EU spending and funding – should continue to provide the EP with evidence on the financing dimensions of EU industrial policy,[87] and increase its continuous and special reporting on industrial policy and state aid.[88]

Second, different initiatives, such as the Industrial Forum and the Joint Forum for IPCEIs, can foster collaboration in implementing and monitoring EU industrial policy together with public and private stakeholders, whose expertise and experience may contribute to better and more effective legislative oversight. The Industrial Forum, with representatives from industry, social partners, NGOs, researchers, EU member states and institutions, and development banks (including the European Investment Bank and the European Bank for Reconstruction and Development) has worked on identifying and analysing industrial ecosystems across five taskforces.[89] In 2024, the Council of the EU recalled the Industrial Forum's central role 'in contributing to shaping and implementing EU industrial policy together with the industry, the Member States, civil society and the Commission'.[90] However, the EP seems to engage only scarcely with this structure and does not seem to be associated with the activities or outcomes of the taskforces which assist the Commission in implementing its industrial strategy.[91]

Regarding the IPCEIs, a Joint European Forum was set up in 2023 through a partnership between the Commission and the member states[92] to identify potential projects in line with the EU's industrial strategy and to improve the effectiveness of the IPCEI process.[93] To date, ten approved IPCEIs span from microelectronics to cloud infrastructures or medicines in

[85] European Parliament, RULES OF PROCEDURE, European Parliament 2024, available at: https://www.europarl.europa.eu/rules/rules20240716/Rules20240716_EN.pdf

[86] See for instance, EESC, 'Industrial policy for resource and energy intensive industries', Own-initiative opinion, CCMI/210, 25 January 2023, and 'Competitiveness and industry', Exploratory opinion INT/1033, 23 March 2023.

[87] See for instance, ECA Special Reports No 11/2024, No 17/2023, No 15/2023 and No 19/2020.

[88] An ECA Report on state aid in times of crisis is due later in 2024.

[89] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions a New Industrial Strategy for Europe (2020). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0102.

[90] Council conclusions on "A competitive European industry driving our green, digital and resilient future" approved by the Council (Competitiveness) at its 4026th meeting held on 24 May 2024, at 8.

[91] "Industrial policy dialogue and expert advice", European Commission, (Last access 14 August 2024) https://single-market-economy.ec.europa.eu/industry/strategy/industrial-policy-dialogue-and-expert-advice_en

[92] It is co-led by the Directorate General for Competition Policy (DG COMP) and the Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW). Members include officials from Member States and from the European Commission at high and technical level. "Members (JEF-IPCEI)", European Commission, (Last access 14 August 2024) https://competition-policy.ec.europa.eu/state-aid/ipcei/joint-european-forum-ipcei/members-jef-ipcei_en

[93] "Daily News, 19/09/2023, Next Generation EU: Implementation of the Recovery and Resilience Facility firmly underway" European Commission, https://ec.europa.eu/commission/presscorner/detail/en/mex_23_4520

different participating member states.[94] The level of reporting for this Joint Forum is relatively high, with short summaries of prior meetings and announcements of future activities.[95] However, the involvement of the Parliament in its decision-making is virtually non-existent.[96] From the sidelines, the EP expressed its support for several IPCEIs,[97] encouraged further transparency in their implementation and in the application process to ensure SME participation,[98] and called for the creation of an IPCEI for critical raw materials.[99] In addition, there appears to be limited engagement in legislative oversight, with the EP, through ITRE, scrutinising some delegated acts that provided a list of projects of common interest to which it did not object.[100] On the whole, both fora display a number of shortcomings that could and should be improved by means of increasing their transparency, streamlining their governance structures, and ensuring a better engagement with political and civil society representatives, including from the EP and the EESC.[101] A suitable starting point for this could be the inclusion of members of the new ITRE-ECON working group on industrial policy (Recommendation 1) in the fora's main activities, initially as observers and eventually as contributors to their decision-making.

[94] "Approved integrated Important Projects of Common European Interest (IPCEI)" European Commission, (Last access 14 August 2024) https://competition-policy.ec.europa.eu/state-aid/ipcei/approved-ipceis_en

[95] "Joint European Forum for IPCEI (JEF-IPCEI)", European Commission, (Last access 14 August 2024), available at: https://competition-policy.ec.europa.eu/state-aid/ipcei/joint-european-forum-ipcei_en#upcoming-jef-ipcei-meetings---draft-timeline

[96] Nicolas Poitiers and Pauline Weil, 'Opaque and Ill-Defined: The Problems with Europe's IPCEI Subsidy Framework', Bruegel, 26 January 2022, available at: https://www.bruegel.org/blog-post/opaque-and-ill-defined-problems-europes-ipcei-subsidy-framework. Note, however, that the EP acted as co-legislator in setting up the guidelines for trans-European energy infrastructure, which regulate the assessment criteria and process to establish projects in this area. Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013.

[97] On the European Battery Alliance, see European Parliament resolution of 18 June 2020 on competition policy – annual report 2019 (2019/2131(INI)).

[98] European Parliament resolution of 25 November 2020 on a New Industrial Strategy for Europe (2020/2076(INI)), at 44-45.

[99] European Parliament resolution of 24 November 2021 on a European strategy for critical raw materials (2021/2011(INI)).

[100] In 2020, 'Trans-European energy infrastructure: Union list of projects of common interest' (2019/2907 (DEA) Supplementing 2011/0300(COD)), in 2022, 'Union list of projects of common interest (2021/2991(DEA) DEA Supplementing 2011/0300(COD)) and in 2024, 'Union list of projects of common interest and projects of mutual interest' (2023/3007(DEA) Supplementing 2020/0360(COD)).

[101] The Council 'supported the streamlining of the governance structures associated with industrial ecosystems', see Council conclusions on "A competitive European industry driving our green, digital and resilient future" approved by the Council (Competitiveness) at its 4026th meeting held on 24 May 2024, at 8.

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4. Together we trade, divided we aid: EU industrial policy, state aid, and the loosening of the EU competition regime

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Executive summary

This chapter addresses the pressing policy problem of growing fragmentation within the EU single market due to the increasing use of state aid by Member States. Over the past decade, and particularly in response to crises like the COVID-19 pandemic and the energy shock following Russia's invasion of Ukraine, national governments have ramped up state aid to promote and protect their domestic industries, foster green and digital transitions, and maintain economic resilience. However, this has led to significant imbalances across the EU, as substantial cross-country variation in the level and composition of national state aid has ensued. The lack of supranational fiscal and political capacity to provide state aid at the EU level has exacerbated these disparities, creating the risk of subsidy races within the Single Market. The chapter proposes several policy solutions to address these challenges. First, it calls for phasing out temporary crisis frameworks, such as the Temporary Crisis and Transition Framework (TCTF), by the end of 2025. These ad hoc measures have played a crucial role in addressing short-term economic disruptions but should not become permanent features of the EU state aid regime, as they contribute to market fragmentation. Instead, the focus should shift towards consolidating and integrating existing state aid instruments, such as the General Block Exemption Regulation (GBER) and Important Projects of Common European Interest (IPCEIs). This consolidation would create a more coherent and efficient state aid regime that balances flexibility with strategic coordination across the EU. The chapter advocates for a more European approach to state aid centred on the use of IPCEIs where projects are selected based on merit rather than a Member States' fiscal capacity to aid. A European Competitiveness Fund should be established with an eye to providing EU co-funding for national spending on IPCEIs which, under the new EU economic governance framework entered into force in April 2024, could be deducted from governments' expenditures calculation in the reformed Stability and Growth Pact. This would guarantee EU Member States enjoy greater fiscal leeway within the constraining EU fiscal framework.

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4.1. Introduction: the policy problem

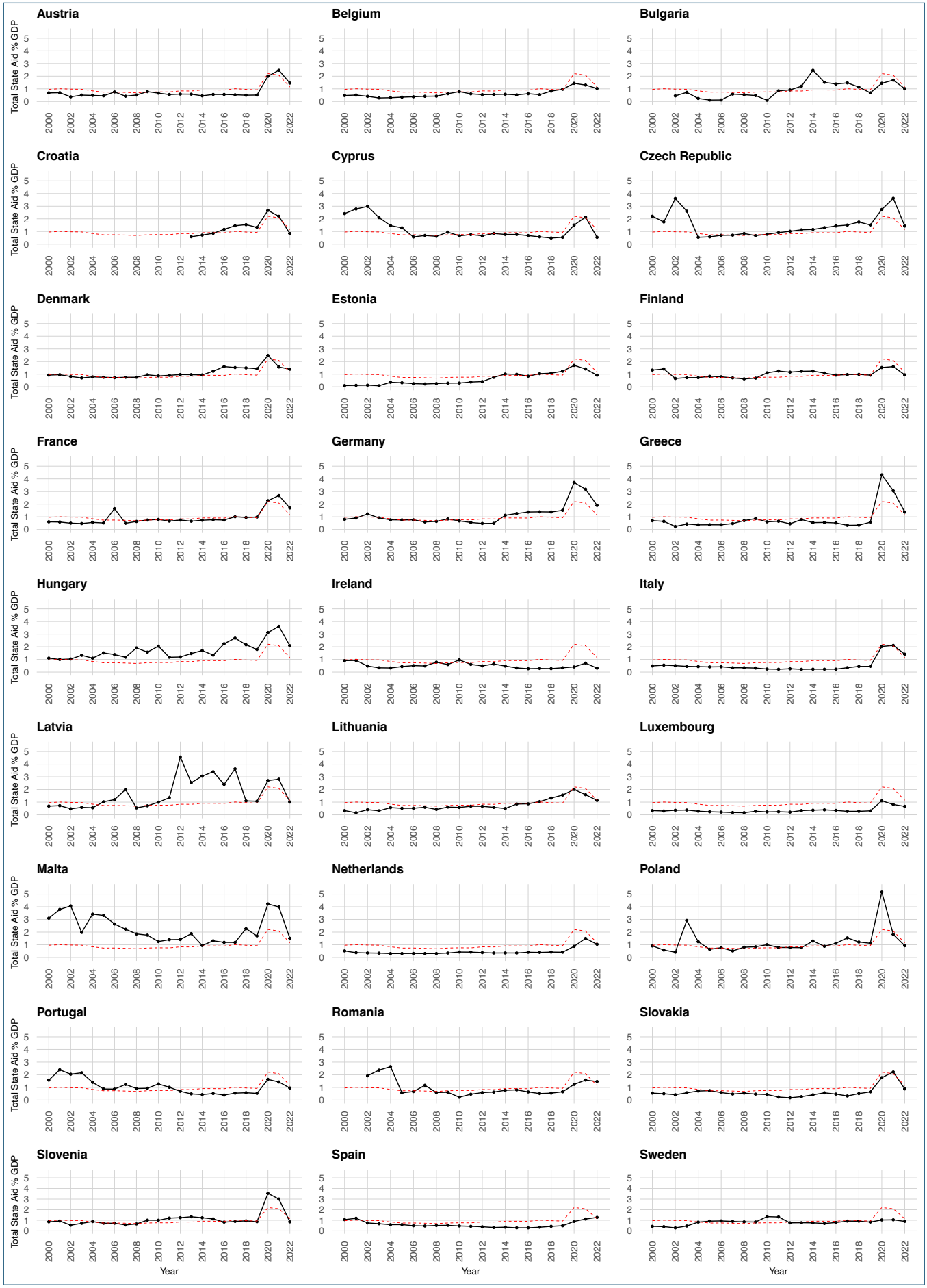
Since the 2010s, national governments and the European Union have increasingly adopted interventionist measures to support their domestic industries in the face of growing international competition and a changing geopolitical environment (Bulfone, 2023; Di Carlo and Schmitz, 2023; Pianta et al., 2020). During the 2000s, state aid had declined slightly across the EU – from an average of around 1 to 0.68 percent of GDP in 2008 (Figure 1). Since the global financial crisis, state aid has increased, but only gradually up to its pre-crisis levels. However, since the outbreak of the Covid-19 pandemic, the level of state aid provided by EU Member States has more than doubled, peaking at an average of 2.2 percent of national GDP in 2020 (Figure 1). Over the recent years, EU governments have increasingly relied on generous state aid policy to shield domestic firms from Europe's energy crisis, to promote the green and digital twin transition and achieve open strategic autonomy in the new multipolar geopolitical order.

Yet, within this general trend, there has been substantial cross-country variation in the level and composition of national subsidies granted across the members of the European single market, raising concerns that uncontrolled state aid by EU Member States could lead to the fragmentation of the single market and hamper the competitiveness of European industry (Letta, 2024). Thus, due to the lack of centralized fiscal resources and political authority to provide state aid supranationally in the EU, Europe faces a dilemma between protecting and promoting its industrial base through national state aid while ensuring a resilient level playing field across the single market.

Our aims are twofold. First, we map major regulatory changes in the EU state aid regime and trace the distribution of state aid granted by EU Member States via three regulatory domains: aid granted under the General Block Exemption Regulation (GBER) (in Section 3); aid provided through the use of the Important Projects of Common European Interest (IPCEIs) framework (in Section 4); aid provided in crisis times under the temporary frameworks enacted as a reaction to the Covid-19 pandemic and the energy crisis resulting from Russia's invasion of Ukraine (in Section 5). Second, in the conclusions we elaborate on a set of policy recommendations on how national state aid could be provided in favour of European industry while minimising distortions of the single market.

This chapter argues that state aid temporary frameworks should be phased out by 2025 to prevent further fragmentation of the single market. Instead, the EU should focus on consolidating its permanent state aid instruments to improve efficiency and coherence. A more European approach based on the instrument of the IPCEIs is needed, prioritizing merit-based project selection across Member States regardless of their fiscal capacity. A European Competitiveness Fund should be established with an eye to providing EU co-funding for national spending on IPCEIs which, under the new EU economic governance framework entered into force in April 2024, could be deducted from governments' expenditures calculation in the reformed Stability and Growth Pact. This would guarantee EU Member States greater fiscal leeway within the constraining EU fiscal framework.

Figure 4.1: State aid as percentage of GDP across EU27 countries (2000-2022)



Source: our elaboration from State aid Scoreboard, European Commission. Note: The red line represents the mean of the sample in each year.

4.2. Key changes in EU State aid law and policy

State aid control is one of the Commission's most important tools for preventing national subsidies from jeopardising the single market's level playing field (Spector, 2009; Defraigne et al., 2022). The importance of state aid policy in the single market stems from its supranational nature and the central regulatory, monitoring and enforcing competences entrusted by the treaties to the Commission (Ehlermann, 1994; Frenz, 2016). Apart from certain cases, any aid granted to European companies by a Member State or through state resources which distorts or threatens to distort competition is incompatible with the single market (Art.107 TFEU). Exceptions include subsidies to promote the execution of an Important Project of Common European Interest (IPCEI), aid to remedy a serious disturbance in the economy of a Member State (Art.107(3)(b)) or aid to facilitate the development of certain economic activities or of certain economic areas where such aid does not adversely affect trading conditions to an extent contrary to the common interest (Art. 107(3)(c)). The Council can determine other categories of aid that may be authorized, based on a proposal from the Commission (Art. 107 (3) (e)). Through unanimous voting, the Council can also decide at the request of a Member State if specific state aid shall be considered compatible with the internal market in exceptional circumstances (Art. 108(2)).

Legal ambiguity concerning the authorization of national state aid has always been present in the European Treaties. The ECSC Treaty (European Coal and Steel Community) of 1951 prohibited state aid for the coal and steel industries,[105] but the application of this provision was limited by Article 26 ECSC which stipulated that general economic policy in member countries was the national governments' responsibility.[106] The EEC Treaty (European Economic Community), for its part, contained a more flexible system granting their authorisation in certain cases listed in article 92. Other types of aid could also be authorised by the Commission if the proposal was adopted by a qualified majority of the EEC Council.[107] The prohibition of state aid in the EEC Treaty was therefore, as the Court of Justice recognised, "neither absolute nor unconditional" (Mertens De Wilmars, 1987, p. 427). In certain cases, state aid could be used as an economic policy instrument to achieve the objectives set out in the treaty (Etzenbach, 1980, p.72–73).

On this basis, since the 1960s, European institutions adopted regulations to clarify the cases in which state aid may be authorized. Their aim was to prevent national state aid interventions from distorting competition within the common/internal market, while enhancing the competitiveness of European industry through restructuring objectives (Doleys, 2013; Ehlermann, 1994; Zurstrassen, 2023). At the same time, horizontal objectives, like the promotion of R&D, environmental protection, and support to small and medium enterprises (SMEs), were increasingly promoted to increase the competitiveness of European industry. Eventually, specific frameworks were adopted to increase the transparency of state aid, particularly regarding subsidies for public companies or for R&D objectives (Zurstrassen, 2023).

In the 2000s, the EU's growing technology gap with the US led the Commission to adopt various reforms of its state aid control procedures. The aim was twofold: firstly, to concentrate the Commission's activities on larger and most distortive cases and, secondly, to have Member States reduce their sectoral subsidies and redirect state aid policy toward horizontal aid – e.g. support for R&D, SMEs and the promotion of risk capital for undertakings.[108] This gradual but transformative process put an end to the hitherto application of *ad hoc* frameworks for state aid, generally used in favour of sensitive industrial sectors, and led to the consolidation of state aid policy into general frameworks, such as the guidelines on regional aid or restructuring aid. In 2005, the Mid-Term review of the Lisbon Strategy[109] was accompanied by a reform of EU state aid control to further simplify its governance and facilitate state aid to foster the rise of the knowledge economy.[110]

[105] See the ECSC Treaty https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A11951K%2FTXT.

[106] On this topic, see the judgment of the Court of Justice of 23 February 1965 concerning case 30-59 De Gezamenlijke Steenkolenmijnen in Limburg v High Authority of the ECSC, available in JO No 17 of 7 March 1961.

[107] Article 92 of the EEC Treaty https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A11957E%2FTXT

[108] JO C 235/4, State aid and Risk Capital, 21 August 2001.

[109] COM(2005) 24, Working together for growth and jobs. A new start for the Lisbon Strategy, 2 February 2005.

[110] COM(2005) 107 final, State aid action plan – Less and better targeted state aid: a roadmap for state aid reform 2005-2009, 7 June 2005.

The need to support companies affected by the global financial crisis led the European Commission to adopt a temporary framework to provide emergency and horizontal aid to support the long-term competitiveness of industry. In 2009, the Commission adopted a temporary framework for state aid to support firms' access to finance in application of Article 87 §3 (b) of the Treaty establishing the European Community (TEC).[111] The framework allowed subsidies facilitating access to finance for businesses in the form of subsidised guarantees and loan subsidies on a temporary basis and under strict conditions.[112] Also, it provides information to Member States on the conditions for granting aid to promote the long-term competitiveness of industry (for R&D, environmental protection, SMEs, venture capital).[113]

In 2008, the General Block Exemption Regulation (GBER), for its part, allowed for an automatic approval from the European Commission without notification of State aid considered beneficial for the strengthening of the competitiveness of EU industry or the cohesion of the single market.[114] It also brought together all the existing block exemptions, as well as new areas (innovation, environment, research and development for large companies and risk capital aid for SMEs) in a single instrument. In 2012, a new process of state aid modernisation was launched to align national subsidies more closely with the objectives of the Europe 2020 Strategy, concentrate ex-ante control on the cases with the biggest impact on the single market and speed-up procedures.[115] In the framework of this reform, in 2014 the Commission provided legal information to encourage the development by Member States of important collaborative projects that promote IPCEIs (Di Carlo and Schmitz, 2023, p.2084).[116]

4.3. GBER aid: evolution of the legal provisions and policy outcomes

4.3.1. The evolution of GBER provisions

According to the European Treaties, state aid must be notified to the Commission prior to its implementation (Art. 108(3) TFEU). Block exemption regulations exempt Member States from EU prohibitions on state aid without the need for the Commission to engage in a case-by-case analysis, which requires time and administrative resources. These tools have been commonly used to reduce the Commission and national competition authorities' workload, while providing guidance and legal certainty to firms (Brook, 2022). While the Commission first introduced exemptions for categories of aid in the 1980s, over time they have evolved into a full-fledged system of regulated exemptions enshrined in the so-called General Block Exemption Regulation (GBER) adopted in 2008.[117] The aim was to reduce administrative procedures by exempting the requirement for Member States to notify certain types of horizontal aid considered to be of European interest (e.g. to enhance the competitiveness of industry or regional cohesion in the single market). Since then, the Commission has repeatedly amended the GBER to widen its scope and further relax its conditions, especially by increasing the authorized thresholds.

In 2014, in the context of the state aid modernisation, GBER was amended[118] to exempt from prior approval higher aid amounts for various new aid categories, such as for broadband-related infrastructure and subsidies to support the development of the energy single market and environmental goals (e.g. aid for energy infrastructure or operating aid for renewable energy). In 2017, GBER was amended[119] to modify the provisions concerning regional aid. In 2021, the scope of the regulation was broadened and the rules simplified to enable effective government support for the twin, ecological and digital transition of European industry. New categories of aid covered by the regulation included aid for investment in new technologies or to improve the energy performance of buildings.[120] Finally, in 2023, the GBER was further amended[121] to simplify its rules, speed-up support for the green and digital transitions of industry and facilitate the support of ICPEIs (see Section 4).

[111] JO C 83/1, Temporary Community framework for State aid measures to support access to finance in the current financial and economic crisis, 7 April 2009.

[112] Those conditions included the fact that aid did not exceed a grant of EUR 500,000 per company, that it was granted to companies that were not in difficulty on 1 July 2008, and that the aid was granted no later than 31 December 2010; JO C 83/1, Temporary Community framework for State aid measures to support access to finance in the current financial and economic crisis, 7 April 2009.

[113] Ibid.

[114] The authorized national subsidies included State aid in favor of SMEs, for R&D, innovation, regional development, training, environmental protection and risk capital. JO L 214/3, Commission Regulation (EC) No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General bloc exemption Regulation), 9 August 2008.

[115] European Commission, COM(2012) 209 final, Modernisation of EU State Aid Policy, 8 May 2012.

[116] European Commission, 2014/C 188/02, Criteria for the analysis with the compatibility with the internal market of State aid to promote the execution of important projects of common European interest, 20 June 2014.

[117] JO L 214/3, Commission Regulation (EC) No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General block exemption Regulation), 9 August 2008.

[118] Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty Text with EEA relevance, available at: https://eur-lex.europa.eu/eli/reg/2014/651/oj.

[119] JO L 156/1, Commission Regulation (EU) 2017/1084 of 14 June 2017 amending Regulation (EU) No 651/2014 as regards aid for port and airport infrastructure, notification thresholds for aid for culture and heritage conservation and for aid for sport and multifunctional recreational infrastructures, and regional operating aid schemes for outermost regions and amending Regulation (EU) No 702/2014 as regards the calculation of eligible costs, 20 June 2017. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1084&from=EN.

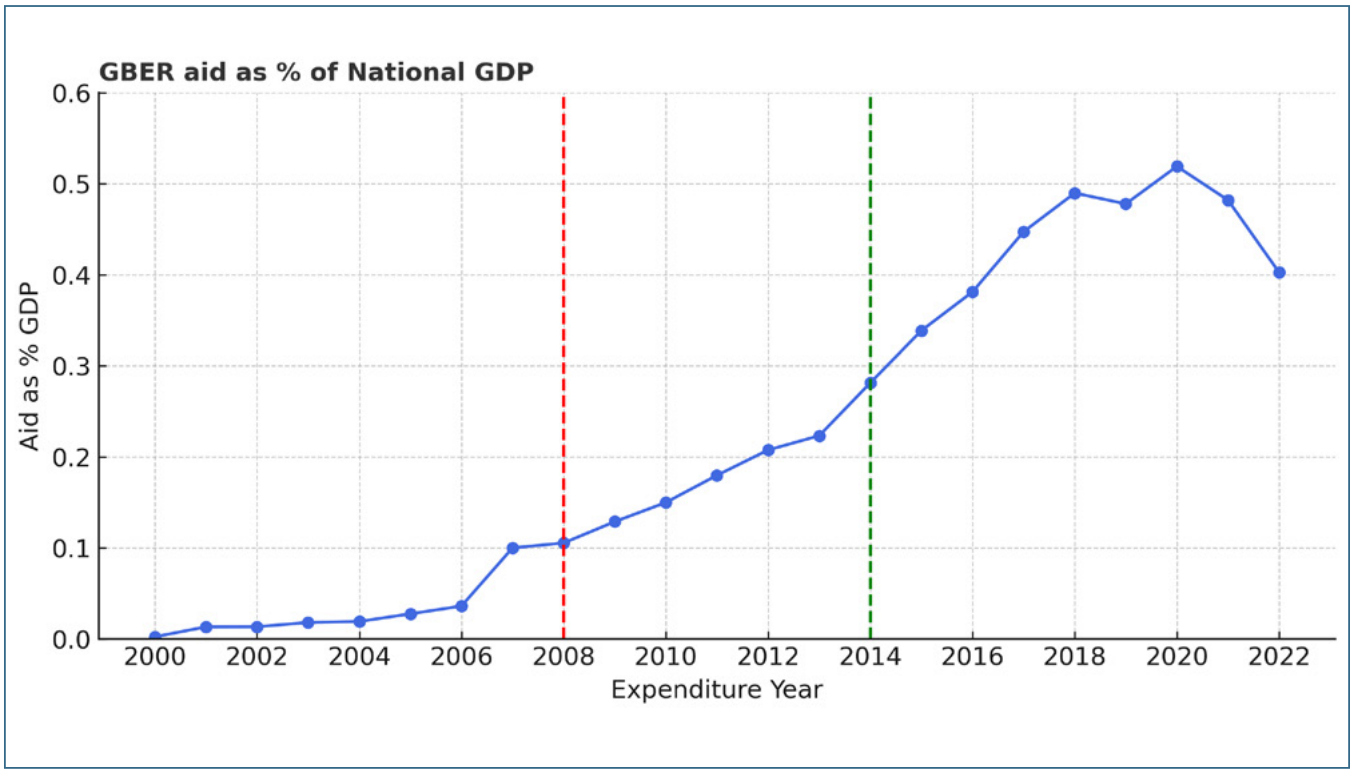
[120] JO L 270/39, Regulation (EU) of 23 July 2021 amending Regulation (EU) No 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, 29 July 2021. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1237&from=EN.

[121] JO L 167/1, Commission Regulation (EU) 2023/1315 of 23 June 2023 amending Regulation (EU) No 651/2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty and Regulation (EU) 2022/2473 declaring certain categories of aid to undertakings active in the production, processing and marketing of fishery and aquaculture products compatible with the internal market in application of Articles 107 and 108 of the Treaty, 30 June 2023. https://shorturl.at/HJSdG.

4.3.2. GBER aid: size

Overall, GBER aid has increased substantially over the last decade: from close to 0 percent in the mid-2000s to an average of 0.5 percent of national GDP in 2020, especially as a result of the 2008 and 2014 regulations (Figure 2).

Figure 4.2: GBER aid across EU27 countries (2000-2022), unweighted average of national GDP values



Source: our elaboration from the State Aid Scoreboard, European Commission. Note: The vertical lines represent the 2008 and 2014 Commission regulations.

As noted by the Commission's 2023 State Aid Scoreboard,[122] the share of block-exempted measures has been rising constantly over time. *In 2022, Member States implemented 1901 new measures under GBER and, together with ABER[123] and FIBER[124] measures, exempted aid measures constitute 84 percent of the total number of new state aid measures in the EU.* This is in line with the Commission's intention, after the modernization of state aid in the EU, to focus on the monitoring and approval of less cases constituting larger – and potentially more distortive – aid cases.

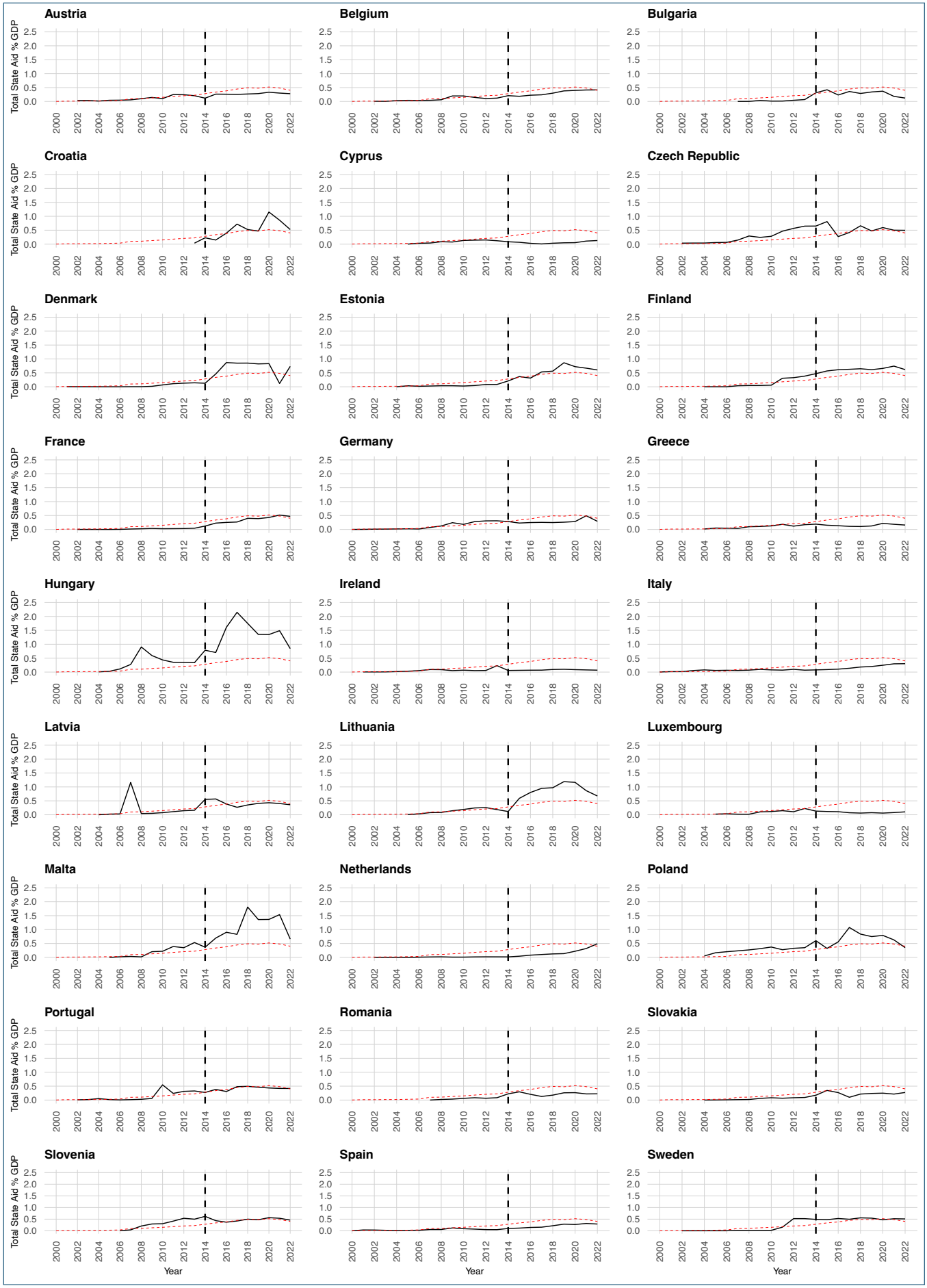
Countries vary substantially in the extent to which they have made use of GBER aid over time (Figure 4.3). Among those which have made the most extensive use of GBER aid are, especially, *Hungary, Malta, Lithuania, Poland and Czechia.* Thus, smaller and particularly Eastern European countries appear to have exploited the new regulatory flexibilities on state aid policy granted by GBER since 2008 the most.

[122] https://shorturl.at/lHHEg

[123] Agricultural Block Exemption Regulation (ABER).

[124] Fishery Block Exemption Regulation. (FIBER).

Figure 4.3: GBER aid as percentage of GDP in EU27 countries (2000-2022)

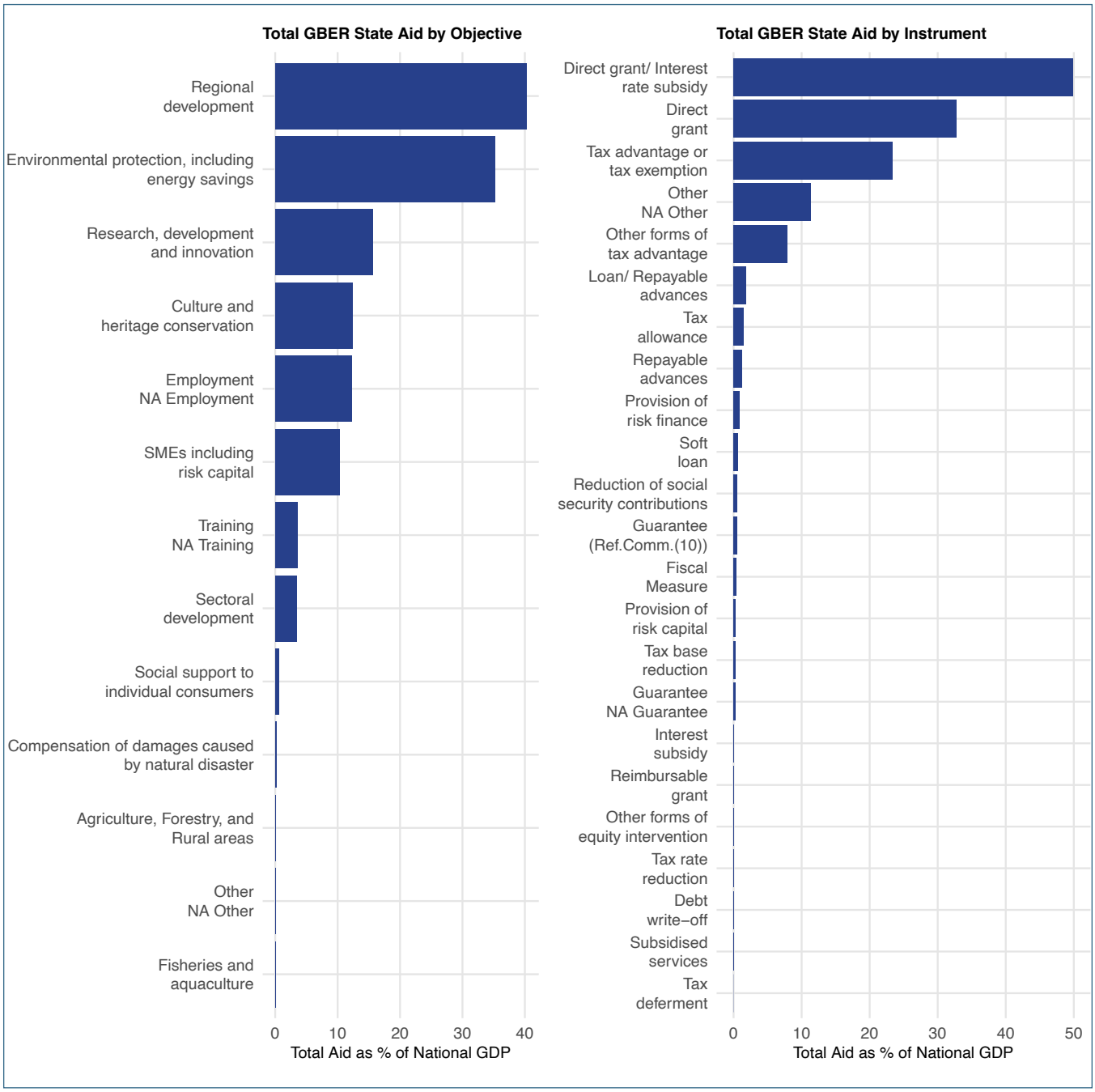


Source: our elaboration from State aid Scoreboard, European Commission. Note: The red line represents the mean of the sample. The vertical dashed line represents the 2014 GBER.

4.3.3. GBER aid: composition

GBER aid has been predominantly targeted at two major objectives: *regional development* and *environmental protection* plus *energy savings* (Figure 4, left). Other notable objectives pursued via GBER aid include *research, development and innovation* as well as *culture and heritage conservation*, aid to stimulate *employment* and to support *SMEs,* including through the provision of *risk capital*. Until 2014, overall, regional development was the major GBER objective pursued by EU countries. After 2014, however, environmental protection has grown to become the major objective pursued via GBER aid.

Figure 4.4: Total GBER aid granted between 2000-2022 by GBER objective and instrument, cumulation of national values as percentage of GDP



Source: our elaboration from State Aid Scoreboard, European Commission.

The instruments most used across the EU to distribute GBER aid across countries are by far *direct grants* and *interest rate subsidies,* followed by *tax advantages* and *tax exemptions* (Figure 4, right).

Notable cross-country variation in GBER aid can be observed across countries, both in terms of the objectives pursued by different countries (Figure 5) and the instruments employed (Figure 6).

GBER aid for regional development is highly concentrated in Eastern European countries as well as small EU countries. Hungary leads with the highest cumulated aid as a percentage of GDP, followed by *Czechia, Malta, Portugal, Poland, Slovenia, Bulgaria, and Croatia*. This pattern suggests that these countries, many of which are newer EU Member States or have historically faced developmental challenges, have made extensive use of GBER aid to foster regional development, enhance economic cohesion and reduce disparities within their jurisdictions.

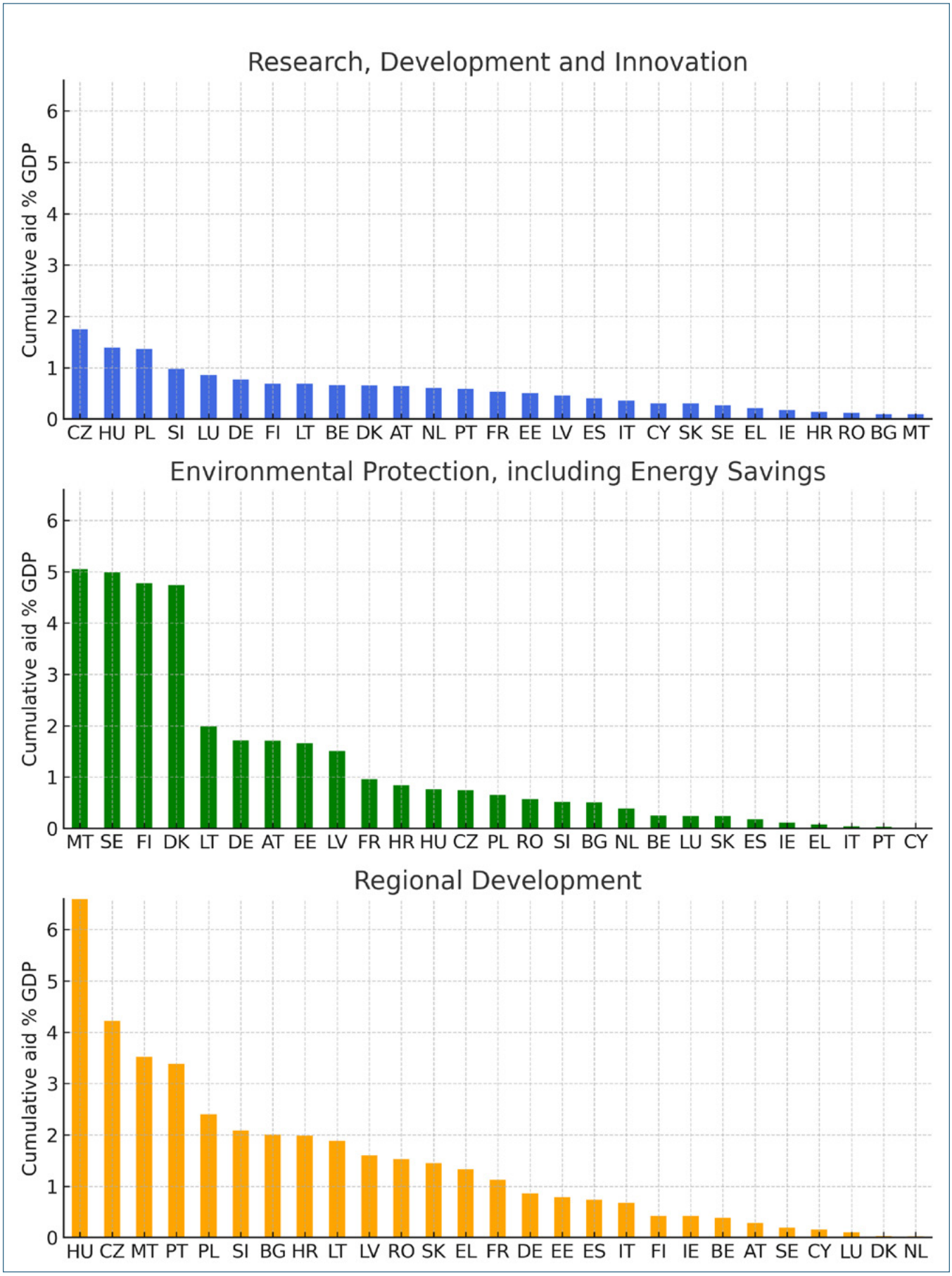
The analysis of state aid for environmental protection and energy savings indicates a different pattern. *Small EU countries and the Nordic countries lead in the provision of environmental GBER aid. Malta* has dedicated cumulated state aid on environmental protection and energy savings of around 5% of its GDP. *Sweden*, *Finland* and *Denmark* follow closely, each allocating just under 5% of their GDP. With much lower levels, *Lithuania, Germany, Austria*, and *Estonia* follow the Nordic countries' lead in environmental GBER aid.

GBER state aid for research, development and innovation is also highly concentrated in Eastern Europe. Czechia leads with the highest allocation, having earmarked a cumulated 1.75% of its GDP to these activities. *Hungary, Poland* and *Slovenia* also show significant spending levels, likely reflecting Eastern European countries' strategic priorities to boost technological innovation within economic models focused on manufacturing (especially automotive) and the attraction of foreign direct investment (Ban and Adascalitei, 2022).

When analysing the major instruments employed to allocate GBER aid (Figure 6), Eastern European countries (especially Hungary, Poland and Czechia) and the Baltics (Estonia and Lithuania) are the ones who have relied the most on the use of *direct grants* and *interest rate subsidies*. On the contrary, Nordic countries such as Denmark and Finland – but also Baltic countries like Lithuania and Latvia – have relied predominantly on the use of *tax advantages* and *tax exemptions* to distribute GBER aid.

In all, since 2008 the Commission has expanded the breadth and scope of general block exemptions. As a result, over the last decade, GBER aid has increased five-fold across the single market (Figure 2). Our analysis points to growing cross-country variation both in the levels and composition (objectives and instruments) of GBER aid across the EU. GBER aid is most used for regional development, environmental protection, including energy savings (Figure 4, left), and is disbursed predominantly via direct grants and interest rate subsidies (Figure 4, right). Overall, Hungary, Malta, Lithuania, Poland and Czechia have made the most extensive use of GBER aid. Eastern European countries have especially used GBER aid for regional development and for research, development and innovation. The Nordic countries have instead made strategic use of GBER aid for environmental protection and energy savings.

Figure 4.5: Total GBER aid granted by country and by the top-3 GBER objectives (2000-2022)



Source: our elaboration from State aid Scoreboard, European Commission.

Figure 4.6: Total GBER aid granted by instrument and by country, only major obectives (2000-2022), cumulated levels of national GDP

Source: our elaboration from State aid Scoreboard, European Commission.

4.4. Important Projects of Common European Interest (IPCEIs)

4.4.1. The IPCEI instrument and its industrial policy priorities

Since the mid-2010s, Important Projects of Common European Interest (IPCEIs) have become an important tool for EU industrial policymaking. Based on Art. 107 (3)b TFEU, two Commission Communications – in 2014[125] and 2021[126] – have defined and refined the scope and design of the IPCEI instrument. Today, it can be used to finance industrial policy projects from the R&D phase and up until first-industrial deployment. Subsidized projects need to be highly innovative (global state-of-the-art) and address existing market failures. Furthermore, individual IPCEIs need to include projects from at least four EU Member States and contain an important cross-border component in terms of collaboration and knowledge dissemination (Di Carlo and Schmitz, 2023, p.2084).

Until September 2024, the European Commission notified ten IPCEIs: four hydrogen IPCEIs, two battery IPCEIs, two microelectronics IPCEIs, an IPCEI on cloud and edge technologies as well as an IPCEI in the pharmaceutical sector. Individual IPCEIs in specific sectors were developed jointly but some were eventually split into different waves of implementation. Table 1 provides an overview of all industrial policy IPCEIs that have been notified over the course of the last years. It covers the participating countries, the number of supported industry actors and projects/undertakings, the expected public and private funding to finance the individual IPCEIs, as well as the overall time frame for their realization.

Beyond the ten currently notified IPCEIs, several others are in different phases of the identification, planning and development processes (Table 2), with some proposed IPCEIs currently either on hold or abandoned. A 2019 report by the *Strategic Forum for IPCEIs*[127] suggested *six key strategic value chains* that could be suitable for setting up IPCEIs:

- clean;
- connected and autonomous vehicles;
- smart health;
- low CO2 emissions industry;
- hydrogen technologies and systems;
- industrial internet of things;
- cybersecurity.

Some of these proposals have subsequently led to the creation of IPCEIs, partly in strongly modified forms (e.g. hydrogen, health, internet of things) while others did not move beyond the initial phase regarding the call for expressions of interest among Member States' companies (e.g. low carbon industry). A photovoltaics IPCEI, pushed by parts of the European solar manufacturing industry in 2021/2022,[128] equally did not materialize into a concrete IPCEI until now.

[125] European Commission (2014): Communication from the Commission. Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest. 20.06.2014. https://shorturl.at/9A4uP

[126] European Commission (2021): Communication from the Commission. Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest. 21.11.2021. https://eur-lex.europa.eu/resource.html?uri=cellar:c6681395-4ded-11ec-91ac-01aa75ed71a1.0004.02/DOC_1&format=PDF

[127] Strategic Forum for IPCEIs (2019): Strengthening Strategic Value Chains for a future-ready EU Industry. Report of the Strategic Forum for Important Projects of Common European Interest. https://www.eartо.eu/wp-content/uploads/Strategic-Forum_Strengthening-Strategic-Value-Chains-for-a-future-ready-EU-Industry.pdf

[128] ESMC (2022): Press release: IPCEI for PV launched in Brussels – EU Member States are invited to join the framework. 23.05.2022. https://esmc.solar/ipcei-for-pv-launched-in-brussels-eu-member-states-are-invited-to-join-the-framework/

Table 4.1: Overview of all notified industrial policy IPCEIs until June 2024

No	IPCEI	Member states (+ third countries)	Industry actors	Projects	Public funding (in bn €)	Private funding (in bn €)	Start date	End date
1	Micro-electronics 1 (ME1)	4+1: Austria, France, Germany, Italy + United Kingdom (Austria joined in March 2021)	29	43	1.9	6.5	12/2018	2024
2	Batteries 1 (Bat1)	7: Belgium, Finland, France, Germany, Italy, Poland, Sweden	17	22	3.2	5	12/2019	2031
3	Batteries 2 (Bat2 | EuBatIn)	12: Austria, Belgium, Croatia, Finland, France, Germany, Greece, Italy, Poland, Slovakia, Spain, Sweden	42	46	2.9	9	01/2021	2028
4	Hydrogen 1 (Hy2 | Hy2Tech)	15: Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain	35	41	5.4	8.8	07/2022	tbc
5	Hydrogen 2 (Hy2 | Hy2Use)	13+1: Austria, Belgium, Denmark, Finland, France, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden + Norway	29	35	5.2	7	09/2022	2036
6	Micro-electronics 2 (ME2 | ME/CT)	14: Austria, Czechia, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Poland, Romania, Slovakia, Spain	56	68	8.1	13.7	06/2023	2032
7	CIS	7: France, Germany, Hungary, Italy, Netherlands, Poland, Spain	19	19	1.2	1.4	2023	2031

No	IPCEI	Member states (+ third countries)	Industry actors	Projects	Public funding (in bn €)	Private funding (in bn €)	Start date	End date
8	Hydrogen 3 (Hy3 | Hy2Infra)	7: France, Germany, Italy, Netherlands, Poland, Portugal, Slovakia	32	33	6.9	5.4	2024	2029
9	Hydrogen 4 (Hy4 | Hy2Move)	7: Estonia, France, Germany, Italy, Netherlands, Slovakia, Spain	11	13	1.4	3.3	2024	2031
10	Medicines 1 (Med1 | Med4Cure)	6: Belgium, France, Hungary, Italy, Slovakia, Spain	13	14	1	5.9	2024	2036

Set up in 2023, the *Joint European Forum (JEF) for IPCEI* agreed on a new list of potential IPCEIs during its first high-level meeting in March 2024.[129] Three value chains were prioritized: nuclear, cleantech and digital technologies. In addition, also biotechnologies and 'advanced materials' were identified as potential areas of interest for upcoming IPCEIs. According to the political guidelines for the 2024-2029 European Commission, "the first new set of common projects will be proposed in early 2025."[130]

[129] JEF-IPCEI (2024): Joint European Forum for IPCEI (JEF-IPCEI). 1st high-level meeting of the JEF-IPCEI on 7 March. https://competition-policy.ec.europa.eu/state-aid/ipcei/joint-european-forum-ipcei_en

[130] Von der Leyen, Ursula (2024): Europe's Choice. Political guidelines for the next European Commission 2024-2029. 18.07.2024. https://shorturl.at/VPfX6

Table 4.2: Overview of proposed IPCEIs that have not been notified until June 2024

IPCEI	Member states (+ third countries)	Date of proposal	Status
Low-CO2 emissions industry	tbd	2019	Halted
Med2 (Tech4Cure)[x]	16: Austria, Belgium, Denmark, France, Greece, Hungary, Irland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Romania, Slovenia, Spain	03/2022	Under development
Photovoltaics	5: Austria, Lithuania, Luxembourg, Poland, Spain	05/2022	Halted
Nuclear[y]	12: Bulgaria, Croatia, Czechia, Finland, France, Hungary, Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden	03/2024	Advanced exploration
Cleantech	tbd	03/2024	Exploration
Digital	tbd	03/2024	Exploration
Biotech	tbd	03/2024	Exploration
Advanced materials	tbd	03/2024	Exploration

Notes: This list of proposed IPCEIs contains suggestions by the Strategic Forum of IPCEIs, priorities selected by the JEF-IPCEI as well as other member state or industry-led IPCEI proposals.

[x] Joint Manifesto (2022): Manifesto towards a health IPCEI. 03.03.2022. https://shorturl.at/GuQyb

[y] Messad, Paul (2024): Pro-nuclear countries back total opening up of EU funding for nuclear. Euractiv. 05.03.2024. https://shorturl.at/SzD8v

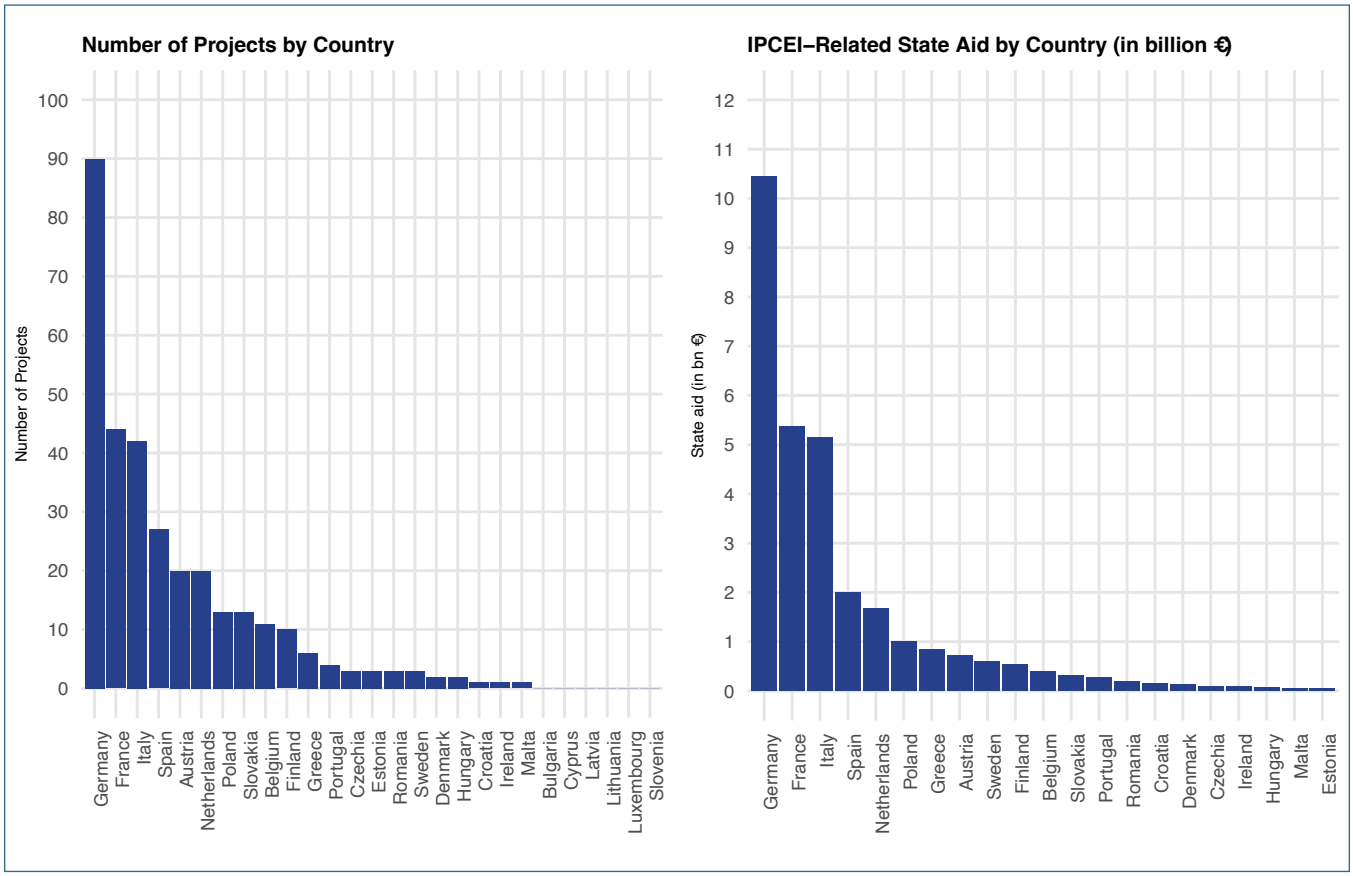
4.4.2. Marked differences between countries: The use of the IPCEI instrument since 2018

The strategic use of the IPCEI instrument strongly differs between EU member states (see Figure 7). *While France and Italy have participated in each of the ten IPCEIs that were notified until June 2024, six other countries have not taken part in any IPCEIs (Bulgaria, Cyprus, Latvia, Lithuania, Luxembourg, Slovenia). Among the countries that have made significant use of the IPCEI instrument are also Germany (8), Poland, Slovakia, and Spain (7 each), the Netherlands (6) as well as Austria, Belgium, and Finland (5 each).*

Country differences in the use of the IPCEI instrument are more pronounced when looking at the number of supported national undertakings/projects and the amount of public state aid given to them. *As Figure 7 shows (left panel), Germany alone accounts for 90 subsidized projects – more than France and Italy taken together. Germany's projects thus amount to 28,2% of all projects, levels higher than Germany's population (18,8%) and GDP share (24,2%) inside the EU.*

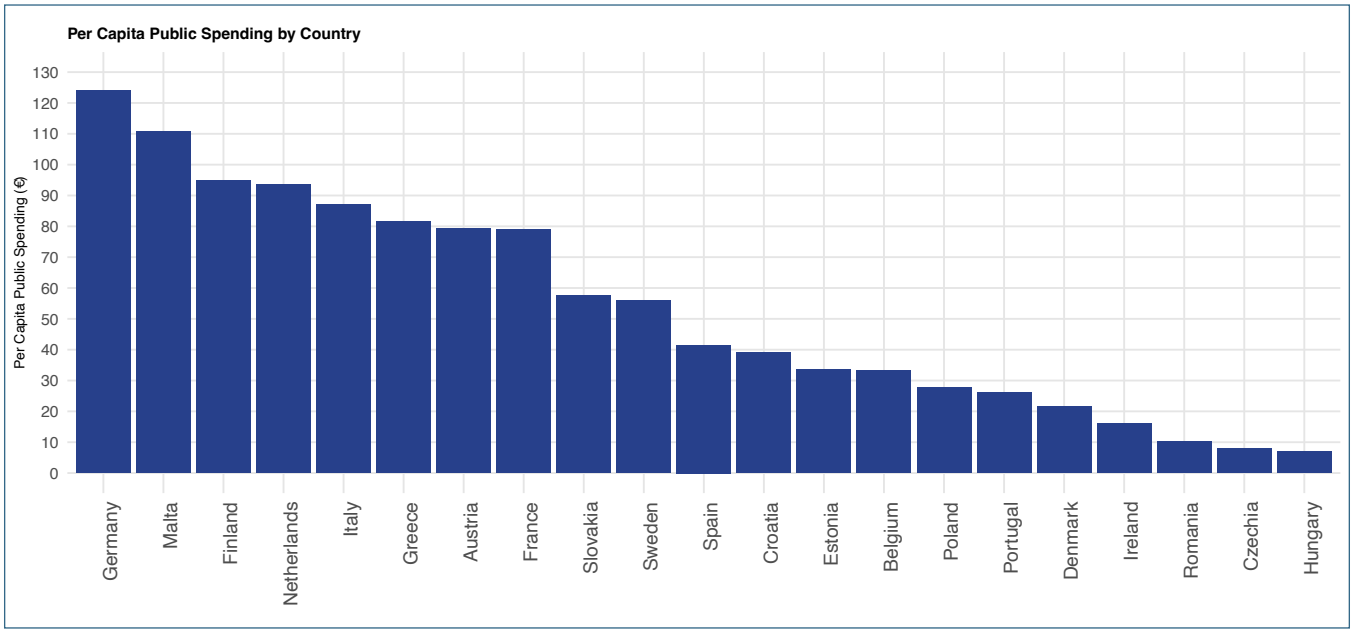
Looking at the state aid decisions that have been made public so far (i.e. the two microelectronics IPCEIs, the two battery IPCEIs, the first two hydrogen IPCEIs and the cloud technology IPCEI) allows us to identify how much of the overall public funding for the various IPCEIs was granted to individual EU Member States (Figure 7, right panel). Here, the country differences are even greater. *With roughly €10,5bn of granted stated aid, German public funding for IPCEIs accounts for 34,7% of overall public subsidies. The shares of France and Italy are 17,8% and 17,1%, respectively. Together, these three countries account for about 70% of granted IPCEI state aid across Europe.*

Figure 4.7: IPCEI participations per country (left panel) and individual projects financed through the IPCEI instrument per country (right panel)



Notes: Data includes all IPCEIs presented in Table 1. Notes: Data includes all IPCEIs with published state aid decisions (ME1, Bat1, Bat2, Hy1, Hy2, ME2, CIS).

Figure 4.8: granted national state aid for IPCEIs per capita



Notes: Data includes all IPCEIs with published state aid decisions (ME1, Bat1, Bat2, Hy1, Hy2, ME2, CIS).

Even when looking at granted national IPCEI state aid per capita, Germany remains on top with roughly 124€ (Figure 8). The per capita view shows that beyond the three biggest EU economies, also some of the smaller rich EU member states, such as Finland, the Netherlands and Austria, made significant public subsidies available for their IPCEI participations.

4.4.3.The sources of public IPCEI funding

Since the IPCEI instrument has been reoriented toward the financing of industrial policy projects, individual IPCEIs have largely been funded through national *ad hoc* financing. This means that the government and/or the responsible ministries need to be able to prioritize IPCEI subsidies over other spending needs. *The Recovery and Resilience Facility (RRF) of the EU's NextGenerationEU plan temporarily allows Member States to finance IPCEI projects with EU funding, which facilitates the IPCEI participation of countries with lower fiscal capacity.* The National Recovery and Resilience Plans (NRRPs) of 13 Member States included IPCEI spending, amounting up to €10,5bn of EU-financed state aid (Eisl, 2022). In addition to RRF money, Member States can also make use of the EU cohesion policy funds, while projects can potentially also profit from EIB support. *But with the expiry of the RRF and fragmented other EU funding opportunities, IPCEIs will remain heavily dependent on national financing unless a more comprehensive approach is adopted.*

4.4.4. The integration of IPCEIs with other European state aid instruments

Since the inception of the IPCEI instrument, the increasing number of participants (both in terms of countries and companies) has rendered the development and notification process of IPCEIs highly complex, causing significant delay and difficulties in implementation (see e.g. Schmitz et al., 2024). Many of the most recent IPCEIs took more than two years from the initial proposal until the final adoption.

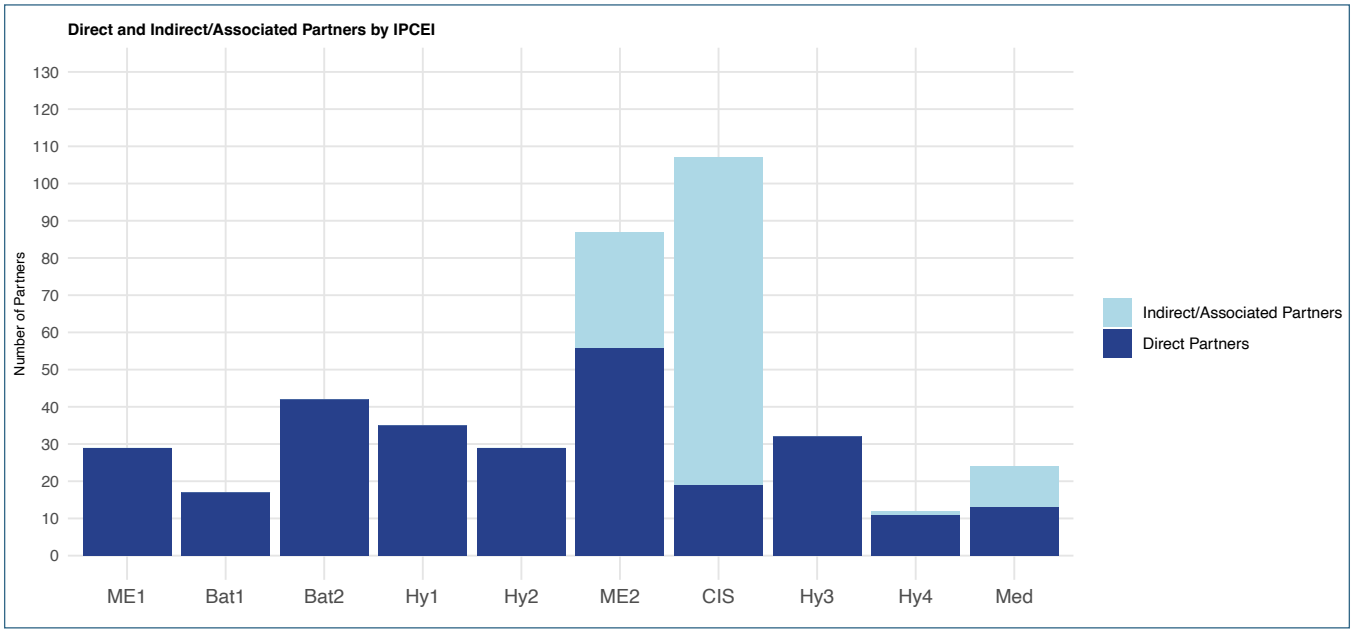
To speed up the notification process, two different strategies were developed. First, some of the proposed IPCEIs were split into different 'waves', allowing more advanced projects to move forward, while giving others more time to improve their project ideas. Second, starting with the second microelectronics IPCEI and further developed with the Cloud technology

IPCEI, the IPCEIs now include not only 'direct partners' (with state aid granted through the IPCEI instrument) but also 'indirect' and 'associated partners', which are part of individual IPCEIs but are granted state aid through other mechanisms, most notably based on the General Block Exemption Regulation (GBER).

To facilitate the utilization of GBER and reduce the number of projects that need to go through the IPCEI notification, the GBER rules were modified in summer 2023 (see Section 3 above). Most importantly, R&D projects related to multi-country projects such as IPCEIs can now receive aid up to €50 million with mandatory notification to the Commission.[131] At the same time, these projects are still recognized as part of the ecosystem created by an IPCEI.

Figure 9 shows the number of direct and indirect/associated partners for all IPCEIs currently notified. Especially for the cloud and medicines IPCEIs, the number of partners not subsidized based on IPCEI-relevant state aid was considerable, reducing the administrative burden for the Commission, enterprises and Member States.

Figure 4.9: Evolution of direct and indirect/associated partners across the different IPCEIs



Notes: Data includes all IPCEIs presented in Table 1.

In all, while the RRF and recent GBER modification have made IPCEI participation – at least temporarily – more inclusive across EU Member States, the analysis above has highlighted remarkable cross-country differences. *Especially the three largest EU economies, Germany, France and Italy, have made ample use of the ICPEI instrument.* Smaller advanced economies such as Finland, the Netherlands and Austria were able to provide significant amounts of state aid to national projects. *In contrast, many Eastern European and Baltic countries did not take part in any IPCEIs or only to a minor extent.*

4.5. State aid under the Temporary Frameworks: Covid-aid and the TCTF

4.5.1. The Covid State Aid Temporary Framework

To mitigate the health emergency caused by the outbreak of the Covid-19 pandemic in early 2020, EU Member States implemented various emergency measures, including lockdowns and travel restrictions, which caused a severe contraction in economic activity (Van Hove, 2020). To enable Member States to ensure liquidity assistance to firms affected by the pandemic's fallout, in March 2020 the Commission adopted the Temporary Framework

[131] https://ec.europa.eu/commission/presscorner/detail/en/ip_24_2852

(TF) for State aid measures to support the economy during the COVID-19 outbreak[132] – later amended various times.[133] As happened after the 2008 global financial crisis, this constituted a major relaxation of state aid prohibitions in Europe. The Commission's aim was to enable enough flexibility in the use of state aid during crisis times while orchestrating a coordinated response to the pandemic and minimizing the distortion of the single market.

The Commission adopted the TF based on Article 107(3)(b) TFEU, enabling Member States to use state aid to remedy a serious disturbance across the EU economy. Moreover, state aid could also be authorized under specific treaty provisions, such as article 107(2)(b), allowing aid to repair the damage caused by national disasters or other exceptional occurrences (Maczkovics, 2020). In its first version, the TF deemed admissible five categories of aid aimed at ensuring liquidity and access to finance for businesses affected by the pandemic's restrictive measures (subject to notification) until December 31, 2020:

- Limited amount aid, such as direct grants, tax and payment advantages, or other forms (not exceeding 800 million euros);
- aid in the form of state guarantees on loans;
- aid in the form of subsidized interest rates for loans;
- aid in the form of guarantees and subsidized loans channelled through credit institutions or other financial institutions;
- greater flexibility in short-term export credit insurance.

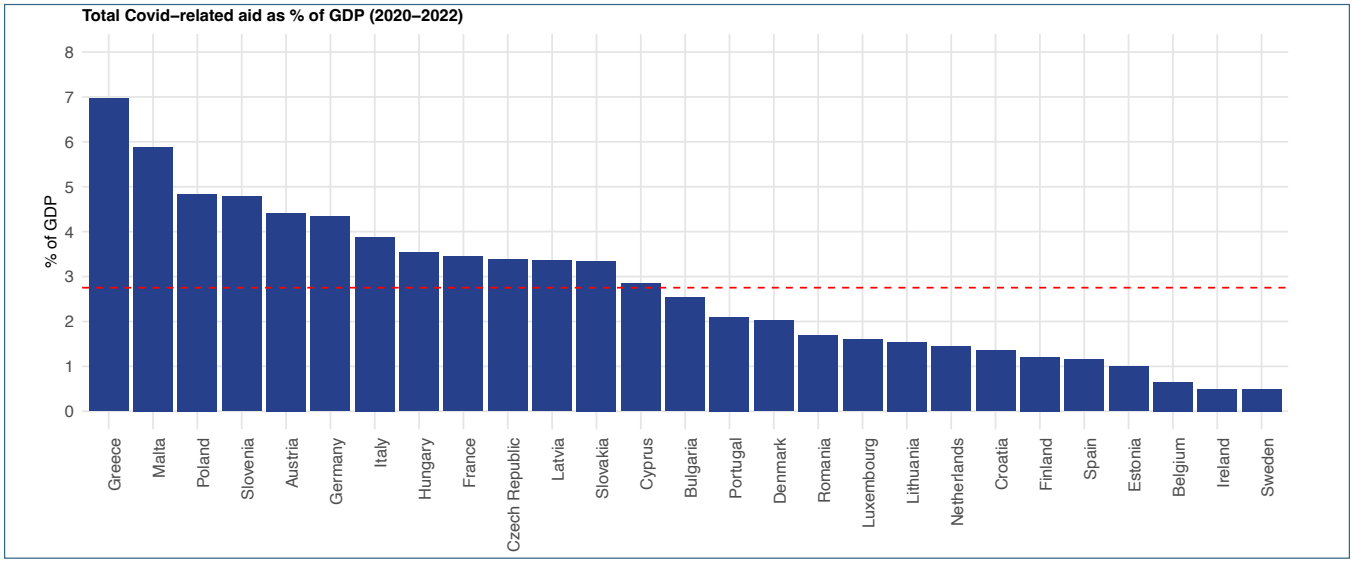
Covid aid: size

During the pandemic, state aid across the EU more than doubled: skyrocketing from an average of around 1 percent in 2019 to almost 2.2 percent of GDP of national GDP across the Member States in 2020 (Figure 1). Looking specifically at Covid-related aid during 2020-2022 – that is aid granted under the TF and similar principles – the great variation of aid levels granted across countries becomes evident. *If, on average EU countries disbursed cumulated Covid aid for around 3% of GDP during 2020-2022, Greece disbursed more than double: around 7 percent of GDP in Covid-related cumulated state aid between 2020 and 2022. Malta and Poland follow with 6 and 5 percent, respectively. At the opposite extreme, countries like Belgium, Ireland and Sweden all granted less than 1 percent of GDP in Covid-related aid (Figure 10).*

[132] Communication from the Commission Temporary Framework for State aid measures to support the economy in the current COVID-19 outbreak 2020/C 91 I/01, 19 March 2020, https://competition-policy.ec.europa.eu/state-aid/coronavirus/temporary-framework_en.

[133] The Temporary Framework was later amended various times and was set to expire - for most of the tools provided - by 30 June 2022 due to the improvement of Europe's health crisis and the phasing out of restrictive measures.

Figure 4.10: Total Covid- related aid percentage of national GPD (Cumulated values as yearly values of state aid in percentage of yearly national GDP)



Source: our elaboration from State Aid Scoreboard, European Commission. *Note:* The horizontal red line represents the mean of the sample.

Covid aid: composition

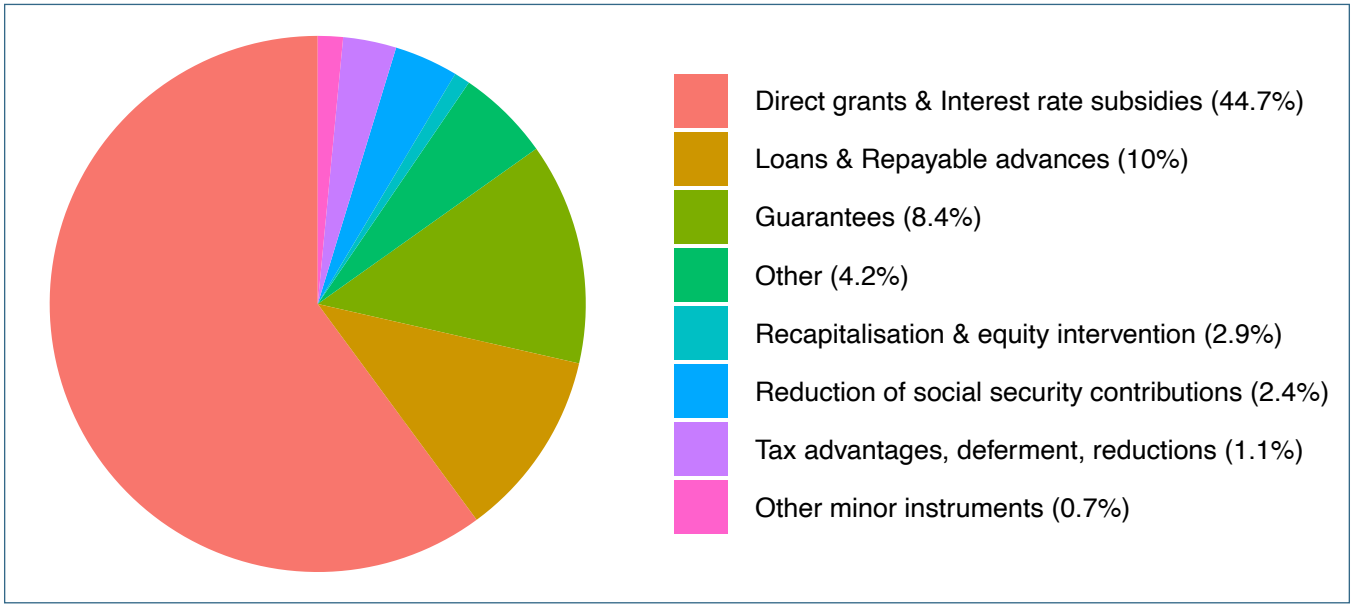
The predominant aid instrument used to channel Covid-related emergency aid was *direct grants* and *interest rate subsidies*,[134] accounting for 44 percent of the total aid value (Figure 10). *Direct grants constitute the single largest instrument used to channel Covid-related aid, reflecting governments' need to provide immediate and unrestricted financial support to firms facing liquidity crises during the lockdowns.*

This is followed by loans and repayable advances, which constituted around 10 percent of the total aid value distributed. Repayable advances are financial instruments provided by governments that serve as a middle ground between grants and loans and must be repaid potentially with interest and additional payments conditional on the success of the project or the firm funded. *Guarantees represented 8.4 percent of the total aid.* State-backed guarantees mitigate banks and lenders' fears about the solvency of borrowing firms, thus maintaining the flow of credit to businesses and the real economy.

The use of state aid instruments to disburse Covid-related aid varied across countries (Figure 11). Malta, Austria, Slovenia, Hungary, and Slovakia were the top five countries that made the most use of direct grants and interest rate subsidies as a percentage of national GDP. Malta leads with 5.61 percent of cumulated national GDP, followed by Austria (3.58%), Slovenia (3.08%), Hungary (2.78%), and Slovakia (2.75%).

Greece (3.8 percent of GDP) and Poland (2.9%) are by far the countries which relied the most on loans and repayable advances. On the contrary, *Italy (1.1 percent of GDP), Austria (0.84%), Romania (0.83%), France (0.77%) and Croatia (0.65%) relied most on guarantees.*

Figure 4.11: Share of Covid-related aid granted (as percentage of GDP) during 2020-2022 by instrument[135]



Source: our elaboration from State aid Scoreboard, European Commission.

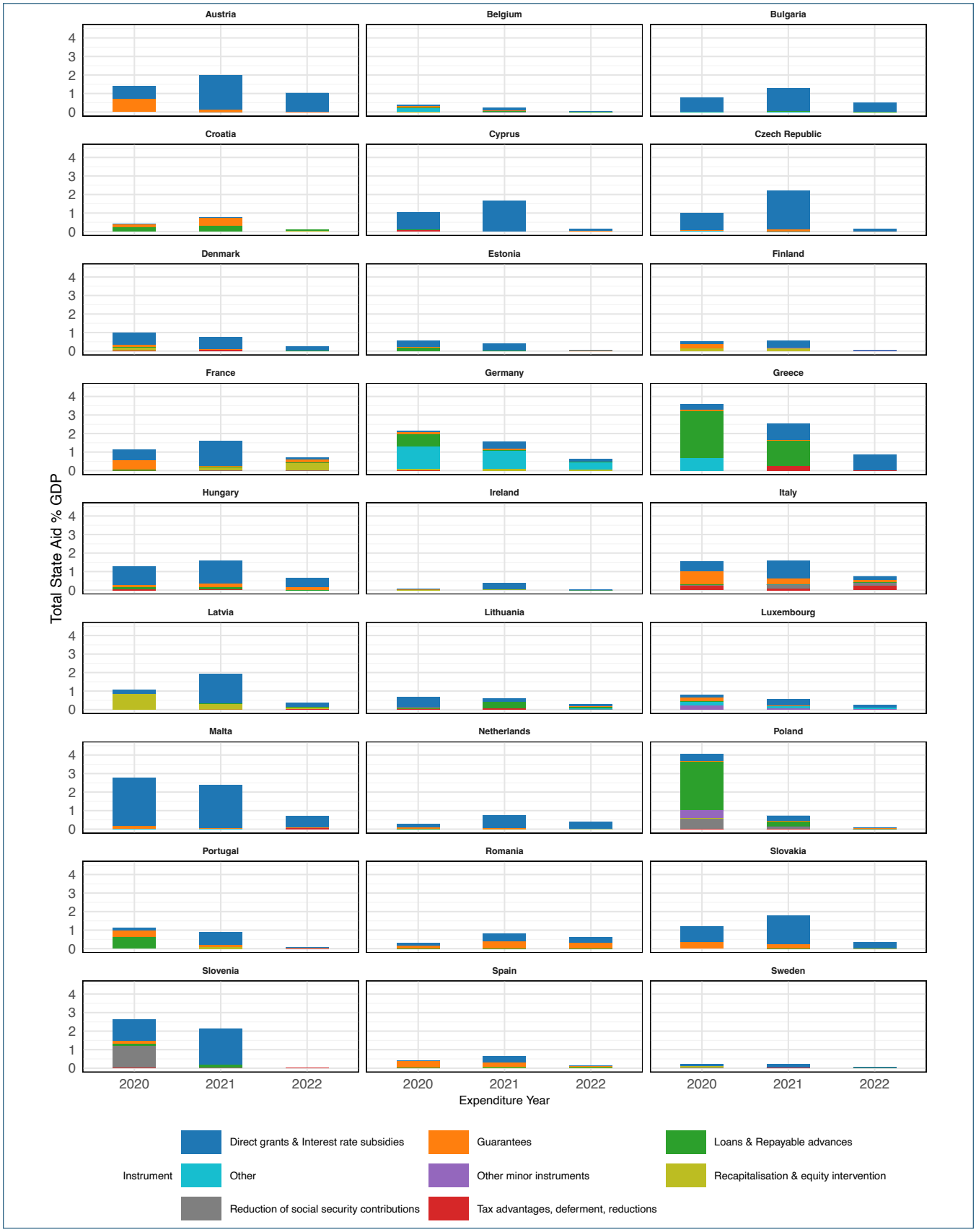
In all, the Covid TF has enabled Member States to flexibly provide emergency aid to struggling domestic firms. During 2020-2022, EU countries disbursed an average of 3 percent of GDP in Covid aid (cumulated over the three-year period). But there was enormous variation in the amount of aid disbursed across countries, raising concerns about the fragmentation of the single market. Greece disbursed more than double the EU average: around 7 percent of national GDP. Malta and Poland follow with 6 and 5 percent. respectively. At the opposite extreme, countries like Belgium, Ireland and Sweden all granted less than 1 percent of GDP

[134] According to the Commission, much of the aid granted under this category can be attributed to the use of direct grants by member states. See, Commission's State aid Scoreboard 2022 (p.29), https://ec.europa.eu/commission/presscorner/detail/en/ip_23_2407.

[135] The category "Other" is largely attributed to a single German COVID-19 State aid scheme (SA.56790 - Federal Framework "Small amounts of aid 2020" - COVID-19), which involved significant spending of EUR 44.01 billion reported as "other" by the German authorities. See, Commission's State aid Scoreboard 2022 (p.30). Several instruments were merged for analysis: "Direct grants & Interest rate subsidies" combines Direct grant, Direct grant/ Interest rate subsidy, and Interest subsidy; "Loans & Repayable advances" includes Loan/ Repayable advances, Repayable advances, and Soft loan; "Tax advantages, deferment, reductions" consolidates Tax advantage or tax exemption, Tax allowance, Tax base reduction, Tax deferment, Tax rate reduction, and Other forms of tax advantage; "Guarantees" merges Guarantee and Guarantee (where appropriate with a reference to the Commission decision (10)); "Recapitalisation & equity intervention" includes Recapitalisation, Other forms of equity intervention, Equity instruments, and Other hybrid capital instruments; and "Other minor instruments" groups Reimbursable grant, Subordinated debt, Hybrid capital instruments (convertible bonds), and Debt write-off.

in Covid-related aid (Figure 10). The most used instruments to disburse Covid aid were *direct grants, loans and repayable advances,* and *Guarantees* (Figure 11). Countries varied greatly also in their use of preferred aid instruments (Figure 12).

Figure 4.12: Covid-related aid as percentage of national GDP by instrument



Source: our elaboration from State aid Scoreboard, European Commission.

4.5.2. The Temporary Crisis (and Transition) Framework (TCTF)

Following Russia's invasion of Ukraine and Europe's sanctions against Russia an energy crisis ensued as Russia retaliated by cutting off gas supplies to Europe. A major supply-side economic shock hit Europe from February 2022 onwards. In this context, the Commission swiftly adopted a Communication for a *Temporary Crisis Framework for State aid Measures* (TCF) enabling Member States to support ailing firms hit by the energy price shock.[136] This framework is designed to complement existing EU state aid instruments and is grounded in Article 107(2)(b) TFEU, which allows Member States to mitigate damage directly caused by exceptional occurrences. Besides the TCF, the so-called *treaty-based aid* allowed Member States to provide aid to remedy a serious disturbance in the economy under Article 107(3)(b) TFEU.

In March 2023, the TCF was replaced by the *Temporary Crisis and Transition Framework* (TCTF).[137] The TCTF[138] expanded the TCF with an eye to fostering the support of renewable energy deployment and industrial decarbonization. Recognizing the urgency of reducing dependency on fossil fuels and promoting the green transition, a new section was included in the TCTF aimed at accelerating investments in critical sectors essential for the transition to a net-zero economy. This includes support for the manufacturing of strategic equipment such as batteries, solar panels, wind turbines, heat pumps, electrolysers, and carbon capture, usage, and storage technologies. The TCTF also supports the production and recycling of key components and critical raw materials necessary for these technologies. Thus, the TCTF has shifted the focus of the TCF from the immediate response to the energy crisis toward the objective of facilitating the green transition across Europe.

While the previous analysis of state aid could rely on data from the European Commission State Aid Scoreboard (updated until 2022 included), there is no data available as of yet on the size and distribution of state aid granted under the TCTF. Our empirical analysis relies on the Commission's surveys of national competition authorities[139] which provide the nominal amounts of aid granted through various instruments from March 2022 until the end of June 2023.

TCTF aid: size

Countries such as Hungary, Italy, and Germany have relied extensively on state aid granted via the TCTF. Hungary granted up to 1.35 percent of national GDP in aid under the TCTF, followed by Italy (1.32%) and Germany (1.23%). *These values stand for more than double the average level across the EU27 countries, at 0.58 percent of EU GDP (Figure 12).*

Most countries granted aid via the legal provisions of the TCTF. However, in some cases, countries granted "treaty-based aid" under Article 107(3)(b) TFEU. While still adhering to the principles laid out in the TCTF, such aid is more general in nature and can be used for broad economic disturbances in the economy when intended national measures do not strictly fit with the TCTF's provisions. During the energy crisis, treaty-based aid was typically used for larger, systemic cases, such as the recapitalization of significant companies, and cases more substantial in scale (e.g., the recapitalization of energy companies like Uniper SE in Germany).[140] Overall, the reliance on treaty-based aid is concentrated in just a few countries like Germany, Spain, and Portugal (Figure 13).

[136] Communication from the Commission, C (2022) 1890 final, Temporary Crisis Framework for State Aid measures to support the economy following the aggression against Ukraine by Russia, Brussels, 23.3.2022./C 131 I/01.

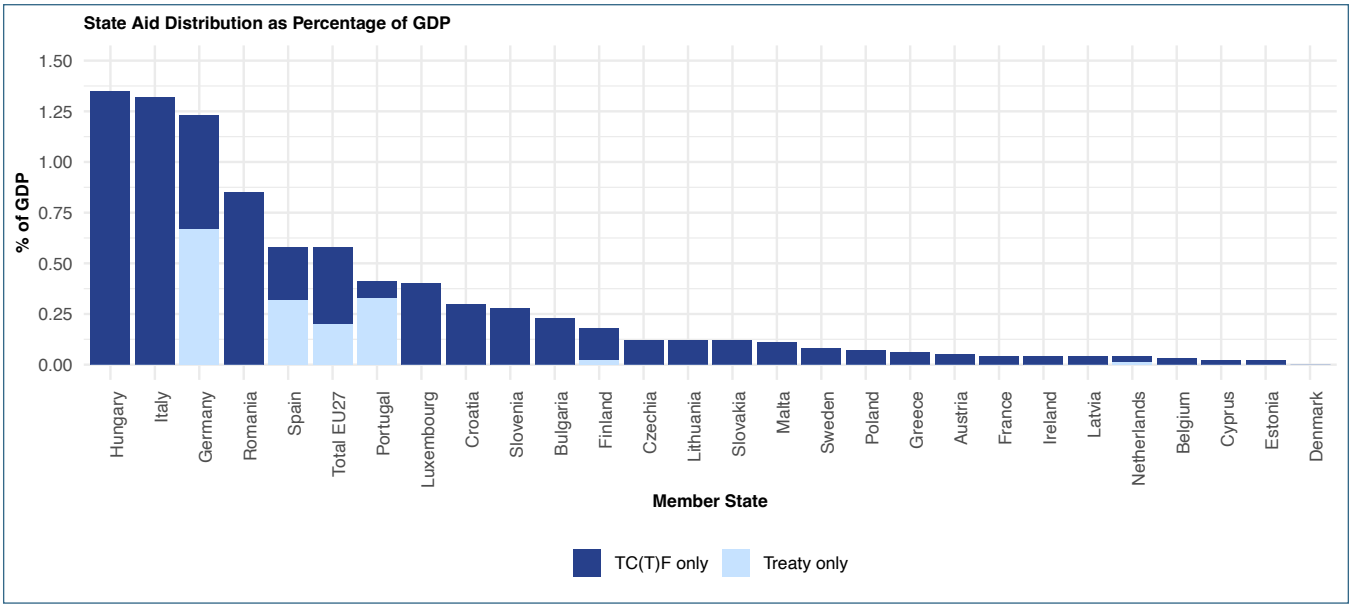
[137] JO C 101/3, Communication from the Commission, Temporary Crisis and Transition Framework for State Aid measures to support the economy following the aggression against Ukraine by Russia, 17 March 2023/C 101/03.

[138] The TCTF was further amended in November 2023 and in May 2024, See: https://competition-policy.ec.europa.eu/state-aid/temporary-crisis-and-transition-framework_en. The Commission extended the phase-out of limited aid amounts and aid compensating for high energy prices until the end of June 2024. Other crisis-related sections of the TCTF, such as liquidity support in the form of State guarantees and subsidized loans, and measures to support electricity demand reduction, expired on 31 December 2023. The provisions for accelerating renewable energy deployment, industrial decarbonization, and investments in key sectors for the net-zero transition remain in effect until 31 December 2025.

[139] Competition State Aid Brief, European Commission, Issue 1/2024 – February 2024. Values for 2023 refer to the period up to the end of June 2023. The data provided is preliminary and may be revised by Member States in the future.

[140] Competition State aid Brief, European Commission, Issue 1/2024 – February 2024, p.3.

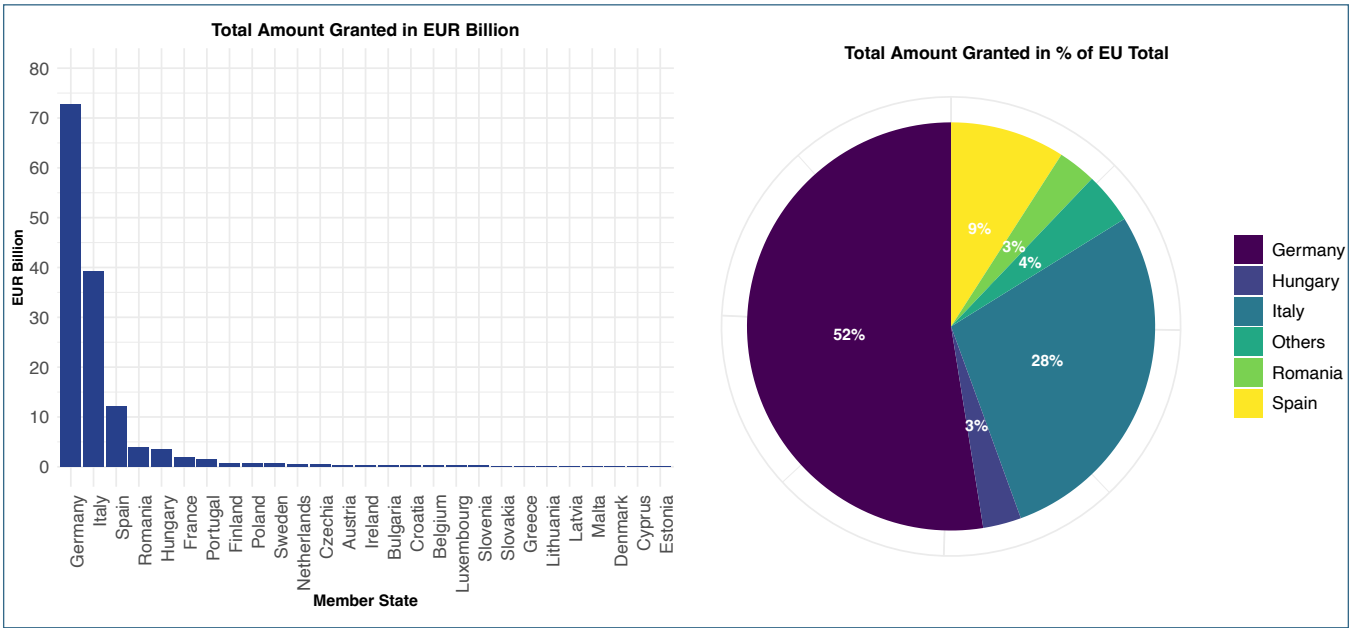
Figure 4.13: State aid granted under the TC(T)F or similar treaty-based principles as percentage of national GDP (March 2022 - June 2023)



Source: our elaboration based on European Commission's Surveys on state aid.

In absolute terms (€ billion), the distribution of state aid across EU Member States reveals significant disparities across the single market. Germany stands out as the largest provider of aid under the TCTF, having disbursed € 72 billion (Figure 14, left), which accounts for a substantial 52% of the total aid granted across the EU (Figure 14, right). Italy follows with € 39 billion, representing 28% of the total EU aid. Spain is the third-largest provider, with € 12 billion, making up 9% of the total, followed by Hungary (€ 3.6 billion) and Romania (€ 3.8 billion) with around 3% of total TCTF aid.

Figure 4.14: State aid granted under the TC(T)F and its principles in billion euros, by country (March 2022 - June 2023)



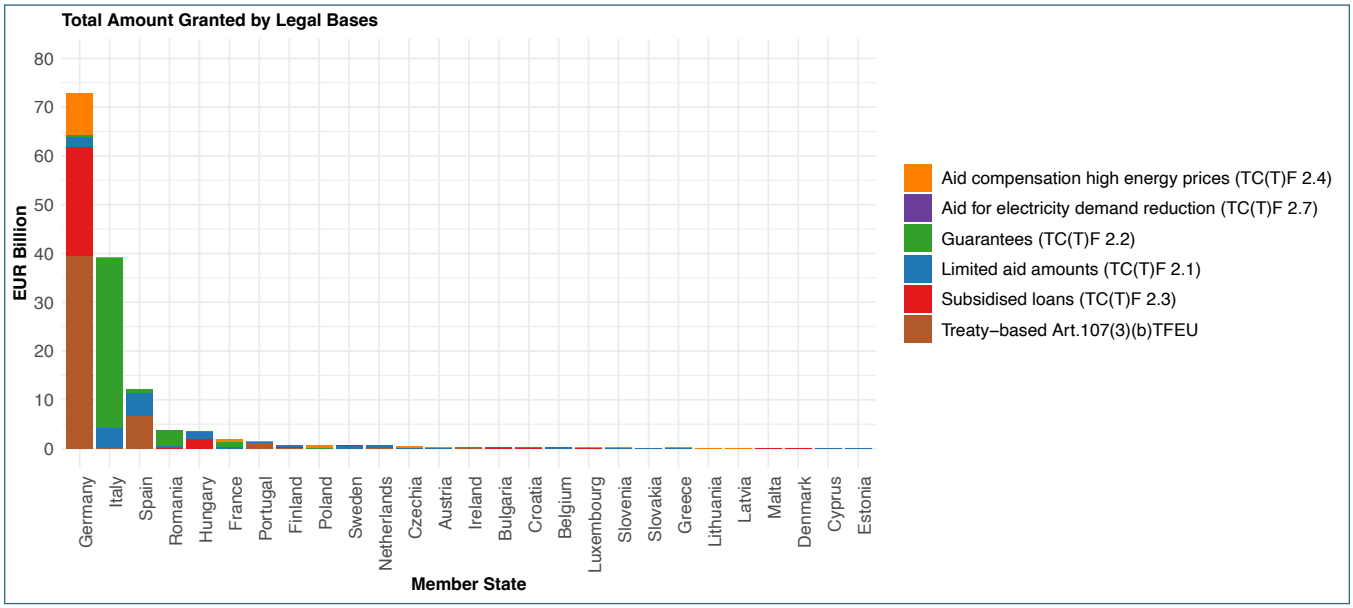
Source: our elaboration based on the Commission's Surveys.[141]

[141] Competition State Aid Brief, European Commission, Issue 1/2024 – February 2024. Values for 2023 refer to the period up to the end of June 2023.

TCTF aid: composition

Germany, Italy, Spain, Romania and Hungary – the top 5 spenders under the TCTF – all used State aid differently during the crisis (Figure 15).

Figure 4.15: State aid granted under the TC(T)F and its principles in billion euros, by legal provision and by country (March 2022 - June 2023)



Source: our elaboration based on European Commission's Surveys on state aid.[142]

Germany has made extensive use of treaty-based aid under Article 107(3)(b) TFEU, providing € 39.5 billion. It also provided €22 billion in subsidized loans (under the TCTF, section 2.3) to offer firms credit at reduced interest rates during the economic downturn; granted € 8.4 in aid to compensate for firms' high energy prices (TCTF 2.4); and distributed € 2.2 billion in direct financial aid (TCTF 2.1), providing immediate relief to domestic undertakings. *Overall, the German government has intervened substantially in the economy with large fiscal resources and subsidies to support its core export-oriented and energy-intensive manufacturing industries (Di Carlo et al., 2023).*

Italy's state aid policy during the energy crisis was instead predominantly focused on the use of guarantees, with the country providing € 35 billion (under the legal basis TCTF 2.2). This suggests that Italy has prioritized the use of contingent liabilities to secure credit and loans for businesses and stabilize the economy in crisis times instead of disbursing immediate fiscal resources, which could have jeopardised Italy's public finance profile, especially vis-à-vis international financial observers.

Overall, the distribution of state aid granted under the TCTF highlights great cross-country variation across the EU. In national GDP terms, Hungary, Germany, and Italy, are the countries which have granted the most aid in the context of the energy crisis. However, countries with different fiscal profiles, most notably Germany and Italy, employed diversified state aid strategies. With stronger public finances, Germany made extensive use of direct aid granted to rescue its large utility firms and subsidised loans. Italy has relied predominantly on the use of guarantees.

4.6. Conclusions and policy recommendations

This empirical analysis has documented the increasing use of state aid in the EU over the last decade. Since 2008, but increasingly so since the mid-2010s, EU Member States have

[142] Competition State Aid Brief, European Commission, Issue 1/2024 – February 2024. Values for 2023 refer to the period up to the end of June 2023.

enjoyed greater flexibility in the use of national state aid policy. Greater flexibility has resulted from changes in both "structural" and "temporary" provisions of the EU state aid regime. On the one hand, the Commission has expanded the scope of state aid which can be granted without prior notification via the GBER (see Section 3) and has incentivised greater use of the treaty-based IPCEI instrument (see Section 4). These constitute structural changes in the EU state aid regime. On the other, in crisis times, the Commission has made strategic use of *ad hoc* instruments, such as the Covid TF and the TCTF to temporarily give Member States flexibility in granting support to domestic undertakings in the face of exceptional economic shocks. However, greater flexibilization has brought greater fragmentation: *Member States have increasingly diverged in the level of national state aid granted.* They also differ in the objectives they pursue through state aid policy and the instruments they employ to grant subsidies.

Temporary frameworks have certainly proved a flexible and effective tool in hard times. However, taking these developments together raises concerns. *The first concern pertains to the legitimacy, transparency and accountability behind the increasing use of ad hoc and soft law instruments of state aid beyond the legislative and democratic remits of EU policymaking* (Biondi, 2020). Secondly, *greater flexibility in the EU state aid framework in favour of significant national fiscal support exposes the European single market to considerable fragmentation risks: if together we trade, divided we increasingly aid,* and national state aid strategies and selection procedures have aggravated the risks of subsidy races and corporate welfare – with *deep-pocketed Member States standing to disproportionately benefit from new regulatory flexibilities* (Agnolucci, 2022; Eisl, 2022).

For lack of supranational fiscal resources for EU state aid policy, *European policymakers face a trade-off between the need to grant subsidies for the twin transition and open strategic autonomy, while minimising distortions of the Single Market, whose integrity constitutes a European public good for EU citizens and firms.*

To address these concerns, we advance the following policy recommendations:

- **Ad hoc temporary frameworks for the provision of crisis state aid should be phased out without renewal after its current expiry date**.
  It is important to move away from the temporary frameworks that have played a defining role in recent times. By the end of 2025, the remaining elements of the TCTF are due to expire (see Section 5.2). It is important that the EU and its Member States do not agree on yet another temporary extension but rather reflect on the lessons learned from the use of the various state aid instruments deployed. They should then decide on which elements of a more active and sectoral industrial policies they want to make permanent and which ones are not adapted when moving away from a mode of absolute economic urgency.

- **The layered expansion of various state aid provisions and instruments over the last decade should now be followed by a phase of consolidation aiming for more coherence and better integration of different instruments.**
  The recent GBER amendment to create synergies with IPCEIs (see Section 4.4) is a step in this direction, which should be followed by others.

- **To reduce fragmentation risks and improve the efficiency of State aid spending, a more European approach, based on the logic of IPCEIs, should be promoted.**
  Inside the single market, the best projects across Europe for a given industrial policy objective should be selected rather than those that are situated in a country with larger fiscal means. Recent high-level reports by Enrico Letta[143] and Mario Draghi[144] make clear suggestions in this direction, also regarding the improvement in governance arrangements and the smart use of conditionalities to achieve desired policy outcomes. While the IPCEI instrument seems to be the most appropriate one to develop a more common industrial policy, it should be further improved based on lessons learned from its ap-

[143] Letta, Enrico (2024): Much more than a market. Speed, security, solidarity. Empowering the Single Market to deliver a sustainable future and prosperity for all EU citizens. April 2024. https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf

[144] Draghi, Mario (2024): The future of European competitiveness. Part A. A competitiveness strategy for Europe. September 2024. https://commission.europa.eu/document/download/97e481fd-2dc3-412d-be4c-f152a8232961_en?filename=The%20future%20of%20European%20competitiveness%20_%20A%20competitiveness%20strategy%20for%20Europe.pdf

plication over the course of the last years. For these purposes, steering capacity and a greater orchestrating role by the Commission is needed.

- **To level the European playing field, EU industrial policy needs more predictable and common funding together with more fiscal space for Member States constrained by the European fiscal framework:**

  - » On the one hand, Ursula Von der Leyen's proposal for a European Competitiveness Fund[145] should be brought to fruition, providing more EU (co-)financing of industrial policy projects in support of the IPCEI state aid instrument.

  - » On the other hand, greater EU co-funding for national IPCEIs has the potential to create the right incentives necessary to crowd in Member States' financing for IPCEIs and exploit the full flexibility potential of the new EU economic governance framework entered into force in April 2024.[146] Under the new rules, all national expenditures on the co-financing of EU funded programmes will be excluded from a government's expenditure calculation in the reformed Stability and Growth Pact. Conditional on the EU expanding the co-funding for national IPCEIs, these legal provisions create both the incentives and the fiscal space for EU Member States to earmark budgetary resources for IPCEIs despite the EU's fiscal straitjacket.

[145] Europe's Choice: Political Guidelines for the Next European Commission 2024–2029, Ursula von der Leyen, Candidate for the European Commission President, Strasbourg 18 July 2024, available at: https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf

[146] For greater information, see: https://economy-finance.ec.europa.eu/economic-and-fiscal-governance/evolution-eu-economic-governance/new-economic-governance-framework_en.

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5. Toward a Triangle of Coordination: The Role of the European Commission, the European Central Bank and the European Investment Bank in (Re-)Making EU Industrial Policy

Daniel Mertens[147] *& Matthias Thiemann*[148]

Executive Summary

The European Union's emergent industrial policy regime has raised concerns over lacking ambition and scope to keep pace with policy initiatives in both China and the US. Inadequate financial means and an overly reliance on private financial market actors to bring forward investment aligned with official goals is one line of criticism; deficient strategic coordination within the European multilevel system is another. This chapter addresses these concerns by discussing the role of three central EU institutions in the emergent regime: the European Commission, the European Central Bank, and the European Investment Bank. We review each institution's respective contribution and shortcoming in European industrial policy and highlight the dimensions of institutional change over the past 15 years as well as their limitations in re-making EU industrial policy fit for the current challenges. Particularly, we provide insights on potentials for and obstacles to effective industrial policy coordination on the supranational level. In line with our brief analysis, we put forward three recommendations to move the EU's industrial policy ahead based on the capacities of the Commission, the European Central Bank, and the European Investment Bank. First, we recommend fostering intra-institutional cooperation in industrial policy financing. The ECB's purchase of EIB bonds that allows the EIB to expand a combination of concessional loans and grants based on target benchmarks set by the EC should no longer be ruled out. Second, the enormous expertise on economic and financial monitoring each institution possesses should be used for enhanced analytical cooperation. Such cooperation could form the backbone of a European Industrial Policy Board that includes national ministries to engage in an industrial policy feedback loop and facilitate the formulation of missions. Third, and finally, we suggest the creation of a green credit register, based on the EU Taxonomy, to advance a system of preferential loans. Connecting the orchestration powers of the EC and the financial and analytical powers of both the ECB and EIB might thus enable a more robust industrial policy that is fit for decarbonization amidst global change.

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5.1. Introduction

In the current era of competitive industrial policy among the leading industrial nations and economic regions, several observers have noted the limited capacity of the EU's institutional setup to keep pace with either US or Chinese initiatives (e.g., García-Herrero and Schindowski, 2024; Jansen et al., 2023). While the Inflation Reduction Act can capitalize on the US dollar as a global reserve currency and its associated fiscal firepower, China's industrial policies combine several tools of planning and coordination with a multi-level investment and subsidy system. The EU, however, neither fits the institutional prerequisites of what has been called "robust derisking" for the US nor the "big green state" for what China is approaching. Instead, it is seen as applying a form of "weak derisking", where limited fiscal resources, especially on the supranational level, are used to incentivize private capital, but without the bureaucratic means to discipline it and impose strict though efficient conditionalities (Gabor and Braun, 2024). In our view, there is widespread agreement among scholars that this mode of industrial policymaking in the EU is painfully insufficient to tackle unfolding environmental crises, geoeconomic competition, and regional inequalities.

This state of affairs raises the question of whether core European institutions could increase their impact through stronger inter-institutional coordination and mutual support of the financing tools at their disposal. Focusing on the European Commission (henceforth EC), the European Central Bank (ECB) and the European Investment Bank (EIB), this chapter assumes the mission of evaluating these three central institutions' roles in European industrial policy and exploring the possibilities (and pitfalls) of heightened coordination and collaboration. In particular, it will propose that instead of relying on "blending and rebranding", the EU's emergent industrial policy regime might benefit from a) elevated financing coordination that strategically aligns both the ECB and the EIB with the industrial and climate targets defined by the EC; and b) elevated coordination of expertise that dovetails the analytical capacity of all three institutions.

It is important to note that all three institutions have seen considerable change and contestation with regard to their roles over the course of the last 15 years. The European Central Bank, through the Euro crisis and its aftermath, has been forced into a much more activist role, engaging in quantitative easing (QE) and hence the purchase of national government debt, despite initially perceived legal limitations. This change, in turn, went hand in hand with a new emphasis on the ECB's secondary mandate, which is to support EU policy as long as this does not contradict its primary mandate to secure price stability (Van 't Klooster and De Boer, 2023). The EIB, on the other hand, squarely placed itself at the top of climate financiers by becoming the EU's climate bank in 2019, pushing further its role as the central investment vehicle for large EU policy challenges (Mertens and Thiemann, 2023). Lastly, the European Commission itself has fundamentally altered its own image and its activities, moving from acting as a neoliberal regulatory state to coordinating, orchestrating and partly financing industrial policy in the EU at an unprecedented scale. This includes the pursuit of Important Projects of Common European Interest (IPCEI) as well as the coordination of massive investment packages in the context of the Recovery and Resilience Facility (RRF), to name the two most pertinent examples, but also broader aspects of climate and energy governance (Prontera and Quitzow 2022; Spendzharova 2023).

All of these changes were initiated by external circumstances, catalyzing change that was often evolving over time in incremental fashion, rather than following a meditated, large-scale design that seeks to take possible mutual synergies into account and learns from other regions. This is the task of this chapter, which seeks to develop an external view which can lead to suggestions for policy change. To this end, we will first outline the current activities and roles of the three main players, then evaluate the possible benefits and drawbacks of increased coordination. Here we draw on recent calls for coordination based on the ECB's secondary mandate (Van 't Klooster and De Boer 2023; Ryan-Collins et al. 2023) and its potential to work with the EIB (Varoufakis and Holland 2012).

5.2. European institutions' role in industrial policy

Before we delve into the question of existing and possible coordination pathways in the remaking of EU industrial policy, we will briefly lay out the core features standing out in each institution's industrial policy function.

5.2.1. The Role of the European Commission

In contrast to some common interpretations, the European Commission has been a key actor in European industrial policy for a long time: Limits to state subsidies, competition enforcement, but also furthering the privatization of state infrastructure can be understood as a particular form of (neoliberal) industrial policy that cuts across the preference for horizontal rather than vertical policies. This approach can first and foremost be described as steering the structure and evolution of European industries through regulation, not least through pricing and information disclosure.

In the last decade, however, the EC has increasingly deviated from this market-based approach and taken a more assertive role. Defining areas of geoeconomic security and priority areas for industrial expansion to secure international competitiveness, it has sought to both steer and allow for a stronger and vertical industrial policy of member states. This has become visible in a wide range of measures, from temporary frameworks in EU state aid, IPCEIs, to the RRF of NextGenEU. Prescribing the share of green and digital investments in the national plans of the latter, the Commission has been negotiating the content of these plans in order to secure that planned investments fit with broad-based industrial policy goals (e.g., Zeitlin et al., 2023). Finally, the EU itself has sought to engage in active industrial policy by setting up the European Innovation Council in order to fund promising start-ups in vital areas of (geoeconomic) interest of the EU (Mocanu and Thiemann, 2024). A closer look at some industrial policy announcements, such as REPowerEU, the Net-zero Industry Act and more generally 'strategic autonomy', reveals the emergent capacity of the EC to formulate specific objectives and pathways, identify critical sectors as well as areas for policy integration – though not a coherent and accountable industrial policy framework (Pianta et al. 2020).

Beyond the RRF, however, financing initiatives have been the weak spot of this more assertive role. In offering financing tools, the EC – still largely dependent on member states' contributions – must resort to a strategy that we call "blending and rebranding". For instance, the proposal for the net-zero industry act (COM(2023) 62) referred to €250 billion already available through the RRF, €100 billion available in existing cohesion funds, €40 billion available for green R&D in the existing Horizon Europe program, and an alignment with the InvestEU program. Additionally, it refers to REPowerEU, which itself is heavily based on €225 billion from an untapped RRF loan facility. Next to these rather opaque repurposing efforts (rebranding), initiatives since the Investment Plan for Europe under the Juncker Presidency have sought to "mobilize" private and public investment. This has happened largely through channeling some existing budgetary funds as guarantees to the EIB group, which is expected to leverage further own resources, "blended" with other expected financial contributions.

5.2.2. The Role of the European Central Bank

With respect to the ECB's role in industrial policy, we can state that as of today it generally has no direct role in industrial policy – even though, historically, central banks in Europe have played an important industrial policy role through credit allocation (e.g., Monnet 2018). Furthermore, a strict price stability mandate that allows for keeping inflation below that of external competitors and a focus on structural reform can be seen as features of an industrial policy catering to export sector interests. However, the ECB's few actual ventures into industrial policy terms can be linked to its QE programs and the undeniable fact that it thereby became a major player in the EU's debt markets (Thiemann et al., 2023). One consequence of this development was the ECB's ability to rebalance its portfolio of assets to make it less

'dirty', a tilting exercise it practiced in 2022, but which shortly after was ended, as the ECB's QE program itself came to a halt (Kedwards et al 2024). This short-lived action can be linked to the secondary mandate of the ECB, which obliges it to support the EU's (industrial) policies if it is not endangering the primary mandate (van 't Klooster and de Boer 2023). In the past, however, this primarily implied a focus on the Capital Markets Union, with the ECB actively intervening in the policy discourse on this topic. Although today this is framed as "Green capital markets union", this follows the ECB's longer-term engagement on this issue (Braun and Hübner, 2018; Baioni et al., 2024).

In the context of these debates, the ECB has also been weighing the possibility of engaging in preferential interest rates for the green transition (Schnabel, 2022). However, this project has been postponed, as taming inflation became the primary concern. Such a policy has several infrastructural prerequisites. Most importantly it would require a credit register that would allow the ECB to easily distinguish between green and non-green loans. Based on this distinction, it could then permit member banks to refinance their loans at the discount window and/or to pledge these loans as collateral for a repurchase agreement (repo) for preferential rates. However, as of today, this project is on hold, meaning that the EU falls further behind other jurisdictions which have already successfully established such policies (see below).

This leaves the supervision of financial institutions, including the EIB, as a lever for the ECB to push for certain changes in the Euro area to achieve decarbonization or other industrial policy goals. Staying within the boundaries of the macro-financial framework of market-based finance (Kedwards et al., 2024), industrial policy's room for maneuver is very limited as it seeks to mostly nudge financial market participants (for a discussion, s. Smolenska and Van 't Klooster 2022). Here, the biggest focus lies in transition plans for financial institutions that incentivize them to move away from the financing of fossil fuel projects, an activity which as of today is legally non-binding, and hence has only exerted a limited impact on the actual behavior of large banks.

5.2.3. The Role of the European Investment Bank

Lastly, we come to the EIB's role in industrial policy. The EIB is a multilateral development bank owned by the EU member states. Founded in 1958, it has evolved from a bank seeking to foster development in particular regions to a bank with a balance sheet the size of 550bn Euros, which increasingly pursues European policy initiatives, not just those of member states, following the lead (and using the money of) the EC. This rapprochement between the EIB and the EC occurred especially from 2000 onwards as a conscious strategy by the EIB to secure resources and legitimacy (Mertens and Thiemann, 2019).

Focusing on the three institutions in terms of industrial policy funding, it is evident that the EIB is the most active. The EIB has acted as a key financier for IPCEIs since the beginning, most prominently in the hydrogen sector and the battery value chain. The EIB also finances critical infrastructure such as underwater electricity cables to distribute electricity based on renewables and invests heavily in the roll-out of renewable energy production. This commitment to the EU's green industrial plan has emerged with the bank's pivot to become the EU's climate bank in 2019 when it pledged to steer 50% of its lending operations to climate action and environmental sustainability until 2025. Furthermore, the EIB group is, via the European Investment Fund (EIF), the main actor in the venture capital market, seeking to push for radical low-carbon technological innovations. In addition to the financing of industrial policy initiatives, the EIB is also active in the EU's regulatory initiatives, such as in the EU taxonomy, and has been expanding its advisory services, such as the InvestEU Advisory Hub, to support investment projects from identification to implementation.

Nonetheless, one of the challenges that emerges for the EIB in the European industrial policy landscape is the feature of having multiple principals. As a multilateral institution and

the EU's policy bank it has to balance potentially competing objectives – from different member states and supranational institutions – for which it employs its capital, and from which complex accountability and transparency issues arise (Ban and Seabrooke 2016).

5.3. Coordination among EU institutions: Status quo, potentials and pitfalls

Against this background, centering on the issue of industrial policy coordination relies on a large body of innovation and industrial policy literature. In short, this literature has long argued that successful industrial policy relies on strategic coordination – between the government and the private sector, but also among government entities (e.g., Evans, 1995; Kattel and Mazzucato, 2018). Developing public sector capacities to effectively utilize resources greatly hinges on the level of inter-government and inter-agency coordination (Wu et al. 2018). But for the European multi-level system, vertical coordination has received much more attention than horizontal coordination, especially between the institutions of interest here.

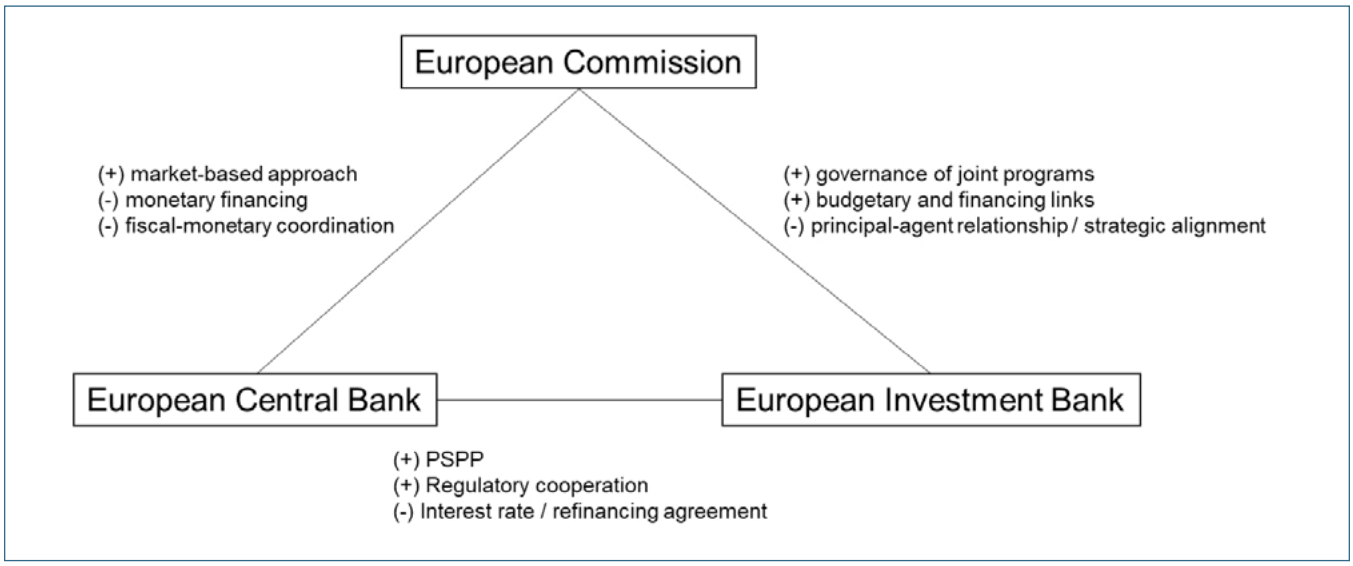
5.3.1. Coordination in the status quo

As outlined above, some of the industrial policy strategies formulated at the Commission level require financing implementation by the European Investment Bank or other national or transnational financial institutions, but it has not yet been precisely examined. In Figure 1 below, we seek to present the current links and alignments on policies between these three different bodies, which signals that the current equilibrium is characterized by contradictory effects upon these institutions' capacities to engage in industrial policy. In particular, we can observe an alignment of the EC and the ECB in terms of a market-based approach, especially in the realm of financial market integration. At the same time, fiscal-monetary coordination is ruled out officially by both actors, as is monetary financing of any policy initiatives.

With respect to the EIB and the ECB, there are only very few official links between the two. The first is the fact that the public sector asset purchases by the ECB have led to the purchase of certain debt instruments issued by the EIB. Secondly, the ECB, since acquiring its mandate as the lead supervisor of the largest banks in the Eurozone (SSM), has supervised the EIB and its portfolio. In addition, there is the collaboration of ECB and EIB in different EU initiatives, such as sustainable finance and the CMU. This collaboration is further advanced by institutional linkages, such as ECB President Lagarde sitting on the advisory body of the EIB for its climate action. As such, certain links do exist, and the two actors interact with each other on an everyday basis. There are also more indirect (and uncoordinated) links between the two. The most pertinent is the impact of interest rates set by the ECB on the EIB's business model. Here, the higher the current rates, the greater the attractiveness of the EIB's concessional lending offers. Note that while this link implies a positive relationship between the ECB's rates and the EIB's policy impact, it creates macro-financial tensions in the larger industrial policy framework. For instance, the expansion of renewable energies is prone to have high upstart costs and hence suffers in particular from high interest rates.

Lastly, the link between the EC and the EIB is characterized by the EC's strong reliance on the EIB to implement its industrial policy via the latter's balance sheet and financing operations. While this strong reliance on the EIB underwent a low point in 2018, when the EC believed that the EIB - rather than pursuing industrial policy goals - took too much advantage of the EU's budgetary means to generate internal profits, the EIB is still a major actor in basically all of the EC's industrial policy initiatives. Institutionally, the EC currently nominates one member (out of 28) of the EIB's Board of Directors, issues opinions on each project presented to the board, and is a major shareholder of the EIF. Still, it is not the main principal of the bank. Additionally, all joint financial programs linked to the EU budget have shared governance structures, which sometimes require conflictive negotiations between the EIB and the responsible Directorates-General (DGs).

Figure 5.1: Status quo of industrial policy coordination



Note. Author's own. (+) present; (-) indirect/absent

As such, the current triangle undergirds the regime of "weak derisking", in which strategic alignment is most visible with regard to financial market integration and a market-based approach in the sense of a 'green CMU'. Coordination between the EC and the EIB mostly relies on a "blended finance" approach, but does not entail clear strategic coordination because of a lacking principal-agent relationship. What is more, the current configuration is characterized by the exclusion of certain policies, such as the direct financing of industrial policy by the ECB (directly, or indirectly via the EIB) and the provision of preferential interest rates for industrial policy objectives. Still, the triangle also entails potential for stronger coordination and strategic alignment to which we turn now.

5.3.2. Potentials for coordination

Having reviewed instances of the current coordination between the EC, the ECB and the EIB, we see that two elements stand out. First, there is the possibility for a greater use of the ECB for industrial policy, in relation to both the EC and the EIB. For instance, the use of preferential interest rates for loans that finance green projects is of primary importance. These preferential interest rates are already granted by central banks in Japan and China (DiLeo 2024), which indicates the general feasibility of such schemes. Looking into these activities, we see the need for a green credit register, which allows the central bank to verify the nature of the loan given and then provide a preferential interest rate. While this is currently signaled as the greatest hurdle for a broader initiative by the ECB (Schnabel, 2022), prior work on the EU taxonomy provides a foundation for putting such a policy initiative into action. As China's example teaches us (Chen, 2024), public development banks play a central role in this initiative as they source said projects and transmit the interest rate advantages to the projects. Given the EIB's central role in these efforts (Mertens and Thiemann , 2023), it is clear that it is predestined to fulfill this role.

A more controversial variation of this proposal is for the ECB to commit to purchasing ex-ante an amount of (green) bonds issued by the EIB, allowing the latter to engage in massive planning for renewable energy expansion. This central leadership role of the EIB, enshrined in an explicit refinancing chain for green investment projects by the ECB, could be based on growth targets set out by the EC. This would link the ECB via the EIB to the final projects, with the EIB giving preferential loans which will then be cheaply refinanced by the ECB (Varoufakis and Holland, 2012). The advantage of this option is that it would be possible to plan for a much larger EIB investment portfolio. Rather than engaging in bottom-up sourcing

of projects, such an initiative could even envision setting up an investment branch at the EIB that directly coordinates with the large national energy providers to accelerate investment in this crucial sector. In the end, this variation on the policy design could be preferred, if one believes that the roll out of large renewable energy build-up requires a focal actor and that the EIB could deliver on this.

This relates to the second outstanding element, i.e., that such a policy option could pave the way for a much larger role for the European Commission in terms of implementing ambitious goals for the EU and defining core strategies. The EC in this setting could provide not only general targets for solar and wind construction efforts, but instead provide a much more concrete European plan for renewable energy production, which seeks to generate an optimal policy for the EU as a whole, rather than relying on national energy plans. Here, the EC could take inspiration from the example of China, which operates based on large national plans that are then implemented locally. Certainly, this raises issues about the politics, the economics and the legal foundations of planning (e.g., Dermine, 2024; Ban et al., 2024). But it can be approximated more incrementally by improving on the EU's analytical capacity through this triangle of coordination.

In fact, all three institutions employ a large number of economists who engage in macroeconomic analysis and the monitoring and reviewing of both the European economy and, in conjunction with the ESCB, member state economies. Along with the EC's and the ECB's databases and reports, the EIB produces an annual investment outlook, which analyzes constraints and potentials for investment in the European Union, based on a dataset of more than 10,000 companies, providing a basis for more strategic planning. These three bodies could, for instance, cooperate in the context of a European Industrial Policy Board, to which other national bodies could be invited and which then provides extant policy feedback in the emergent regime. An interesting blueprint for said initiative is the European Systemic Risk Board, which besides the ECB and the national central banks also houses national ministries of finance, jointly discussing the systemic risks the Eurozone is exposed to. How to set-up such a body to achieve the multitude of input needed, all the while remaining capable of taking decisions and converging on a common plan, is a tricky matter, which future analysis should seek to understand.

5.3.3. Obstacles and pitfalls in intra-institutional coordination

There are obvious criticisms that can be levelled at our propositions. First, critics might argue that the bulk of industrial policymaking still occurs at the national level and that, therefore, the major task for the EU is state aid regulation to avoid market power concentration in fiscally more potent member states – with everything else being but marginal add-ons. This is true only if there is no permanent or, again, extraordinary expansion of the EU budget or the EC's borrowing power, or, if financing coordination between the ECB and the EIB remains unexplored. As such, coordination and more explicit goal-post setting by the EC, combined with an expanded support both by the EIB and the ECB, will stand to benefit all individual members.

However, we concede that there is high uncertainty about the existence of the right institutional mechanisms that can secure the above and that can sufficiently address the concerns over input and output legitimacy. Almost twenty years ago, Baldwin and Martin (2006, 134) argued that "(t)he contrast between the vagueness of the benefits of coordination and the surety of the decision-making costs suggests that the EU has no need to set up a new institutional structure for coordinating industrial policy." But the world – and industrial policymaking in the EU – was different back then and new solutions to pressing policy challenges need to replace the integration mode of "failing forward". Still, financing and analytical coordination should be based on a clear identification of mutually beneficial initiatives. Here, once more, the three institutions we discussed can provide much of the backbone of said intellectual planning infrastructure.

5.4. Conclusions and policy recommendations

This chapter started out with the observation that compared to the US and China, the EU's industrial policy and its level of coordination is much weaker and characterized by a large reliance on financial markets, and hence private actors to achieve its policy goals. To overcome this position of weakness, we have suggested increasing the level of coordination between three institutions crucial for EU industrial policy, namely the EIB, the ECB and the EC. As such, we suggest to foster:

- intra-institutional cooperation in industrial policy financing, namely to consider bond purchasing of the EIB by the ECB, concessional loans and grants through the EIB, based on target benchmarks set by the EC;

- analytical cooperation between the three bodies, based on their economic expertise and the data they collect. Said cooperation could form the backbone of a European Industrial Policy Board, which would assemble national ministries to engage in an industrial policy feedback loop and facilitate the formulation of missions, based on shared problem perspective.

- the creation of a green credit register, based on the EU Taxonomy, to advance a sys tem of preferential lending for an industrial policy that targets decarbonization.

We would like to emphasize, however, that these proposals need to be embedded in democratic governance and accountability mechanisms, rather than a purely technocratic exercise that reproduces the failure of the neoliberal regulatory state (see Diessner and Petit, Chapter 3). Adding this to the equation makes the re-making of European industrial policy look like a herculean task – but one that is worth pondering upon.

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6. United in diversity? EU core-periphery divides at the time of the green transition

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Executive Summary

The European Union (EU) is at a crossroads, faced with the pressing need to accelerate the green transition in response to climate change and energy security concerns. Historically, the EU has been plagued by a core-periphery divide, with each economic crisis deepening the gap between the resilient German-centred core and the more vulnerable southern periphery (SP). The core economies have traditionally outperformed the peripheral ones, benefiting from stronger technological capabilities, higher productivity and faster recovery from downturns. The green transition offers an opportunity for innovation and growth, but it also presents complexities that could disrupt this dynamic. Indeed, while core countries are better equipped with resources to manage the transition, their sectoral specialisation and reliance on energy imports could lead to significant restructuring costs. This raises critical questions: will the green transition lead to further divergence within the EU, with the core pulling ahead, or, alternatively, could the core face challenges that will result in downward convergence? And, finally, which policies can reduce the gap by promoting upward convergence? This chapter addresses these questions through a comprehensive mapping of EU economies, highlighting disparities in industrial structure, energy dependency, green technological capabilities and policy space. Germany, traditionally regarded as Europe's economic powerhouse, lags behind in renewable energy adoption and green capabilities, raising the risk of downward convergence. Additionally, new divides within the 'old' core may become more pronounced as Scandinavian countries push forward. These new asymmetries coexist with the old ones. Core countries still possess greater fiscal capacities, enabling higher investments in green technologies and placing them in a stronger position to support structural upgrading and the green transition. This investment gap between these countries and the SP remains significant, reinforcing existing divides and putting the EU's collective climate goals at risk. Against this background, we evaluate existing EU policy initiatives aimed at supporting the green transition. The current policy framework, while ambitious, risks falling short in addressing the structural imbalances between Member States. To mitigate these risks, the chapter proposes some targeted interventions, including large-scale EU-funded investment plans focused on key sectors such as public transport, especially in lagging regions. Additionally, the chapter calls for industrial alliances, coordinated by the European Commission, to maximise economies of scale and ensure fair distribution of resources. Furthermore, 'place-based' conditionalities are recommended to direct investments towards vulnerable regions, reducing structural inequalities and preventing further economic divergence. By aligning environmental, economic and social goals, the EU can foster a just and sustainable transition with a coordinated green industrial policy.

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6.1. Introduction

The growing pressure of climate change has made the targets for phasing out fossil fuels ever more binding. As a result, the shift towards green production, goods and jobs should proceed at a much faster pace, bringing with it relevant challenges in managing the transition, ensuring political acceptability and protecting 'losers' (Veugelers et al., 2024). In this context, the Russo-Ukrainian War has exposed Europe's energy vulnerability, highlighting the urgent need to reduce dependency on foreign suppliers (Guarascio et al., 2024a) and, hence, increase its resilience in the face of future (and not so unlikely) inflationary crises (Stiglitz and Regmi, 2023). Although EU Member States are equally exposed to these challenges, their degrees of vulnerability and resilience, as well as their room for manoeuvre in terms of fiscal and industrial policy, are rather uneven (Guarascio et al., 2024b), therefore resulting in an adverse combination: countries characterised by a large (small) share of energy-intensive industries, facing a strong (low) import dependence and lacking (having) an adequate supply of renewables and related technological capabilities are often those with the smallest fiscal capacity (deepest pockets) to carry out timely and ambitious green industrial policy actions. In other words, the energy transition may reshape internal hierarchies, exacerbating existing divides or giving rise to 'new geographies' within the EU.

So far, the EU has been plagued by a growing core-periphery divide, ballasting its economy in good and in bad times alike (Gräbner et al., 2020; Simonazzi et al., 2013; Celi et al., 2018). Each crisis widened the gap between the German-centred core (Stehrer and Stollinger, 2015), which stood out as the most resilient part of the EU economy, and the southern periphery (SP), worsening its position in terms of technological capabilities, productivity and growth. However, when it comes to the green transition, the core may face similar, if not greater, challenges, as its sectoral specialisation and degree of import dependency are likely to inflate restructuring costs (Celi et al., 2022).[152] On the other hand, the core tends to be better equipped concerning the resources to manage the transition, and this, in turn, may further widen the core-periphery divide. Overall, it is still hard to say what kind of geography will emerge from the green transition – whether it is further divergence, an upward convergence where the periphery moves closer to the core and both promote a fast and socially sustainable green transition, or downward convergence, with the core sliding back toward the periphery.

The green industrial policies put forth at both the EU and national levels will undoubtedly play a key role in shaping such developments. Given the significant heterogeneities in the degree of Member States' vulnerabilities and the EU's renewed industrial policy activism, this chapter sets out two main objectives. First, it maps the distribution of restructuring needs across countries–along with the associated social and economic costs–and the resources (i.e., productive, technological, knowledge-related and financial resources) necessary to support the transition (Section 2). Second, it evaluates the main EU green industrial policy initiatives and offers specific policy recommendations on how the EU should foster the green transition without further exacerbating the core-periphery divide (Section 3). In so doing, we show how the EU is facing a 'bifurcation'. One path involves pursuing a policy strategy that neglects structural asymmetries, thereby heightening the risk of failure, undermining a just green transition and increasing the structural vulnerability of the entire Union. The other involves a sustainable policy mix, centred on green industrial policy, capable of simultaneously ensuring the greening of the economy while reducing internal divides and inequalities.

6.2. Mapping EU Member States' capacity to carry out the green transition

This section provides a comprehensive mapping of European economies, highlighting their relative positioning with respect to all relevant factors potentially affecting the green transition. The central hypotheses underpinning the analysis run as follows. Countries with a relatively large share of energy-intensive industries (EII)[153], to which we add automotive, given the massive restructuring it faces, are exposed to higher restructuring costs and, therefore, greater vulnerability (Carfora et al., 2022; Gatto et al., 2024). However, such vulnerability

[152] It is important to underline that the export-led core is likely to face further challenges related to the protectionist tendencies in the world economy, which risk resizing and, in some cases, disrupting altogether some of the key markets that have driven its post-2008 growth (Guarascio et al., 2024).

[153] The classification of energy-intensive industries is based on the energy intensity of each sector—i.e., final energy consumption per unit of value added—in the EU in 2019. Those above the median are identified as energy-intensive: non-metallic minerals; iron, steel, and non-ferrous metals; chemical and petrochemical; wood, paper, pulp, and printing.

can be counterbalanced by factors that reduce costs and, eventually, enhance the benefits of the transition, such as a higher share of renewable energy, relative specialisation in environmental technologies (measured by the patent-based 'Relative Specialisation Index' as a proxy of green productive-technological capabilities), and state aid[154] directed at environmental protection (as a proxy of Member States political commitment to green industrial policies). Conversely, in countries where a large share of EII is combined with low renewable energy adoption, limited green productive-technological capabilities and less willingness and ability to implement green industrial policy, transition costs may skyrocket.

As illustrated in Figure 6.1, the European landscape is highly heterogeneous. The German manufacturing core (GMC) – i.e., Germany and Visegrad countries – exhibits relatively high employment shares in the EII and automotive sector, with Czechia and Slovakia recording 11% and 10% of their total employment, respectively. Despite a lower share in Germany (7%), this represents over 2.6 million workers, exceeding the combined figures for Czechia and Slovakia by four times. This not only highlights the scale of Germany's specialisation in these sectors but also hints at the considerable political influence that the German energy-intensive industries and the automotive sector may have exerted over energy policymaking for decades, safeguarding their own interests and resisting the shift towards greener and more sustainable growth models. This may partly explain why the EU, despite ambitious climate objectives, has remained highly dependent on imported fossil fuels (Plehwe, 2022).

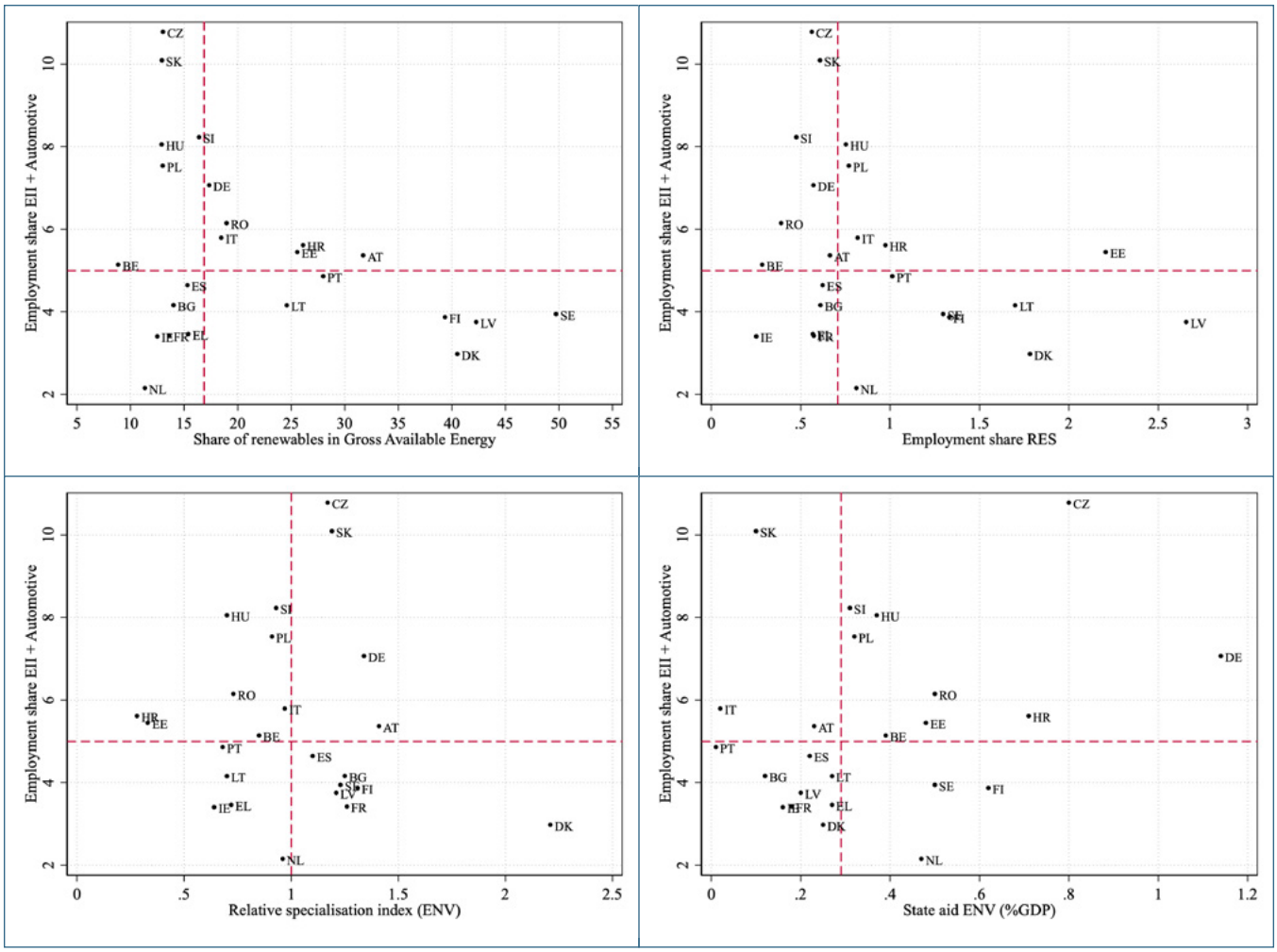
Remarkably enough, the upper-left panel reveals an inverse relationship, suggesting that countries less specialised in EII tend to have a higher share of renewables in their energy mix. The Nordic countries exemplify this trend, with levels of renewables exceeding 40%, reaching 50% in Sweden. In contrast, many countries still rely primarily on energy from imported fossil fuels. The Visegrad countries (but also Germany) show a pronounced lag in deploying renewables, which also partly reflects their reliance on domestic solid fuels such as coal, presenting significant challenges in light of decarbonisation targets.

Assessing the landscape of manufacturing and technological capabilities in the green sector is equally relevant, particularly as 'de-risking' strategies aimed at reducing energy-related import dependency became a top priority of EU policymakers (European Commission, 2021). An emblematic case is the production of photovoltaic panels, central to the green transition, yet dominated by China along most of the supply chain (Caravella et al., 2024). Strengthening the EU's domestic production of essential green technologies is imperative not only to reduce risk of shifting dependencies from imported (Russian) fossil fuels to imported (Chinese) green technologies but, more importantly, to boost the fiscal and employment impact of public investments, thereby making the transition more socially sustainable.

The upper-right panel illustrates that in no EU country does the workforce employed directly and indirectly by green sectors surpass that in the energy-intensive and automotive industries, not even in Denmark, despite its status as a global leader in wind technology. Furthermore, only a handful of EU countries have an employment share in renewables exceeding 1%. In this context, harnessing the sector's untapped potential for job creation across the EU could not only ensure a smoother transition with less social backlash but also significantly reduce the economic and social costs associated with restructuring traditional industries. When it comes to green technological capabilities measured by patents in environment-related technologies (bottom-left panel), countries positioned to the right of the vertical line—indicating a relative specialisation index greater than 1—demonstrate a specialisation in these technologies. This means that their share of environment-related patents in total patents (in all technologies) exceeds the world average, reflecting a relative advantage in green innovation. Austria and Germany, despite their high manufacturing specialisation in traditional, mature sectors, could potentially leverage their advanced green comparative advantage to sustain their net-zero transition. In contrast, SP countries, with the exception of Spain, are noticeably lagging behind in this critical area.

[154] Here, state aid includes spending on both notified schemes and those under the General Block Exemption Regulation schemes, which allow EU Member States to implement certain aid measures without requesting prior approval from the European Commission, as long as they meet specific criteria.

Figure 6.1: Key variables and asymmetries



Source: Own elaboration based on Eurostat, OECD and EurObserv'ER data.

Notes: Specifically, the data on employment, energy balances and state aid in the environment-related (ENV) domain were sourced from Eurostat, while the data on employment in renewable sectors (RES) and the relative specialisation index in ENV technologies were sourced from EurObserv'ER and the OECD, respectively. To define energy-intensive industries, we ranked sectors according to their energy intensity at the EU level in 2019 (i.e., the ratio between the amount of energy used and value added in each sector), classifying those above the median as energy-intensive (including non-metallic minerals; iron, steel, and non-ferrous metals; chemical and petrochemical; wood, paper, pulp, and printing). We then computed the sum of their relative employment share for each EU country in 2021. All variables refer to 2021 or the latest available year.

The final dimension concerns political commitment to green industrial policies, as proxied by state aid in the environmental protection domain (bottom-right panel). This is crucial, as strengthening green productive and technological capabilities, particularly for countries lagging behind in key areas, requires massive public investments, at both the national and the EU level. According to our working hypotheses, countries allocating a higher proportion of green-related state aid relative to their GDP demonstrate a stronger capacity to manage the green transition, effectively supporting industries and workers during this shift. However, the uneven distribution of state aid reflects enduring economic asymmetries within the EU: Germany stands out with the highest level of state aid per GDP, which showcases its robust fiscal ability and political willingness to sustain the green transition (although some uncertainty remains about the funding of future green projects due to its debt brake rule).[155] In contrast,

[155] See "Time for supply-side policy: Thatcher versus Schumpeter", Social Europe, 20 May 2024, available at: https://www.socialeurope.eu/time-for-supply-side-policy-thatcher-versus-schumpeter#

SP countries like Italy and Portugal record considerably less state aid, compounding their challenges in achieving climate goals.

Our analysis shows how the interaction between sectoral specialisation in energy-intensive industries and the automotive sector, alongside the deployment of renewables and the distribution of green productive-technological capabilities, allow us to capture the diverse conditions across EU economies (Veugelers et al., 2024). This diversity reveals profound asymmetries, particularly concerning green technological capabilities and national policy capacity, emphasising the need for targeted EU policy interventions. One-size-fits-all solutions are clearly inadequate for addressing these complex and varied challenges within the Union (Többen et al., 2023).

Finally, to provide a more precise mapping of EU economies in the context of the green transition, we carry out a hierarchical cluster analysis[156] to group countries based on multiple dimensions. This helps us identify country-specific trajectories as well as key areas of strength/vulnerability, enabling a clearer identification of where targeted interventions and support are most critically needed.

Figure 6.2: Country clusters

Source: Own elaboration based on cluster analysis

The analysis leads to the identification of four distinct clusters as illustrated in Figure

[156] Ward's clustering method was employed to group European countries based on nine variables related to their preparedness for the green transition: share in energy-intensive industries and the automotive sector, share of renewable energy sources, employment share in renewable energy sectors, relative specialisation in environmental technologies, asset finance in solar and wind, public R&D in renewable energy, state aid for environmental protection, public debt, and energy import vulnerability. This method starts with each country as its own cluster and iteratively merges the closest pairs to minimise within-cluster variance. Several statistical tests, including the Calinski-Harabasz Pseudo-F Statistic and the Duda/Hart Je(2)/Je(1) Index, consistently identified four clusters as the most statistically robust and meaningful way to partition the data.

6.2, reflecting how blurred the core-periphery divide in the context of the green transition has become: German Manufacturing Core (GMC) (Austria, Germany, Czechia, Hungary, Poland, Slovakia, Slovenia, Bulgaria and Romania), Green Stragglers (Italy, Spain, Greece, Portugal, France, Netherlands, Belgium, and Ireland), Emerging Green Adopters (Croatia, Estonia, Lithuania and Latvia) and Green Leaders (Denmark, Finland, Sweden). As illustrated in Table 6.3, the four clusters differ from each other based on a combination of factors, including: sectoral specialisation, deployment of renewables, green technological and productive capabilities and public expenditure capacity.

Germany and the EU economies more closely linked to its exporting industries emerge as a distinct cluster, in line with the large literature documenting the rise of the GMC (see, among others, Stehrer and Stollinger, 2015, Celi et al., 2018). This cluster stands out with its high reliance on EII and the automotive sector, with a relatively low share of renewable energy sources. Their green productive and technological capabilities are moderate, suggesting some progress, but are not sufficient to lead a rapid net-zero transition. However, these countries have a higher fiscal capacity (i.e., lower level of public debt-to-GDP ratio), which can provide significant support for the transition itself.

Green Stragglers have a relatively lower employment share in EII, which potentially reduces the negative impact of transitioning away from fossil fuels. However, on the demand side, there is a considerable lag in renewable energy adoption. Their green productive and technological capabilities are also limited, which, coupled with low state aid in environmental protection, makes a fast green transition hardly achievable. The high debt-to-GDP ratio, with Greece and Italy as prominent examples, further constrains their ability to accelerate their way to a net-zero economy and to mitigate the social cost of restructuring (Heimberger et al., 2024). Nevertheless, some countries, including the Netherlands, Belgium and France, display high public R&D in the renewable energy domain, indicating commitment to green technologies that may materialise in innovation output in the near future. This is not the case in the SP, where public R&D investments remain comparatively low, mirroring the challenges faced by the EP.

Emerging Green Adopters also have moderate employment share in EII, but these countries have a high share of renewables, indicating a strong adoption of green energy. Their green productive and technological capabilities are low, however. Social acceptability is likely higher in these countries as they are less dependent on traditional industries and have relatively high renewable energy adoption. This positioning offers a promising foundation, but the challenge remains in scaling up their technological capabilities.

Green Leaders are distinguished by a low employment share in EII, leading the way in both deployment and production of green technologies. These countries possess strong green technological capabilities, which are supported by substantial public R&D. Additionally, with substantial private investments and a solid fiscal stance, they are likely to experience a fast and socially acceptable transition, making them exemplary models in the EU.

Overall, our analysis highlights several risks associated with old and new asymmetries. Germany, traditionally seen as the European economic powerhouse, seems to be lagging behind in renewables adoption and green capabilities, risking downward convergence towards the periphery. The interests of the traditional sectors of German specialisation—such as the automotive and chemical industries—have prevailed over the necessity to mitigate climate change concerns, resisting the green transition and blocking opportunities for diversification into new areas (Guarascio et al., 2024a). Moreover, as Scandinavian countries push forward, new divides within the 'old' core are likely to become even more pronounced.

Nevertheless, these new asymmetries coexist with the old ones. Core countries, particularly Germany, Austria and the Scandinavian countries, still possess greater fiscal capacities compared to the peripheral areas, which enable higher investments in green technologies

and place them in a better position to support structural upgrading and the green transition. The fiscal gap between these countries and the SP remains significant, reinforcing old divides and putting the EU's collective achievement of climate objectives at risk. A cohesive EU-level industrial policy is imperative to prevent the EU from falling behind China and the US in the green 'race' as the latter face fewer constraints and rely on more interventionist and protectionist industrial policy strategies (Pisani-Ferry et al., 2024).

Table 6.1: Descriptive statistics by country clusters

	German manufacturing core	Green stragglers	Emerging green adopters	Green leaders
Countries	AT, BG, CZ, DE, HU, PL, RO, SI, SK	BE, EL, ES, FR, IE, IT, NL, PT	EE, HR, LT, LV	DK, FI, SE
Employment share EII + Automotive (%)	7,49	4,11	4,74	3,60
Share of RES (%)	16,70	15,43	29,64	43,20
Employment share RES (%)(*)	0,60	0,62	1,88	1,47
Relative specialisation ENV(†)	1,07	0,90	0,63	1,58
Asset finance solar & wind(*)	229,35	594,30	133,41	1283,84
Public R&D RES(*)	5,95	9,68	1,60	36,11
State aid ENV/GDP (%)	0,43	0,22	0,41	0,46
Debt/GDP (%)	56,18	101,50	41,13	45,43
Energy import vulnerability	0,14	0,10	0,12	0,09

Source: Own elaboration based on Eurostat, OECD(†) and EurObserv'ER(*) data.

Notes: All variables refer to 2021 or the latest available year, with the exception of public R&D, which refers to the cumulative expenditure per capita over the period 2011-2020. Asset finance in wind and solar PV includes all investments in utility-scale renewable energy projects over 1 MW, based on closed deals in a given year, with financing secured through balance-sheet finance, non-recourse project finance and bonds or other instruments.

6.3. Conclusions and policy recommendations

As a consequence of the COVID-19 pandemic and the subsequent energy and geopolitical crises, policy instruments that were unthinkable just a few years ago—such as selective public investments, plans for building up productive and technological capabilities in frontier domains (e.g., AI, lithium batteries, solar technologies), support for "European champions"

and industrial alliances—are now at the top of the EU's agenda (Di Carlo and Schmitz, 2023). The rediscovery of industrial policy is a substantial turnaround in EU policymaking, and it is a very welcome one given the significant challenges the European economy is facing, from decarbonisation to the reduction of strategic dependencies in key technological domains (Crespi et al., 2021). The decarbonisation process affects all main aspects of economic activity—from energy supply (transitioning from fossil to renewable resources) to the adoption of low-carbon technologies in production, especially in EII, to the reduction of the carbon footprint in consumption (houses, transport, sustainable mobility)—with strong economic, financial and social repercussions.

Indeed, the new European industrial policy must reconcile conflicting objectives and manage multiple diverging interests between and within countries in an EU that remains highly fragmented. While the previous policy of non-interference with the market—based on the principle that the best industrial policy is the one that does not exist—relied on the notion of a neutral and non-discriminating market where unfair outcomes could be attributed to inexorable economic laws, the new industrial policy is explicit about the deliberate choices made, the interests it favours and the consequent distribution of costs and benefits (Guarascio and Simonazzi, 2024). Conflicting interests irremediably risk undermining internal cohesion and further slowing down growth. The task, therefore, is to find a shared strategy that enhances the elements of common interest over those of conflict: a policy that aims to leave no one behind and reduce the imbalances between regions, countries and European citizens. In this section, we discuss the new EU green industrial policy and highlight the potential trade-offs in order to understand under what circumstances the goal of decarbonising the economy can favour (or prevent) the narrowing of regional and social divides (Demertzis, 2024).

The new EU industrial policy is based on three pillars: supply diversification, incentives to encourage private investment, Industrial alliances (solar, batteries, hydrogen) and the constant monitoring of areas of critical dependence (Guarascio et al., 2024a). Recent proposals, such as Fit for 55, RepowerEU and the Critical Raw Materials Act, enrich the framework of initiatives for climate neutrality and energy autonomy. However, Europe's ambitious agenda still lacks a comprehensive strategy to ensure its achievement and to address internal conflicts and latent policy dilemmas. Below, we briefly consider some of these issues.

In the absence of an adequate federal budget, the EU's green industrial policy is still predominantly delegated to the Member States (Pianta and Lucchese, 2020).[157] Leaving the management and costs of the transition to individual countries increases the risk of polarisation. The ability to attract new investments varies enormously between different areas due to the relevance of agglomeration economies, particularly in the green and digital sectors, and the differing capacities of member countries to subsidise investments. In regions where green productive and technological capabilities need to be created from scratch, knowledge, skills and supporting activities are likely to be scarce or non-existent, creating an environment that is not conducive to attracting investments due to high uncertainty and unfavourable macroeconomic conditions. Moreover, the asymmetric distribution of fiscal capacity, combined with state aid liberalisation, means that countries with fewer budget constraints have more resources to subsidise and attract investments (Heimberger et al., 2024), potentially exacerbating regional divergences. Indeed, the IMF New Industrial Policy Observatory data (Evenett et al., 2024) suggest that in 2023 Germany implemented or announced interventions in the field of low-carbon technology totalling almost 84 billion USD, 85% of total interventions in the GMC cluster and 55% of all interventions in the EU, while the countries that we defined "green stragglers" significantly lagged behind. How to reconcile the conflicting interests between the various national industries (and their governments) thus becomes a thorny political problem.

If the existence of dynamic and scale economies makes the concentration of green investments more efficient, there could be a serious trade-off between overall efficiency and a

[157] Although quantitatively relevant, regional and cohesion policies are inadequate to address the economic and social costs incurred by the regions more seriously affected by structural change and deindustrialisation related to the green transition, as illustrated in Section 2.

more egalitarian distribution of development opportunities between countries. The US Inflation Reduction Act (IRA) is an example of how to reconcile the twin goals of stimulating a domestic green industry and reducing regional imbalances. On the one hand, firms receiving IRA-based incentives commit to purchasing intermediate inputs from local suppliers[158] so as to strengthen national and regional supply chains and maximise the impact on employment.[159] Similarly, eligibility for consumer tax credits for electric cars requires final assembly in North America (Kleimann et al., 2023). On the other hand, greater incentives are provided for companies that invest in regions considered to be more 'in need': tax credits under the IRA can be increased by 10% if a project is located in "energy communities", defined as brownfield sites, areas with significant fossil fuel production and higher-than-average unemployment or areas with closed coal mines or coal-fired plants (Church et al., 2023).

Conditionalities similar to the ones included in the IRA are starting to be applied also in the EU, at least at a national level (see, for example, the French policy of subsidising the purchase of electric cars, provided that the components are produced in the EU). Conversely, conditionality policies aimed at encouraging the localisation of investments in less developed areas or areas at greater risk of deindustrialisation—such as the countries and regions included among the 'green stragglers' in the previous Section—are still essentially absent. One of the main reasons is the relatively small size of the EU common budget compared to the US federal budget, along with the poor coordination of European industrial policy. Even setting aside the limited scale of the EU budget, the importance of a comprehensive green policy—a 'vision' capable of unifying the multiple aspects of the green transition, from resource production to consumption models—cannot be underestimated. What is needed is a holistic plan that includes a common policy to ensure the supply of critical raw materials (CRMs), the production of renewable energy (where even the periphery can assert its comparative advantages), the coordination of essential infrastructures (such as pan-European grids) and the promotion of institutions for the creation of knowledge and skills (including universities, research centres, technological institutes and training centres). State-owned enterprises, public-private joint ventures and public procurement could contribute to the creation of innovation clusters. Although conditionalities must be adequately designed to balance the trade-off between equality and overall efficiency, "place-based" conditionalities, when included in a holistic programme, reduce the risk of increasing regional inequalities while multiplying the overall expansive effect of green investments across the EU as a whole (Di Tommaso et al., 2020).

Companies' objectives can also conflict with broader national economic interests, so green policy must be able to guide corporate strategies toward economically and socially sustainable production and consumption models. The car industry is a case in point: in the transition to electric vehicles (EVs), European regulations aimed at promoting decarbonisation have supported (if not encouraged) the strategy of European car manufacturers to favour the production of premium cars, more powerful and expensive, which are also much more profitable. This strategy has disadvantaged them in competition with cheaper Chinese cars and has limited the growth in demand for EVs. Revised emissions regulations and subsidies targeting less expensive EVs could encourage the production of affordable EVs, fostering their adoption also in poorer countries or by poorer consumers and, in turn, helping to counter the threat from cheaper Chinese imports. Such changes would accelerate decarbonisation, as larger electric vehicles require bigger batteries, more CRMs and consume more energy on the road (Pardi 2022). This approach could also encourage production by generalist manufacturers in the SP (Guarascio and Simonazzi 2024).

Offshoring production to low-cost locations and relying on low-cost imported inputs may not only undermine national production, technological capabilities and employment (Cimoli et al. 2008), but also raise national security concerns. These issues of deindustrialisation and security could, in turn, affect the speed and costs of the green transition. The EU faces significant import dependency in green production and technology sectors such as lithium batteries, solar panels and semiconductors. While cheap imports from China could lower the costs of decarbonisation and benefit consumers, they risk undermining the industrial base

[158] Indeed, this is similar to the 'Buy American' clause that was included in the public investment programme put forth by the Obama administration after the 2008 crisis (Crespi and Guarascio, 2019).

[159] Renewable energy producers can receive a 10% subsidy if the steel and iron used in their facility are entirely produced in the US and if their products meet a minimum local content requirement.

and nipping in the bud the growth opportunities offered by the transition. Conversely, protecting "European" industry and jobs could become socially unsustainable and politically contentious if it results in excessively high costs for consumers and/or leads to significant imbalances in the reallocation of supply chains. It could also be self-defeating if corporate strategies are not aligned with public policies. Moreover, restricting Chinese foreign direct investments for economic or security reasons, as in the case of electronic devices and connected cars, could put the European Commission at odds with Member States keen to attract investment and know-how at lower costs, in order to counteract their disadvantage in the race to attract or retain production and plants. Securing global supplies and access to CRMs requires a coordinated foreign policy, avoiding the 'cacophony' of multiple national initiatives. A balanced approach of containment and collaboration with China on green technologies could help reduce the costs of decarbonisation.

Finally, a socially sustainable European green industrial policy requires action aimed at shaping consumer habits and preferences. To this end, regulations and subsidies are not enough; investments in public goods are also necessary. For instance, the growth of the EV market can only occur if accompanied by an expansion of supporting infrastructure: charging stations, renewable energy networks, software services and connectivity technologies. In addition, a large-scale EU-funded investment plan, coordinated with national and regional governments, could promote sustainable mobility by strengthening public transport (e-buses, trains). Combining public procurement to sustain demand, labour market policies (re-skilling and dedicated training programmes) to ensure a supply of green skills and a reasonable policy of protection from unfair foreign competition could enhance the impact on domestic production and employment, reducing uncertainty and boosting private investment and production in the transportation sector. Such a coordinated scheme can be replicated in other relevant green sectoral domains, such as the development of EU-wide solar panel or wind turbines industries.

The green transition presents a significant growth opportunity for the EU. The European market is large enough to deliver the benefits given its scale and dynamic economy, provided that a shared strategy addresses regional inequalities, helping lagging countries seize the opportunities offered by the transition without resorting to low road of labour-cost competition. While the EU has made an important U-turn in its policymaking, bold commitments must be complemented by a systematic approach that ensures no country or region is left behind. This requires a common long-term strategy that coordinates various decisions on planning, financing, material procurement and governance. It should mobilise and coordinate public and private investments, while avoiding harmful competition between states. Achieving this is more feasible within a supportive macroeconomic framework that encourages investment and reduces internal competition between countries and regions. As documented by vast empirical literature (see, among others, Deleidi and Mazzucato, 2021), favourable macroeconomic conditions are necessary for attracting private investments. However, fiscal austerity measures, as foreseen in the new EU fiscal framework (Heimberger et al., 2024), could pose a serious obstacle to achieving industrial policy objectives, particularly in regions where they are most needed. Without targeted interventions that account for the cross-country heterogeneous capabilities and vulnerabilities, there is the risk of exacerbating existing core-periphery divides, which could jeopardise the EU's collective climate goals. The EU's ability to achieve a just green transition will thus depend on its capacity to foster collaboration, equitable resource distribution and policy coordination within the Union.

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7. Taking the territorial dimension of industrial policy seriously: industrial and cohesion policy in the EU

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Executive summary

Cohesion Policy and Industrial Policy are at the core of development policy in the EU. Cohesion Policy aims at territorial, social, and economic cohesion, pursued historically via redistributing resources for key infrastructure investments. Industrial Policy, while originally subsumed under the EU's Cohesion Policy, developed gradually into a wholesome strategy aiming to 'direct' innovation and economic transformation, with emphasis on the green and digital transition. While the 'Lisbonisation' of Cohesion Policy has seen its objectives shift towards technological upgrading and global competitiveness (an 'entrepreneurial shift'), bringing it closer to the innovation focus of Industrial Policy, recent developments in the EU have pushed the latter towards the pursuit of more "macroscopic" objectives, such as 'open strategic autonomy', decarbonisation and a 'resilient single market'. The coordination of these two policies is crucial to balance the new goals and ambitions of the EU with its Treaty obligation of promoting territorial cohesion. We demonstrate that this is not to be taken for granted. The two policies differ significantly in terms of their principles, governance and fund-allocation criteria; while substantial differences exist also in terms of their thematic prioritising and spatial targeting and selectivity. Taking stock of the differences, we advance two main recommendations. First, that Industrial Policy becomes more 'territorialised' – an Industrial Policy that thinks space. This involves developing a spatial strategy alongside the sectoral-thematic strategies and wider missions; obtaining a more direct spatial character in its financial interventions and support actions; and directing resources also to areas that lack 'excellence', via appropriate instruments able to nurture untapped advantages. Second, that Cohesion Policy becomes more 'strategic' – a place-centred Industrial Policy. While maintaining its principle of place-based strategizing under locally-advanced logics of intervention, this involves two key changes: a partial re-centralisation of the policy, to connect more organically to (and to influence) the strategic objectives of the EU in the realm of Industrial Policy; and stronger horizontal cooperation in the formulation of the local strategies, so that successful re-specialisations that make sense at the local level also contribute to the overall re-specialisation of the EU's economic space.

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7.1. Introduction

Cohesion Policy and Industrial Policy constitute two core pillars of development policy in the EU. Strictly speaking, Cohesion Policy (henceforth, CP) aims at addressing development blockages in lagging regions and areas of economic decline, with the overall objective of achieving territorial, social and economic cohesion across the EU. In turn, the aim of Industrial Policy (henceforth, IP) is to stimulate innovation and growth by resolving market, information and coordination failures which prevent the economy from attaining socially desirable equilibria (from global competitiveness to carbon neutrality).

In past decades, the two policies saw little conflict: CP was traditionally focused on supporting development via redistributing resources to less developed regions; while IP was rather rudimentary, with efforts limited to supporting innovation and a general principle of non-interventionism, relying on processes of market liberalisation and economic integration (via Competition Policy and the Single Market) to attain its objectives.

As attention to problems of development and competitiveness intensified over the last two decades, both policies experienced significant shifts. CP became more 'entrepreneurial' and innovation-minded, extending its aims to support innovation, industrial restructuring and economic re-specialisation across the EU. Industrial policy became more 'active', aiming at 'directing' growth and stimulating reindustrialisation and economic restructuring that went well beyond the traditional attention to 'correcting' market failures.

The emergence, more recently, of various 'disruptions' intensified this process – with objectives such as open strategic autonomy, economic sovereignty, decarbonisation, 'fair' competition in a 'resilient' single market obtaining a centre-stage position. Consequently, the EU developed new instruments, legal frameworks and initiatives that appear to 'compete' with CP as the EU's traditional development tool; while CP is increasingly compelled to align with these wider objectives: in the 2021-2027 period, over a quarter of the Cohesion budget is earmarked for "green" actions and about 15% for the "digital" transition. More crucially, as has been convincingly argued in the literature (Bachtler & Downes, 2023), developments in EU industrial policy challenge the core goals of CP (balanced development and convergence) by favouring better-off or technologically leading areas and imposing higher transition costs to less developed and less dynamic areas.

These developments raise important questions about the 'division of labour' between the two grand policies of the EU, their functional differentiation and potential for coordination. This chapter looks at the tensions between the two policies and their degree of alignment, asking how and whether the interplay between industrial and cohesion policy can be enhanced to effectively pursue the seemingly divergent goals of fostering green/digital innovation and economic sovereignty and promoting cohesion within the EU.

7.2. Elective affinities: the evolution of policy

Although lacking a precise economic theory at its backbone (Begg, 2016), CP has traditionally defined regional disparities as a 'regional problem', whereby market dynamics create investment gaps in specific regions, requiring policy to direct investments there (mainly in the form of hard infrastructure), to stimulate an expansion of local productive capacities (extensive growth). Intellectual developments in growth theory and new economic geography around the turn of the century challenged this view, reframing the issue as a 'development problem' of weak institutions and weak capabilities for mobilising existing resources (intensive growth) (Puga, 2002), implying that lagging regions face problems of competitiveness and highlighting the efficiency advantages of agglomeration (and thus of spatial disparities) (World Bank, 2009).

The EU's response to this was a reframing of CP as the pursuit of balanced growth, which

maximises the utilisation of available resources and untapped local advantages through context-specific 'place-based policies' (Barca, 2009). The latter married well with the concept of "smart specialisation", developed through the work of the Knowledge for Growth expert group, established as part of the Commission's plans to reinvigorate the Lisbon Strategy (Foray & Van Ark, 2007). Highlighting the importance of "entrepreneurial discovery" (Foray, 2009) and linked to developing ideas in the literature concerning the transformational potential of "related diversification" (Neffke, Henning, & Boschma, 2011), together they formed a forceful argument pushing policy towards actions aiming at supporting (regional) growth via innovation, risk-taking and sectoral targeting under the premise of a 'double dividend' of maximising overall growth (and efficiency) while simultaneously promoting convergence across regions (Farole and Akinci, 2011).

The result was the so-called 'Lisbonisation of Cohesion Policy' (Mendez, 2011). The new CP aimed at stimulating industrial upscaling and developing new activities through smart investments that leverage local assets and involve all stakeholders in the process of entrepreneurial discovery. With this, its policy objectives shifted from the pursuit of convergence to that of technological upgrading and competitiveness: regions – that is, all regions, irrespective of their level of development – had to develop their own smart specialisation strategies, with sound analysis of the evidence-base, identifying the existing and latent areas of strength where they want to (re-)specialise and develop their future growth drivers, focusing on improving framework conditions that could enable this (Di Cataldo & Monastiriotis, 2020). This also implied a shift in the policy model: from redistribution-oriented grants-based transfers to support infrastructure development to the utilisation of new financial instruments (that sought to leverage private investments and stimulate risk-sharing) and investments aimed at accelerating growth and supporting EU political priorities (Brunazzo, 2016); from evaluations of programme delivery to results-orientation under each programme's 'logic of intervention' (European Commission [EC], 2014); and from more inflexible allocations with limited conditionality and ever-expanding thematic objectives to more ownership at the national level (Partnership Agreements, expansion of national sectoral Operational Programmes), fewer thematic objectives linked more directly to the wider policy priorities of the EU and tighter conditionalities. The end result is a more 'entrepreneurial', more flexible and less bureaucratic policy, arguably resembling more of a place-centred Industrial Policy.

As CP shifted, non-spatial policies for market correction also evolved – as evidenced through a series of policy documents, from the European Commission's 2002 Communication "Industrial Policy in an Enlarged Europe" to the 2021 Communication "Updating the 2020 New Industrial Strategy" and the 2023 "A Green Deal Industrial Plan for the Net-Zero Age". Although the shift seemed originally well-informed by relevant academic debates highlighting the importance of systemic failures and the need for policy to induce economic activities rather than merely address market inefficiencies (e.g., Rodrik's, 2004, 'New Industrial Policy' and Mazzucato's, 2013, 'directionality' of growth), more recently the remit and scope of EU's industrial policy expanded further. The EU's IP today has become more "macroscopic", focusing more broadly on the union's geopolitical ambitions (Breton, 2022) and on its legislative effort to ensure a "fair but not naïve" competition policy (IPCEIs, Temporary State aid Crisis and Transition Framework, General Block Exemption Regulation), a functioning single market (Banking Union, Capital Markets Union, Digital Services Act), a protective regulatory environment (Net-Zero Industry Act; Critical Raw Materials Act; EU Chips Act; Digital Markets Act), and security of supply (Global Gateways, trade agreements), reportedly focusing on all sectors of the economy.

Consequently, while the evolution of CP saw it moving towards alignment with the 'entrepreneurial shift' in IP, the more recent shifts in the latter (towards both carbon neutrality and economic sovereignty) create the potential for new misalignments and tensions – with new IP objectives and actions potentially widening territorial disparities across the EU, and the increasing focus of CP on smart growth and 'entrepreneurial discovery' potentially diminishing its likelihood of addressing these disparities. This raises two questions. The first con-

cerns the issue of territorial cohesion: how can an innovation-oriented CP ensure the support for those who fail to cultivate the new comparative advantages allowing them to thrive in the "new economy" of the twin transition. The second concerns the issue of policy alignment: with CP commanding fewer resources for regional targeting, and IP actions taking a more place-blind perspective, what mechanisms are there to ensure that the place-based IP delivered by CP will work and, moreover, that it will remain aligned – and supportive of – the macro-IP of the Green Deal and the EU's New Industrial Strategy? As the first question has been the subject of intense discussion within the policy community (e.g., High-Level Group on the Future of Cohesion Policy), our main focus is on the second question.

7.3. Empirical analysis: synergies and misalignments

7.3.1. Funding modes and governance

As a mature EU policy, CP has well-defined funding mechanisms and criteria, which follow specific rules for thematic and geographical allocations ('financial envelops'). Funds are largely allocated based on regional GDP and national GNI per capita (with minor adjustments for unemployment, education, net international immigration, and total greenhouse emissions), with the main beneficiaries being regions with GDP per capita below 75% of the EU average (ERDF funds). Investments and programmes are jointly agreed upon in advance of the programming cycle between the European Commission and national authorities ('shared management'), with the direct involvement of authorities from beneficiary regions. Once programmes are approved, projects are selected by the managing authorities and funded based on eligible costs and programme-specific selection criteria. While performance assessments are carried out ex post, fund allocation and project approval procedures follow stringent regulations and requirements (Molina & Lleal-Fontàs, 2020), with adherence to ex-ante conditionalities ('enabling conditions') as an on/off criterion.

In contrast, IP funding is very fragmented, with different rules depending on the instrument. For example, Horizon Europe, the European Research Council and the European Innovation Council allocate funds through competitive calls (c.€95bn in 2021-2027) based on proposal excellence and impact, favouring firms and research institutes that already possess significant knowledge and technological advantages. InvestEU guarantees (c.€26bn) and the EU Innovation Fund (estimated to raise €40bn in 2020-2030) also use competitive application processes, with beneficiaries from both the public and private sectors. Other components, such as the relaxation of state-aid rules for IPCEIs or assistance offered to entities participating in Industrial Alliances, also lack a spatial dimension or specific allocation rules. The only instrument with allocation rules and conditionality criteria is the Recovery and Resilience Facility (RRF).[162] Still, RRF grants are not directly income-dependent, while RRF loans do not follow a fixed allocation key. Programmes are governed at the national level, with National Recovery & Resilience Plans setting specific objectives and milestones for the investments and reforms to be implemented ('direct management'). Fund disbursement depends on performance against milestones, with a much greater flexibility in re-allocating funds across investments, no systematic obligation for territorial earmarking and, importantly, without national co-financing requirements.[163]

Overall, funding under CP is slower, more bureaucratic and taxing for countries with limited resources and regions of limited capacities; but it is also more participatory and with a direct focus on territorial cohesion. Instead, funding under IP follows market principles, offering more flexibility and control to beneficiary countries (RRF) and entities (Horizon, EIC, InvestEU, etc), but lacking emphasis on stakeholder involvement, territorial cohesion and regional convergence (Bachtler, Mendez, and Begg, 2020).

7.3.2. Targeting and funding allocations

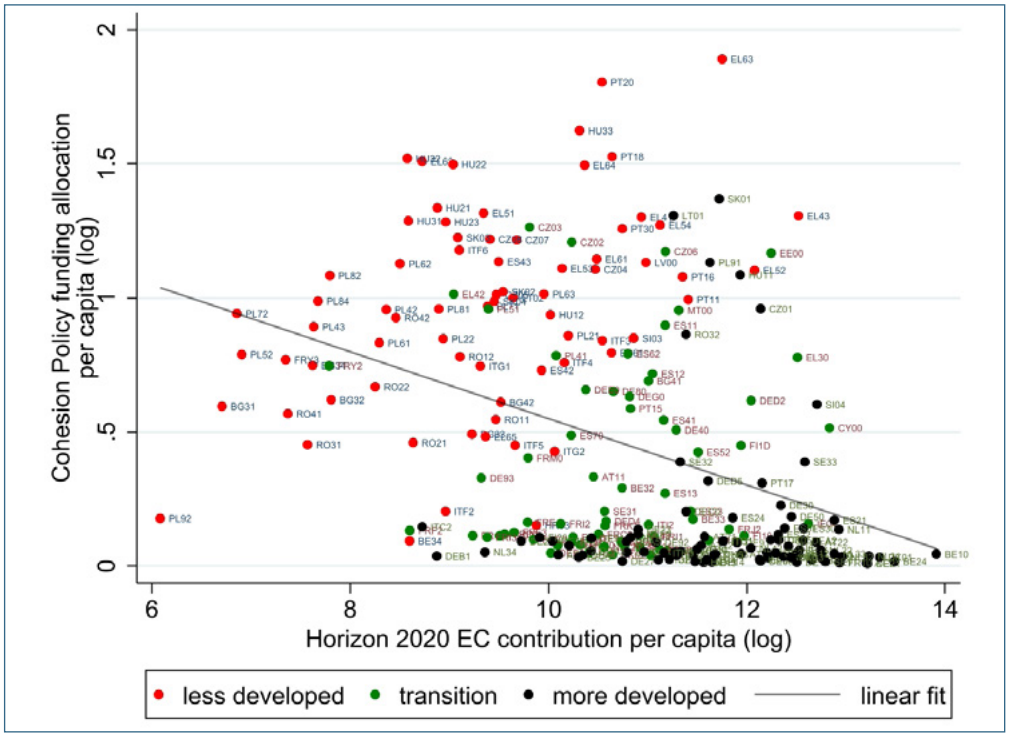
To compare the targeting of the two policies we draw on some indicative examples, as

the fragmented nature of the EU's IP and the absence of aggregated data on investment allocation across its various instruments make direct comparisons with CP impossible.

7.3.2.1. Innovation policy instruments

We first draw on data from EC Cordis to develop a regionalised measure of Horizon funding allocations – which we contrast with the regional distribution of CP funds in the 2014-2020 period. A clear misalignment emerges between the two funding sources (correlation coefficient is r=-0.31), indicating an inverse relationship between a region's capacity to attract funding for innovative research projects and its overall level of development (Figure 7.1). This is further illustrated by the concentration of more (less) developed regions on the right (left) side of the scatterplot.

Figure 7.1: Horizon and Cohesion Policy funds across regions.



Source: Author's elaboration based on Crescenzi et al. (2021) and EC Cordis.

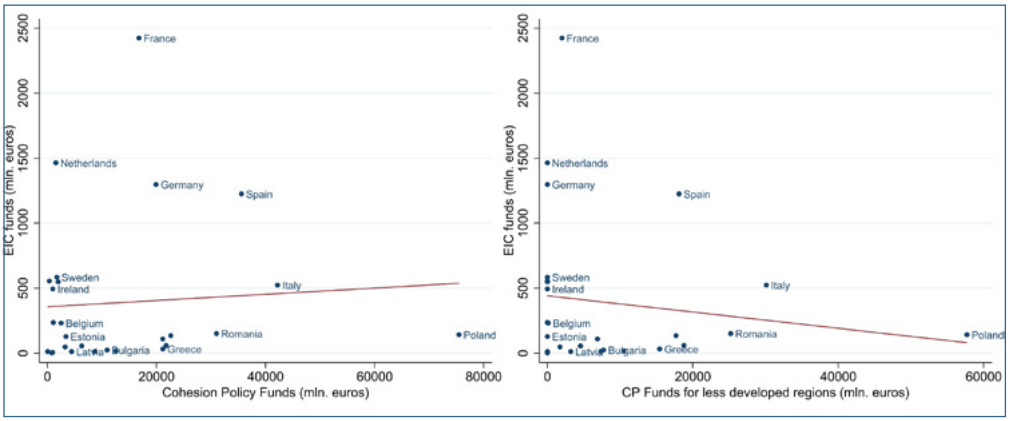
Second, we do a similar analysis for funds allocated through the European Innovation Council – this time at the national level but looking both at total CP funds and CP funds directed to less developed regions (Figure 7.2). Allocations of EIC grants and CP allocations are weakly correlated (r=0.07), while for funds targeting less developed regions correlation is negative (r=-0.14). Thus, on the whole, research and innovation policy, as proxied by Horizon 2020 and EIC grants, is inversely redistributive, potentially amplifying territorial inequalities.[164]

[162] Strictly speaking, the RRF is not part of the EU's Industrial Policy. It is, however, the main funding vehicle for the green and digital transition currently.

[163] For a more detailed comparison between the RRF and Cohesion Policy see Molica and Lleal-Fontas, 2020; Koopman, 2022; Bachtler et al, 2020; Bachtler and Mendez, 2021.

[164] Note that the analysis here is at the national level and thus underestimates the full extent of regressivity. EIC grants tend to concentrate in national capitals and major cities, which are typically not main CP beneficiaries. Similar spatial patterns exist also for the case of grants awarded to firms through the InvestEU Programme.

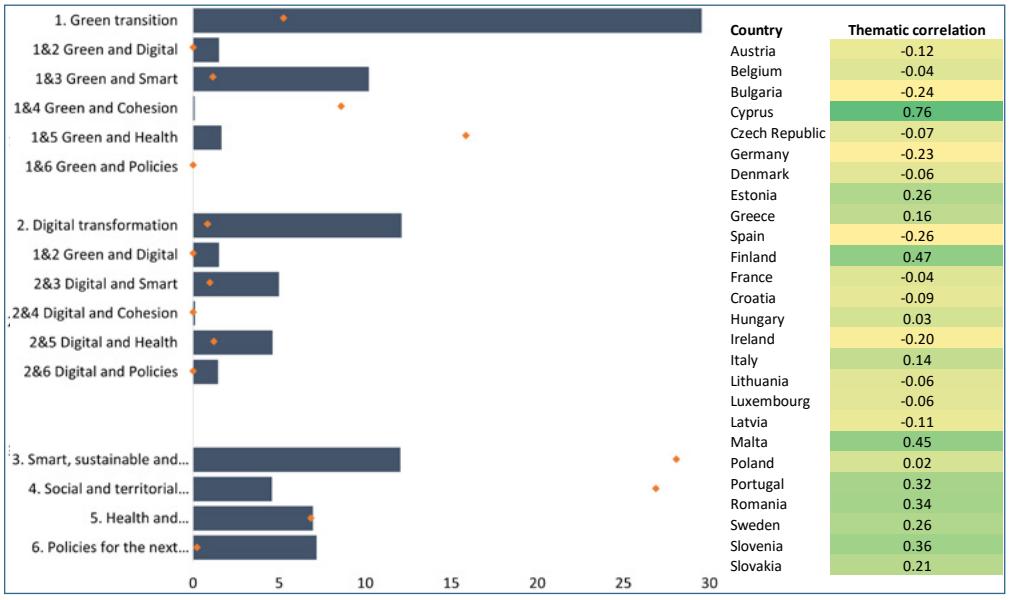
Figure 7.2: EIC and Cohesion Policy funds across Member StatesSource: Author's elaboration based on EIC data



7.3.2.2. Recovery and Resilience Facility

Replicating the above analysis for the case of the RRF – as one of the instruments that currently support the EU's IP objectives (Bachtler & Mendez, 2023) – produces a much higher correlation (r=0.59), indicating that RRF and CP funding are better aligned at the cross-country level. To further this analysis, we compare the alignment of the two funds' thematic prioritisation, drawing on data from Crescenzi et al. (2021) on the thematic priorities of CP allocations in the 2014-2020 period and matching them with the thematic pillars of RRF allocations developed by Darvas et al. (2023). As shown in Chart 3(b), in most countries allocation of the two funds is directed to different priorities (negative or near-zero correlation).[165] Positive correlations (alignment of thematic allocations) are observed mainly in southern and eastern European countries (plus Finland and Sweden). Overall, the correlation at the country-pillar level is weakly positive (r=0.16), reflecting limited alignment between RRF and CP priorities. Still, some aspects of alignment, or synergy, can also be observed (Figure 7.3(a)): while allocations to digital transition and social/territorial cohesion are different between the two funds, both funds allocate significant amounts to the green transition – albeit mostly within sub-areas of their own prerogative (e.g., 'green and smart' for RRF; 'green and cohesion' for CP).

Figure 7.3: Thematic alignment between RRF and Cohesion Policy funds



Country	Thematic correlation
Austria	-0.12
Belgium	-0.04
Bulgaria	-0.24
Cyprus	0.76
Czech Republic	-0.07
Germany	-0.23
Denmark	-0.06
Estonia	0.26
Greece	0.16
Spain	-0.26
Finland	0.47
France	-0.04
Croatia	-0.09
Hungary	0.03
Ireland	-0.20
Italy	0.14
Lithuania	-0.06
Luxembourg	-0.06
Latvia	-0.11
Malta	0.45
Poland	0.02
Portugal	0.32
Romania	0.34
Sweden	0.26
Slovenia	0.36
Slovakia	0.21

Notes: (a) *Thematic allocations in CP and RRF (b) Correlation of allocations, by country Source: Author's elaboration based on Crescenzi et al. (2021) and Darvas et al. (2023).*

[165] Note that this also applies to some countries (such as Spain) where National Plans pursue explicitly territorial cohesion.

7.3.3. The spatial footprint of non-funding instruments

Last, we examine the differences in prioritisation in the EU's IP more generally, as captured by its attention to decarbonisation and wider priorities (Sensitive Ecosystems, Industrial Alliances, etc).

7.3.3.1. Decarbonisation and green transition

We ask whether regions more strongly affected by the green transition are more (or less) heavily supported by CP. To examine this, we put together data on the sectoral intensity of 'brown' sectors by region (extrapolating GHG emissions per worker using Eurostat's Air emissions accounts by NACE Rev. 2 activity and multiplying by each region's sectoral employment share) and juxtaposed it with the regional allocations of ERDF payments (in per capita terms, for the 2014-2020 period). We complemented this with data from the 'Regional green transition vulnerability index' (Rodríguez-Pose & Bartalucci, 2024).

Figure 7.4: Brown jobs / green vulnerability and ERDF allocations

	Mean values		Correlations with ERDF allocations	
Region	GHG emissions per worker	Green transition vulnerability	GHG emissions per worker	Green transition vulnerability
Less developed	19.17*	1.11*	-0.18	-0.16
Transition	13.09	-0.12	0.43	0.24
More developed	14.62	-0.87	0.21	0.29
All regions	15.59	-0.119	0.237	0.472

Notes: asterisks (*) show a statistically significant difference from the values observed in the other regional categories.

Source: Author's elaboration based on Eurostat, Cohesion Policy data and Rodríguez-Pose & Bartalucci (2024).

Overall, there is a strong positive association between exposure to the green transition and ERDF payments (Figure 7.4). Thus, regions that receive more support from CP are expected to be more heavily (negatively) affected by the priorities set out in the EU's Green Deal. While this may be read as a source of synergy (whereby CP targets exactly the most vulnerable regions – also in relation to IP objectives), our reading is rather that the objectives of the EU's IP, with regard to the green transition, impose higher burdens exactly on those regions that have the lower levels of development and thus receive the largest support from CP. While this does not seem to apply in the same way within the group of less developed regions (first row, columns 3 and 4), we note that, as a group, these are the regions with the highest exposure to those risks (first row, columns 1 and 2).

7.3.3.2. Other initiatives

The EU's IP places significant emphasis on 'industrial ecosystems', which are clusters of entities forming distinctive value chains. The EU provides support and technical assistance to Member States aiming to enhance coordination among businesses and industries within each ecosystem, thereby strengthening their resilience and reducing external dependencies of the single market. To analyse how support for these ecosystems may unevenly affect different EU regions, we calculate each NUTS2 region's notional participation in each ecosystem and analyse how this varies across types of regions and how it correlates with the regions' CP allocations.[166]

Across the EU, the largest employment shares are in the ecosystems of Retail, Construction and Tourism (Figure 7.5). Specialisations across types of regions, however, are different.[167] Relative to the average (LQ columns), less developed regions specialise more in ecosystems

[166] Notional participation is calculated by multiplying each region's sectoral employment shares across NACE 2.0 sectors with the NACE 2.0 sector weights for each industrial ecosystem (which we draw from the European Cluster Collaboration Platform – https://www.clustercollaboration.eu/sites/default/files/2023-05/Methodology_Notes.pdf):

[167] Indicatively, notional participation in Electronics ranges from below 1% in Melilla, Ceuta (Spain) and Notio Aigaio (Greece) to over 4% in Freiburg, Dresden (Germany), Vest (Romania) and Észak-Magyarország (Hungary).

such as Agri-food, Tourism, and Energy-intensive industries; while more developed regions participate disproportionately in ecosystems such as Digital, Electronics, Health, Aerospace & Defence and Cultural & Creative industries (in most cases, more developed regions also exhibit stronger specialisations / more extreme LQ values). A correlation analysis (between ecosystem participation and ERDF allocations – last column) confirms this 'division of labour'. ERDF allocations show strongly negative correlations with the specialisation in ecosystems related to Textiles, Digital, Cultural & Creative industries, Health, Construction and Electronics; and positive with Tourism, Energy-intensive industries, and Agri-food.

This suggests a potential disadvantage for regions targeted by CP. Unless all industrial ecosystems enjoy the same degree of technological sophistication and face similarly disruptive supply chain challenges, the focus on industrial ecosystems in the EU's IP could create relative disadvantages precisely for those regions (Franco & Wilson, 2022).

Figure 7.5: Notional participation in 'sensitive ecosystems' by type of region

Ecosystem	All	Less developed		More developed		Transition		Correlation of regional shares with regional ERDF funds allocation
	Share	*Share*	*LQ*	*Share*	*LQ*	*Share*	*LQ*	
Aerospace and defence	2.9%	3.0%	1.02	3.1%	1.07	2.6%	0.89	-0.01
Agri-food	6.4%	8.3%	1.30	4.8%	0.76	6.5%	1.02	0.32
Construction	20.5%	18.8%	0.92	20.6%	1.00	22.3%	1.09	-0.20
Cultural and creative industries	2.9%	2.2%	0.77	3.5%	1.23	2.6%	0.92	-0.27
Digital	4.2%	3.0%	0.70	5.8%	1.37	3.4%	0.80	-0.29
Electronics	1.2%	1.0%	0.86	1.5%	1.24	1.0%	0.81	-0.11
Energy intensive industries	6.1%	6.7%	1.10	5.7%	0.94	6.0%	0.99	0.13
Energy-renewables	0.8%	0.9%	1.09	0.9%	1.01	0.7%	0.88	0.10
Health	2.2%	1.7%	0.79	2.6%	1.20	2.1%	0.94	-0.24
Mobility-Transport-Automotive	10.7%	11.2%	1.05	10.6%	0.99	10.2%	0.96	0.10
Proximity, Social Economy and Civil Security	5.9%	5.7%	0.97	5.8%	0.99	6.2%	1.05	-0.01
Retail	24.2%	24.9%	1.03	23.5%	0.97	24.5%	1.01	0.07
Textile	0.2%	0.1%	0.82	0.2%	1.17	0.2%	0.96	-0.39
Tourism	15.2%	16.0%	1.05	14.4%	0.95	15.4%	1.02	0.18

Source: Author's elaboration as described in the text

Similar conclusions can be drawn for other initiatives, such as the formation of Industrial Alliances and the approval of Important Projects of Common Economic Interest, which benefit from exemptions from state-aid restrictions. While granular data on participation in these schemes is not available, anecdotal examination shows that participation from peripheral and less developed regions is uneven: quite naturally, entities participating in Industrial Alliances (besides national and professional organisations) are large national and multinational companies and research institutes specialising in high-end technologies, typically located in national capitals or regions of high development and accessibility. Similarly, the example of the most recently approved IPCEI (Move4Cure) shows that, of the 13 beneficiary companies, nine are in regions classified as 'more developed', another two are in a 'less developed' national capital (Budapest), while a third have multinational operations. Again, it can be argued that the alignment of such interventions with the objective of territorial cohesion is, at best, extremely limited.

7.4. Conclusions and policy recommendations

We have argued that Industrial and Cohesion Policy appear to have rather limited alignment. Despite both policies experiencing an 'entrepreneurial' shift in recent decades, the emphasis on excellence in innovation policy and the advancement of increasingly challenging "macroscopic" ambitions and objectives, may be difficult to reconcile with the realities of many of the EU's regions and territories. For Cohesion Policy to support these new ambitions, and for the two policies to become more synergetic and mutually reinforcing, two things need to happen. First, IP should obtain a more 'territorial' character, developing a spatial strategy

alongside its thematic and geopolitical objectives, understanding territorial cohesion and harmonious development as key constituent parts of any strategy for growth. Second, CP should become more 'strategic', linking more organically to the strategic priorities and ambitions of the EU and understanding that a fragmented set of local strategies (for smart specialisation) cannot sufficiently deliver on the EU-wide key objectives.

Recommendation 1. A 'territorialised' Industrial Policy

As we saw, the EU's IP has a potentially regressive 'territorial footprint', amplifying regional disparities. To be aligned with the CP objective (and the EU's own Treaty obligations) of territorial cohesion, IP needs to internalise the logic of the double-dividend of balanced growth guiding the modern CP (whereby supporting lagging regions releases untapped potentials that maximise overall growth) and apply it in its own interventions.

Devise a spatial strategy alongside the various sectoral strategies and mission-oriented policies. Spatial strategies set strategic priorities for specific areas and regions, under a systemic view of enhancing functional connectivity (e.g., supply-chain networks) across space. Their need derives from the realisation that regional disparities and disadvantage are a form of systemic market failure, similar to the ones that IP is already called upon to address. A spatial strategy will allow the EU to formulate a plan not only for 'what goes where' (in terms of funds or supported activities) but, importantly, also for why (how a particular allocation connects to other activities across and other assets/advantages within). This requires the more direct involvement of "spatial" institutions – such as DG Regio or the European Committee of the Regions – in the design and governance of IP, in closer coordination with local 'smart specialisation' plans.

Introduce a direct spatial character in IP interventions, consistent with the overall spatial strategy. Assistance by IP programmes should incorporate spatial criteria consistent with the overall spatial strategy in the allocation of funds and other forms of support, thus directing resources to (low-capacity) regions to allow them to move to new position(s) in the European and global supply chain. For example, EU support for the establishment of Gigafactories in Europe (via InvestEU) or for deep-tech investments (via the EIC) should avoid leaving the (al)location choice to the free market (by supporting the most 'competitive' bid) and instead factor-in how the resulting economic activity is distributed across space. Or, grants under Horizon and state-aids under the ICPEIs could include quotas for participation by entities from less developed regions in their selection criteria, consistent with the overall spatial strategy, similar to Widening Participation and Spreading Excellence actions under Horizon Europe currently.

IP initiatives should measure their extent of regressive selectivity and apply corrective actions to support the involvement of entities from less developed regions. As demonstrated, the participation of regions of different types in the various industrial ecosystems, industrial alliances and IPCEIs is uneven. Support and planning for industrial ecosystems, under the European Monitor, should also include analysis of "notional regional participations". This would help identify those less developed regions that could potentially participate in each ecosystem; and support their participation either by leveraging on existing advantages or by helping them diversify into relevant sectors and activities. Similarly for participation of businesses and other entities, from less developed regions, in Industrial Alliances and IPCEIs – or even in Procurement for Innovation and Alliances for Innovation actions. This requires the development of specific funding and technical assistance measures (e.g., quotas and incentives in IPCEIs; brokering and coordination services for Alliances) and relevant quotas and selection criteria (for Innovation actions) targeting specifically regions of economic disadvantage and linking directly to those regions' strategies for upgrading.

The spatial costs (and proceeds) of IP should be turned into an opportunity for the economic upgrading of affected regions. As shown, some IP objectives (e.g., green transition)

impose larger challenges to less developed regions. While the Just Transition Mechanism was devised in part to address exactly this problem, its resources are limited; while its instruments (co-financing for grants under the Just Transition Fund; leveraging for InvestEU and EIB loans) generally put less developed regions at a disadvantage (Volintiru & Nicola, 2024). Funding for such initiatives should increase substantially (whether via taxes capturing the 'proceeds' of IP or via direct debt-issuing, as with the RRF), moving from a compensatory logic to one that understands green investments in these areas as a public good which creates social value for all territories; while support should shift towards less risky instruments (e.g., tax and investment/production credits, as in the very successful example of the 'Energy Communities' programme under the USA's IRA) that will support more directly 'clean investments' in 'green vulnerability' regions. Similarly for other types of 'vulnerability', e.g., with regard to critical raw materials.

Recommendation 2. A 'strategic' Cohesion Policy

While our interest is not specifically with the reform of the Cohesion Policy, two important measures derive from our recommendations on the fine-tuning of Industrial Policy.

Connect smart specialisation strategies into a network of local strategies that adhere to the EU's overall spatial strategy.

The shift to 'place-based' initiatives and locally-inspired "logics of intervention" in CP affords a great amount of autonomy and discretion to regions, on how (and where) to re-specialise in their pursuit of economic upgrading – raising the question of whether successful re-specialisations that make sense at the local level, may actually contribute to, or hinder, the overall re-specialisation objectives (decarbonisation, sufficiency in sensitive products and critical raw materials) at the EU-wide level (Di Cataldo et al, 2022). This calls for stronger horizontal cooperation in the formulation of these strategies (among regions, at different spatial scales), but also for some degree of re-centralisation of the policy (with oversight and actioning power by the Commission or some appropriately delegated authority) to facilitate a spatially coherent prioritisation of re-specialisations for the European economic space at large. Leveraging on existing policy structures and initiatives (e.g., Interreg, Trans-European Networks, the EU Territorial Agenda and ESPON as the legacy institution of the 1999 European Spatial Development Perspective), could be important both in terms of knowledge transfer and in terms of the legitimacy of the process.

Integrate more organically the developmental tools and priorities of CP to the strategic thinking and priorities of the EU. We have argued that CP has in some regards transformed into a "place-centred industrial policy". We also saw that some of its thematic priorities adhere increasingly to those of the EU Green Deal and digital transition (e.g., earmarking of expenditures for green and digital transition objectives). Still, most of CP is not concerned with the strategic priorities and wider ambitions of the EU – e.g., regarding economic sovereignty, sensitive products, critical raw materials, etc. To raise the alignment and adherence to such objectives, the design of CP should be integrated more organically to that of IP. While the overall principle of 'place-based' policy should not change, a degree of (re-)centralisation may be due, so that objectives are (at least partly) decided at the same level as with Industrial Policy. This would require the more direct involvement of "industrial policy" institutions – such as DG Growth, the European Innovation Council and SMEs Executive Agency, etc – in the design of Cohesion Policy, at least at a consultation level.

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8. Industrial policies for the twin transition in Europe

Filippo Bontadini[168], Valentina Meliciani[169] & Maria Savona[170]

Executive Summary

This Chapter offers novel evidence and policy discussion that could aid the implementation of the European Union's Open Strategic Autonomy and industrial policies for the twin transition. The analysis draws on theories from the capability-based and structural literature, relying on a methodological approach developed within the literature on economic complexity and geography. Specifically, we explore the relationship between EU countries' proximity to twin transition-related products, their trade dependencies and comparative advantage. The findings are twofold. First, when we look at what countries have a productive structure that is the most aligned to twin transition products, we find that these are large manufacturing countries such as Germany and Italy. However, when we consider which countries are closest to twin transition products in relative terms – i.e. whether transition products are the closest to their productive structure – we find that it is often smaller countries, notably Sweden and Czechia, that have incentives to specialise in such products. Second, we find that both the development of comparative advantage or a reduction of trade dependence is not closely related to measures of proximity. Conversely, we also find that distance is a good predictor of the likelihood of losing comparative advantage and increasing trade dependences. This means that on the one hand, policies aiming to develop comparative advantage in twin transition goods should focus on factors beyond proximity alone. On the other hand, such policies should focus on fostering broad and coherent technological and capability ecosystems, taking a systemic approach focused on complementarities in line with the structuralist and capabilities-based theory. Moreover, and in light of the asymmetries among EU countries in their ability and incentives to diversify towards OSA and twin transition goods, it is necessary coordinate industrial policies across the EU to avoid an exacerbation of pre-existing inequalities that would be contrary to EU cohesion policy principles.

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8.1. Introduction

European trade and industrial policy have undergone considerable changes in the past two decades, in a global context of radical technological and economic transformations. The digital transformation, particularly with the emergence of AI, has substantially accelerated its pace and might have unpredictable effects on economies and societies. The ongoing climate crisis has put increasing pressure on governments to reduce emissions and make economic activity more sustainable. A major policy challenge is therefore to steer what is often referred to as the twin transition.

The geopolitical landscape has also profoundly changed over the past few years. While the first two decades of the 21st century have witnessed a steady increase in liberalisation of trade and economic integration among countries, recent years have seen greater turbulence. Trade relationships between China and the US have soured considerably, the COVID-19 pandemic has shown the vulnerability of global supply-chains, the dependence on supplier countries and the introduction of export restrictions for selected products. The Russian invasion of Ukraine has sparked an energy crisis and inflation across the World. This geopolitical turbulence has made the notions of near-/, re-/, back-/ or even friend-/ shoring to gain significant traction in the policy debate around globalisation.

The EU has started to pursue what it refers to as open strategic autonomy (OSA) (Szyszczak, 2023, Evenett et al., 2024), trying to strike a balance between preserving a rules-based open trade system and reducing its own dependences on foreign suppliers of strategic products and technologies for the twin transition (Edler et al., 2023).

To illustrate this, we can adopt a rough, but intuitive, measure of trade dependence:

$$Trade\ dependence = \frac{m_{ik}-x_{ik}}{m_{ik}+x_{ik}}$$

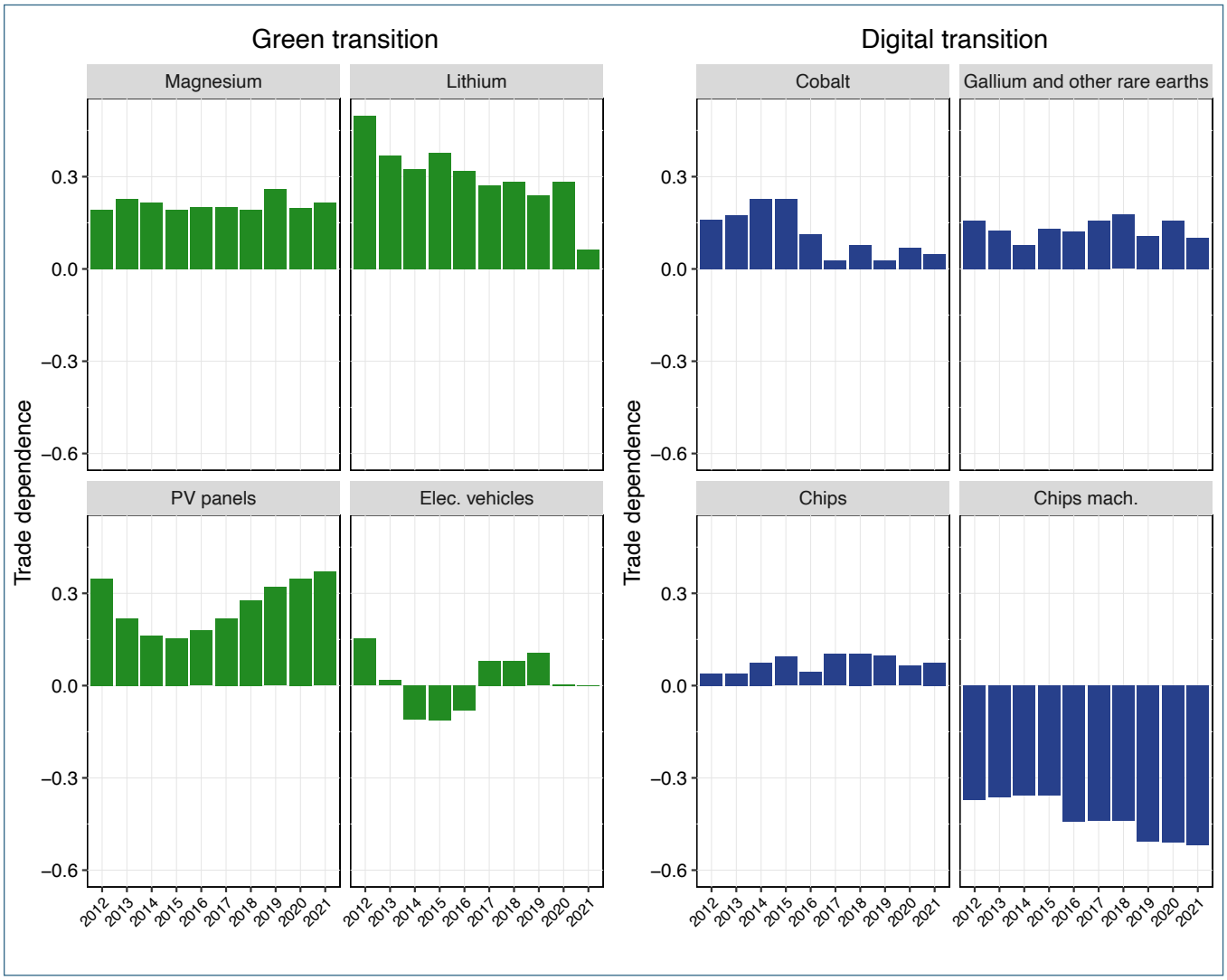
Where and are exports and imports, respectively, of country and product.

Figure 8.1 reports this index over time for a selection of eight among raw materials and manufactured products for the green and digital transition. Most European countries are net importers of both raw materials and mid-tech manufactured goods such as PV panels – in which China has become a leader – and microchips (Bulfone et al, 2024). The EU remains however a net exporter of more technologically intensive products. This is the case for machineries to produce microchips, and electric vehicles, although its competitiveness in the latter has been deteriorating in the most recent years.

Looking at the origin of imports of these eight products in Figure 8.2, we find that EU dependences are rather diversified geographically, although a few key suppliers clearly emerge. Among raw materials, China is by far the largest supplier of magnesium and an important one for gallium and other rare elements. Latin American countries, lumped in the Rest of the World (ROW) group in Figure 8.2, are also large suppliers of lithium (Chile) and gallium (Brazil), while Africa (especially the Democratic Republic of Congo) is a crucial supplier of cobalt.

Looking at manufactured goods, China is again a major supplier of PV panels and, to some extent, microchips, while both electric vehicles and microchip machineries are mostly sourced from the US or other advanced economies (OAE).

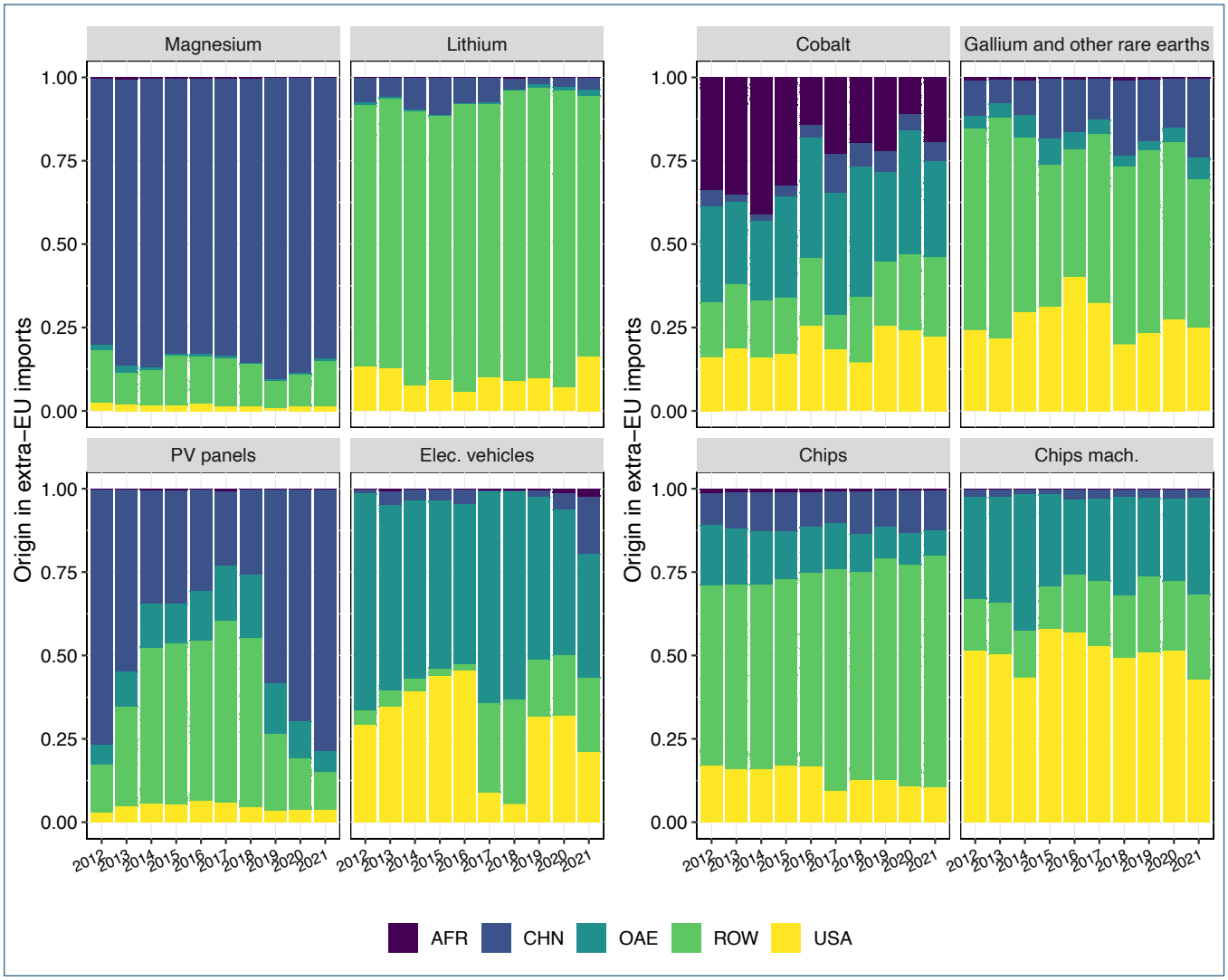
Figure 8.1: EU trade dependencies in twin transition value chains



Note: Trade dependence is computed here for groups of HS6 codes, grouped through manual procedure to identify the eight broader categories, CRM are identified based on Rietveld et al. (2023). Other advanced economies include Australia, Canada, Iceland, Japan, New Zealand, Norway, Taiwan, and South Korea, Rest of the World (ROW) is a residual category including all remaining countries. Source: Authors' elaboration on BACI-CEPII data.

Overall, despite some heterogeneity, this preliminary evidence shows that the EU is not self-reliant, which explains the growing policy interest to reduce such dependences to ensure a successful twin transition. A significant challenge in this respect is the fact that such products vary greatly in terms of underlying technology, complexity and capability requirements. Countries might face challenges to pursue strategic autonomy, and, depending on their resources, industry structure and capabilities, they might need to focus on achieving autonomy only in some, rather than all the strategic materials and products for the twin transition. Policy-targeting full autonomy may prove both inefficient and unsuccessful.

Figure 8.2: Origin of EU trade dependencies in twin transition value chains



Note: Origin of imports is computed here for groups of HS6 codes, grouped through manual procedure to identify the eight broader categories, CRM are identified based on Rietveld et al. (2022). Other advanced economies includes: Australia, Canada, Iceland, Japan, New Zealand, Norway, Taiwan, and South Korea, Rest of the World (ROW) is a residual category including all remaining countries. Source: Authors' elaboration on BACI-CEPII data.

The aim of this chapter is to provide a general framework and a methodological device that helps to identify the specific products that each country can target. We draw upon the literature on technological capabilities and economic complexity, and ground our work in theories of structural change.

Theories of structural change and technology gap have a long history of policy relevance in the context of industrial policy for development (Lall, 1992; Dosi et al., 1990; see more recently, Chang and Andreoni, 2020; Juhász et al., 2023). The approach of economic complexity – while fairly a-theoretical - has gained significant attention in the policy domain. Specialising in complex products has been found to be consistently associated with economic growth (Balland et al. 2022, and Broekel, 2022) and relevant for the green transition (Mealy and Teytelboym, 2022). A key takeaway of this literature is that countries' productive structure evolves slowly over time and that "jumps" from one specialisation pattern to include products that are very dissimilar are unlikely to happen. In sum, this literature provides country-specific recipes for policy interventions to steer economic specialisation towards complex products.

The methodological toolbox developed within the economic complexity approach (Hidalgo et al., 2007: Boschma et al., 2013) may prove very useful in mapping the position of Europe with respect to strategic products and to identify areas of opportunity to steer production structures towards strategic products that are closer to own extant capabilities.

Recently this methodology has been applied to green capabilities, mainly using patent data (for a review see Caldarola et al., 2024), while few studies have focused on green productive capabilities using trade data (Huberty and Zachmann, 2011; Hamwey et al. 2013; Fraccascia et al. 2018; Mealy and Teytelboym 2022; Müller and Eichhammer 2023).[171] Among these studies Fraccascia et al. (2018), using panel data regressions for 141 countries over the period 2005-2013, find support for the hypothesis that the green products with the highest potential for growth among all green products in a given country are those in close proximity to the products a country produces with high Relative Comparative Advantage (RCA). Mealy and Teytelboym (2022) use a similar approach to explore countries' opportunities to increase their green production capabilities and find that the "green complexity potential", which measures each country's average relatedness to green complex products, positively affects changes in green production capabilities (measured by the green complexity index), the number and the share of exported green products.

In sum, our paper offers a framework that builds on theories of structural change and economic development (Lall, 1992), while using the methodological contribution of the economic complexity approach to map productive and technological capabilities, and assess their role in shaping diversification and growth (Hausmann et al 2007, 2011; Pugliese et al 2017; Sbardella et al., 2018).[172] It is important to note that this approach is agnostic on what technologies/sectors/value chains offer different opportunities for long term strategic competitiveness and growth. As illustrated in the next section, we complement this approach by selecting areas that are relevant for the purpose of this paper and also complement some of the recent discussions on industrial policy (Chang and Andreoni, 2020; Fontana and Vannuccini, 2024) for European Open Strategic Autonomy (Arjona et al., 2023).

We map the distance across country-product pairs and study its relationship with countries' likelihood to (i) decrease their dependence, as well as to (ii) develop comparative advantage.

8.2. Data and methods

8.2.1. Strategic products for EU's twin transition

We focus our empirical analysis on three groups of products, which are relevant for the green transition and then identify subsamples within each of them of both high-complexity and high EU-dependence products.

Green transition products. In line with the policy literature on this topic (Steenblik 2005 and Sauvage, 2014), we follow the output approach[173] and take the list of green products compiled by Bontadini and Vona (2023). This list is essentially a refined version of the OECD Combined List of Environmental Good (CLEG), excluding products with more than one usage, one of which is not green, such as water pipes or other waste management equipment.

Digital transition goods. The construction of digital goods lists has drawn significantly less attention in the literature. Andreoni et al. (2023) put forward a list which encompasses capital goods in relevant 2-digit the Harmonised System and a manual cleaning procedure leading to 127 products.

Critical raw material. The two lists above identify products deploying technologies for the twin transition. Within them, some raw materials have emerged as particularly critical for these technologies. They are referred to as critical raw materials (CRM). The EU has pub-

[171] For a review of the application of EC to sustainability, see Caldarola et al. 2024.

[172] The intuition underlying the measurement of complexity is that complex products require a wide array of capabilities that are rare among countries. Therefore, complex products are those that are exported competitively (i.e. with a revealed comparative advantage) by few and highly-diversified countries. To illustrate, natural resources (e.g. lithium) are exported by only few countries (e.g. Chile), but these countries are not very diversified. In contrast complex products such as machinery for the production of microchips are exported by few countries (e.g. the Netherlands) that also export many other products, thanks to their wide range of capabilities.

[173] Broadly speaking, greenness can be identified in terms of production process, i.e. products whose production process requires less pollution, e.g. bamboo instead of metal structures. Or it can be defined in terms of output, i.e. products whose use has positive remediation effects on the environment, such as wind turbines, filters or photovoltaic (PV) panels.

lished a CRM Act and Eurostat has been compiling a yearly list of CRMs. We rely here on the list published by the European Commission in 2023.

From these three product ecosystems, we identify those products in which the European Commission has found the EU to have strategic dependence, based on Arjona et al (2023). We then also identify within each product ecosystem the top decile for economic complexity, which we consider high-complexity products.

8.2.2. Measuring distance between countries and products

Based on the methodological procedure specified in the Methodological Appendix to Chapter 8 (henceforth referred to as the Appendix), we identify a matrix of country-product distance. This allows us to map countries in terms of their likelihood/advantage to specialise in the three set of products for the twin transition.

As argued in the section above, this measure reflects not only the difference between a country's export portfolio and the product, but also the difference in terms of technological and capability requirements. Larger countries exporting many products with RCA will have a lower distance with respect to most products.[174] For example, a large, diversified, and manufacturing-based country, such as Germany, will likely have lower distance to all products than, say, a small, service-based economy such as Luxembourg, and will likely be disproportionately benefiting from EU-level support to specialise in twin transition goods. This is important from a policy perspective at the European level, since the pursuit of specialisation in twin-transition products may come at the cost of undermining EU cohesion.

Moreover, there is a tension emerging between policymaking at the EU and the national level. EU policymakers may wish to focus all support to countries that are closest to the strategic products, while national policymakers will each consider what product is closest to their productive structure regardless of whether other EU countries have a lower distance.

Let us consider the case of a small country with high absolute distance from all twin-transition products. Other countries will stand a better chance to specialise in twin-transition goods, but from the small country's perspective it might still be reasonable to pursue specialisation in the twin-transition products that are closest to its own productive structure.

In a specular way, large and diversified economies are likely to have relatively low distance with respect to all products. This means that twin transition goods may not be the closest products a large, diversified country could specialise in; therefore, while EU level policymakers would want to support a large, diversified country's efforts to specialise in twin transition goods, this might not align with the country's own productive structure.

8.3. Empirical results

8.3.1. Mapping country-product distance for the twin transition

Some of the twin transition products illustrated above will be more complex than others, requiring different sets of capabilities. First, we plot the density distribution of the three product ecosystems, contrasting it with the distribution of complexity for all products in Figure 8.3. As expected, we find rather stark differences in terms of complexity.

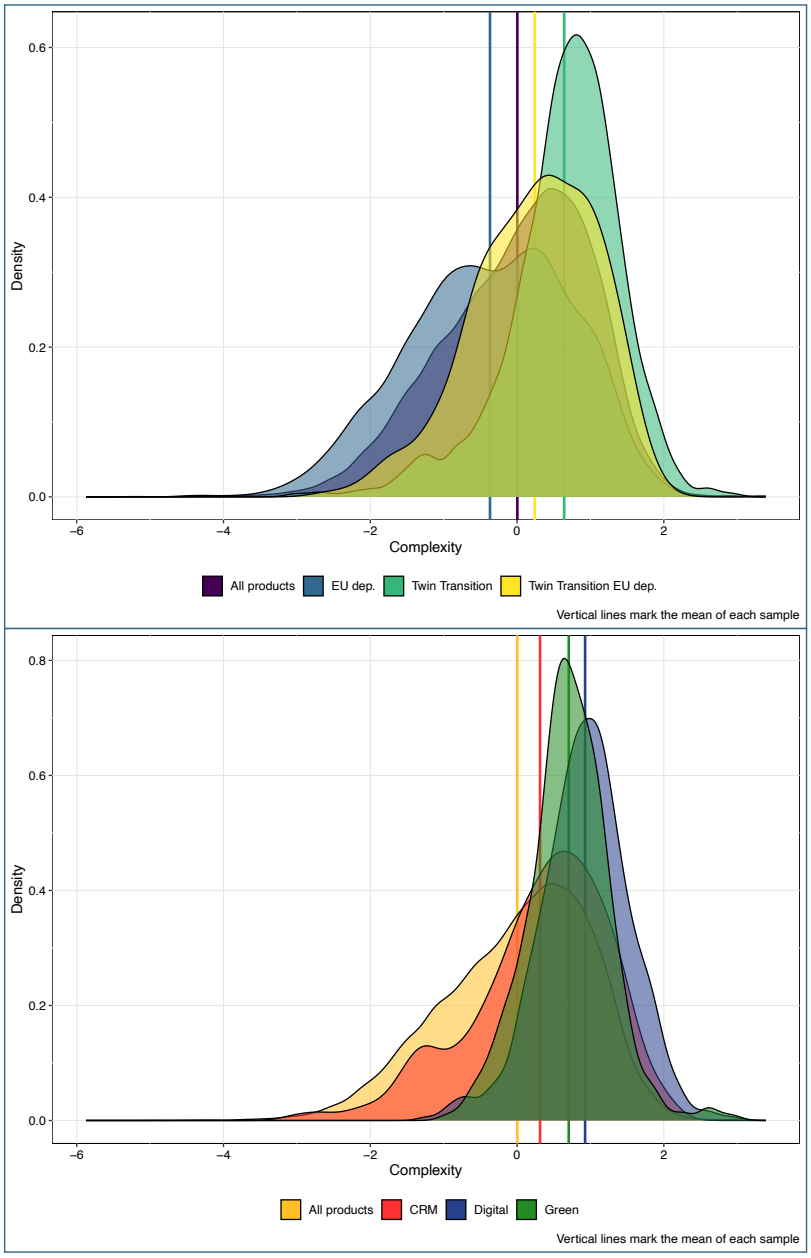
The upper panel of Figure 8.3 plots the distribution of complexity for (i) all products, (ii) the products where the European Commission (Arjona 2023) finds an EU-level dependence, (iii) the twin transition products that we identified above and (iv) the intersection between (iii) and (ii). Twin transition products are by far more complex than all other groups, especially when looking at all products. However, the subsample of twin transition products on which the EU is most dependent are significantly less complex, while those on which it is less de-

[174] See Appendix: a country exporting many products with RCA will have populated with more ones which will decrease distance.

pendent are fairly complex, as mentioned in the introduction (Figure 8.1).

The lower panel of Figure 8.3 looks at the three classes of twin-transition products individually. The distribution of all these is skewed towards higher complexity, especially the digital and green ecosystem. Concerning critical raw materials, one would expect them to rank rather low on complexity, since, although rare, they are usually exported by natural resource intensive countries that have low levels of diversification. However, it is worth bearing in mind that critical raw materials are rarely mined as such and often have to be extracted from other ores (Li et al., 2024), therefore requiring some level of technological capability. All told, Figure 8.3 suggests that the twin-transition products are rather complex, which means they are not easy to specialise in, requiring a vast array of capabilities. At the same time, successful specialisation in such complex products may yield a growth dividend (Hidalgo et al. 2007). This lends support to the idea that policy intervention could be helpful in steering countries' productive structure towards such products and that, if successful, this specialisation may be conducive to economic growth.

Figure 8.3: Distribution of economic complexity across ecosystems



Note: Density plot of products' complexity. Complexity is averaged over time to only vary among products. Source: Authors' elaboration on BACI-CEPII data.

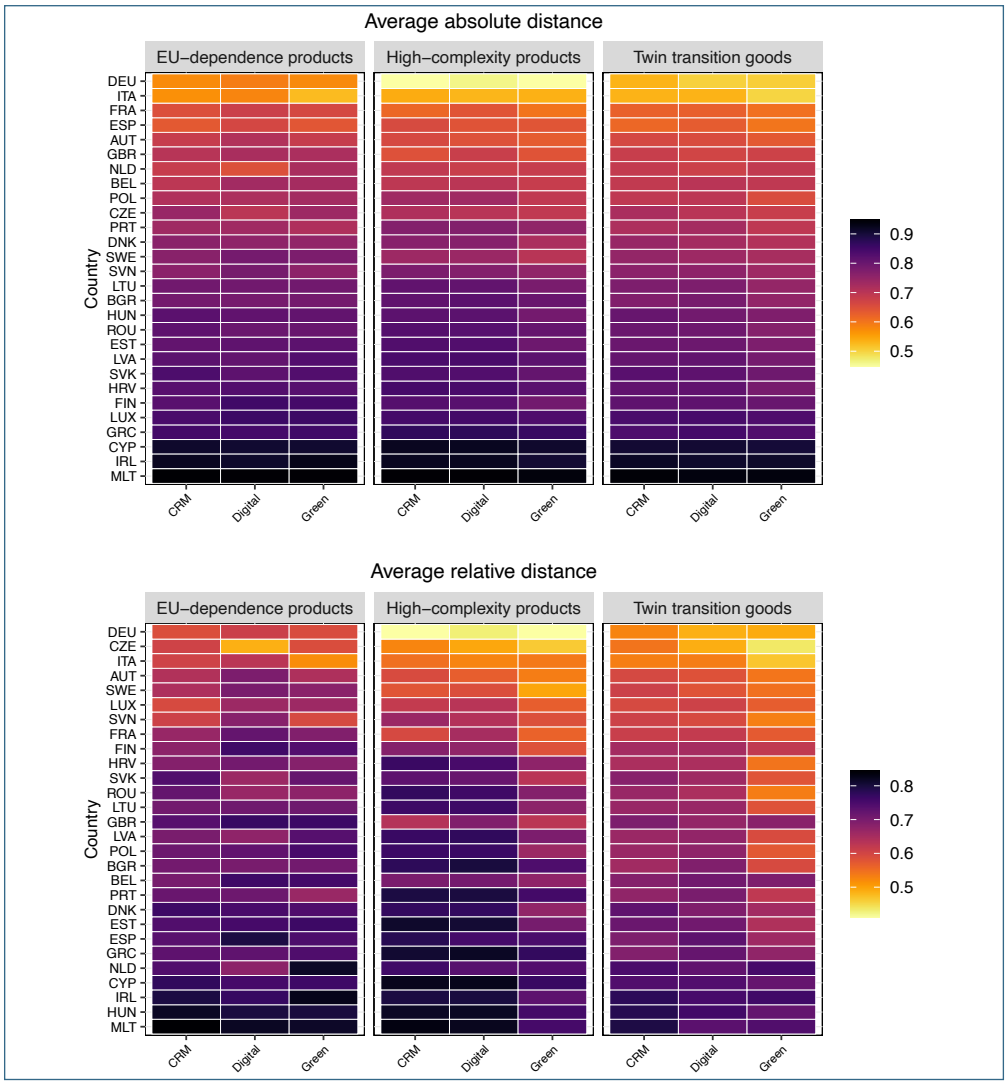
Second, we look at the likelihood of a country specialising in highly complex twin transition products, based on their initial sectoral specialisation and capabilities (i.e. looking and the country-product matrix explained in Section 2). Figure 8.4 plots unweighted averages of distance for each country-product ecosystem combination looking at all twin transition goods (righthand panel), as well as the high-complexity and EU-dependence subsamples (centre and lefthand panel, respectively).

The upper panel reports absolute distance. We find support for our conjecture that large and diversified countries, such as Italy and Germany, have the lowest distance from all products, regardless of their ecosystem. Germany seems to have a productive specialisation that is particularly close to high-complex products. EU-dependence products in contrast exhibit a higher distance, suggesting that those products in which the EU has the highest dependence are also those that lie the farthest from EU countries' specialisation pattern.

When we turn to the lower panel and the relative distance, we find a rather different picture. Twin transition products are overall much closer to EU countries' productive structure, especially green ones, while high-complexity and EU-dependence products are significantly farther away.

Looking at individual countries is, however, where the most striking differences emerge. Czechia, Sweden and, remarkably, Luxembourg now appear to have considerably shorter distance than in absolute terms.

Figure 8.4: Absolute and relative average distance across countries and product ecosystems



Note: Colour refers to unweighted average distance of products in each country-product ecosystem over time. Source: Authors' elaboration on BACI-CEPII data.

This suggests that there might be a misalignment in policy interests between the EU- and the national levels and a high cost of uncoordinated national policies. Were small countries to pursue the twin-transition towards products closest to their productive structure, they would most likely have to compete with larger countries such as Germany and Italy that not only operate at a large scale – and in the case of Germany also with larger fiscal capacity – but also have a technological advantage in absolute terms. This may prove to have detrimental effects not only in terms of doubling up policy efforts across countries but also to exacerbate pre-existing asymmetries across EU Member States and, ultimately, undermine EU cohesion.

8.3.2. Distance, trade dependence and RCAs

We now explore how countries' distance from twin transition products is related to EU trade dependence on such products, bearing in mind that distance is a measure of similarity between a product and a country's productive structure, built on export flows, while trade dependence in contrast is the outcome of import and export flows, with no mechanical relationship to distance.

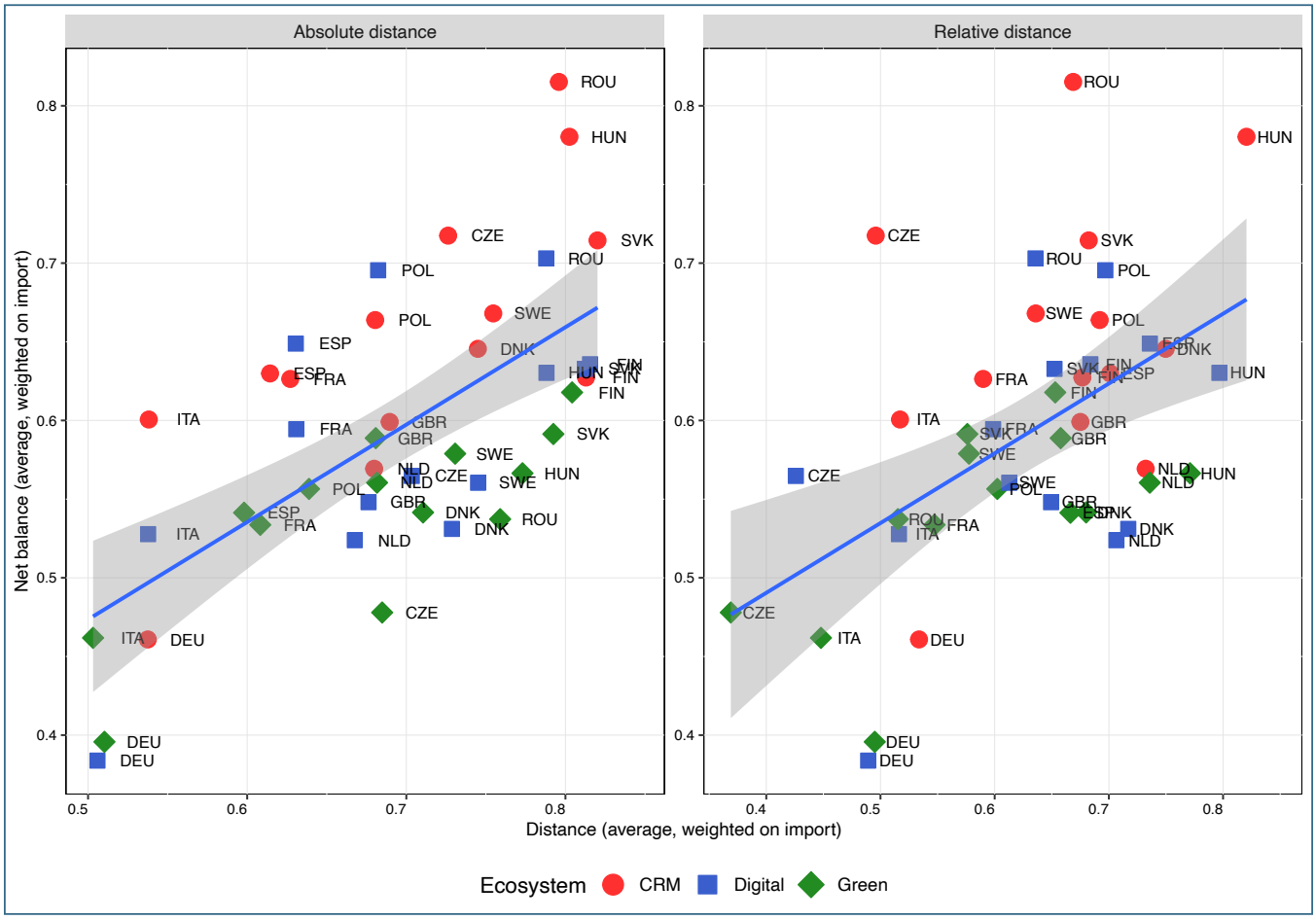
In theory, it is possible for a country to decrease both import and export in distant products, leaving its trade dependence unaltered. In practice however, countries are likely to increase exports of products closer to their productive structure, while resorting to imports of products from which they are farther away. These mechanisms would be consistent with both absolute and relative distance, since the two are related to one another and we therefore expect the relationship between trade dependence and both measures of distance to be the same.

In Figure 8.5 we plot both the absolute and relative distance, focussing on the average between 2018 and 2021, against trade dependence. The figure looks at country-product ecosystems averages, weighted on imports to give more importance to products that are imported in larger quantities. As expected, we find a positive relationship between distance and trade dependence, suggesting that countries tend to import rather than export products that are distant from their productive structure.

While, as expected, both absolute and relative distance exhibit similar relationships with trade dependence, some differences emerge in terms of position of individual country-product pairs along these two variables.

The figure does highlight some difference in between absolute and relative distance. Concerning the former, we see a cluster of country-products that have rather high trade dependence but low distance, circled in blue. This cluster includes only large and diversified countries, such as Italy, France and Spain. In contrast, as a similar cluster of high-dependence but low-distance countries using relative distance we identify a rather different group of countries: Czechia, Poland, Slovakia and Sweden. This again highlights the difference in policy incentives when we consider absolute as opposed to relative distance and the emergence of policy misalignment discussed above.

Figure 8.5: Trade dependence and distance 2018-21

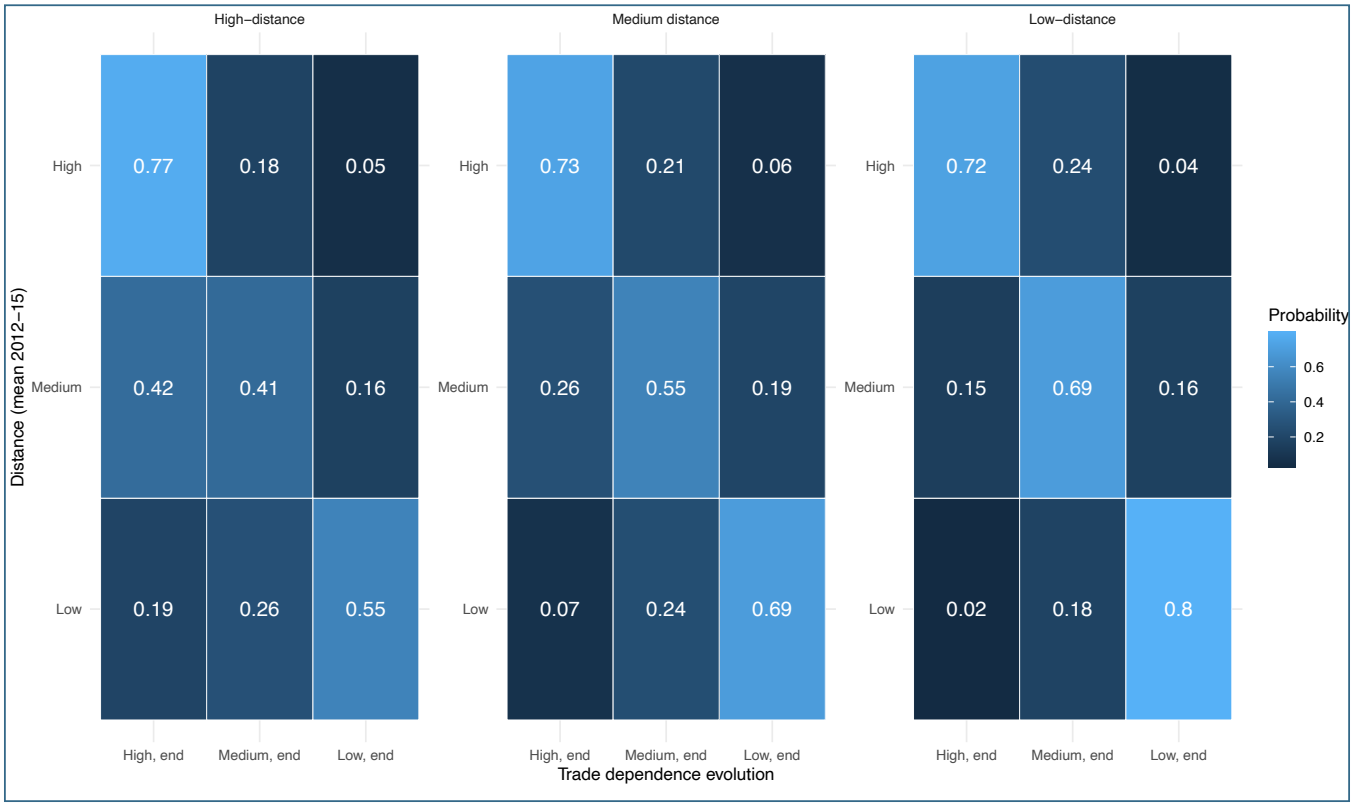


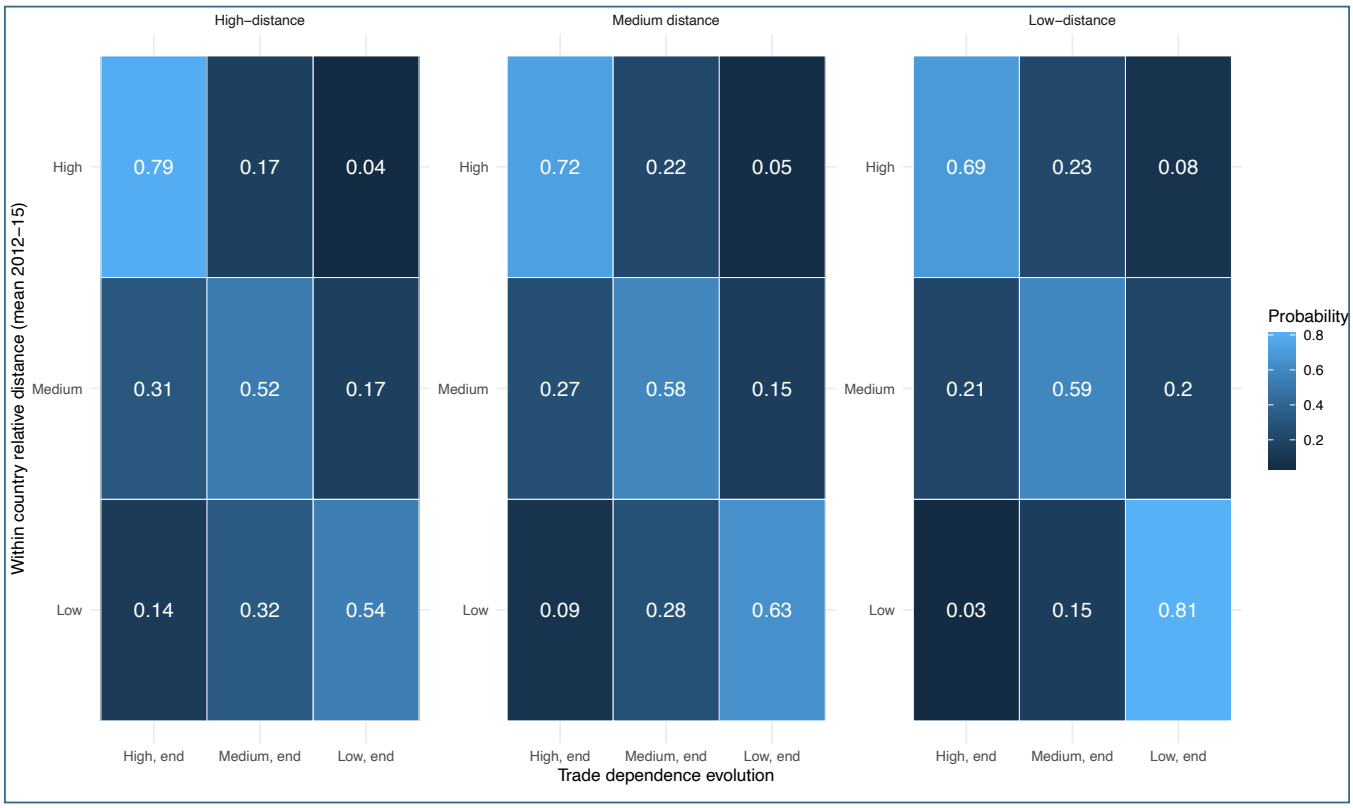
Note: The figure imports averages for distance and trade dependence over the period 2018-21 across product ecosystems. The lefthand panel uses absolute distance, while the right hand panel uses relative distance. Source: Authors' elaboration on BACI-CEPII data.

Figure 8.5 relies on averaged values of distance and trade dependence, weighted on imports, to convey the overall relationship between these two variables. Trade data are of course much more granular with high levels of both volatility and heterogeneity. Trade dependence in particular is likely to fluctuate greatly due to changes in relative prices, demand or trade policy among countries. It is therefore hard to gauge clearcut insights from small changes. Hence, we focus on trade dependence in a discrete, rather than continuous way, looking at whether a country's dependence changes widely over time.

In Figure 8.6 we consider three possible states, binding trade dependence between 0 and 1, with the threshold indicating whether a country is a net importer of a product being 0.5: low dependence (trade dependence below 0.5), medium trade dependence (between 0.5 and .75) and high dependence (above 0.75). Figure 8.6 shows the transition matrix detailing the probability of a product-country transitioning from one state to another, grouping them by distance tercile.

Figure 8.6: Trade dependence transition matrix, absolute and relative distance





Note: The transition matrix looks at three possible states: trade dependence above 0.75 (high), between 0.5 and 0.75 (medium) and below 0.5 (low). Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.

Source: Authors' elaboration on BACI-CEPII data.

Overall, country-product pairs that start off with a high dependence are very unlikely to see that decrease over time, regardless of their initial level of distance. In contrast, high distance is associated with a higher probability of low dependence products to transition to higher dependence.[175]

In the lower panel of Figure 8.6 we replicate the results using relative distance; in the Appendix we break down each product class (Figures A.1 and A.2) and find these patterns to be very robust. It therefore appears that the chance of a high-dependence product to see this reduce is unrelated to its distance from a country's production structure. It is likely that such high dependence is driven by the lack of production factors mix, skills or endowment of natural resources.[176]

In contrast, distance is a good predictor of which products are likely to develop trade-dependence. In line with the literature on technology gap and relatedness, these results suggest that countries focus on products closer to their capabilities set, and shed less related products; as a result, countries will decrease exports of distant products, increase imports and see trade dependence rise.

The policy discussion around EU industrial policy and open strategic autonomy is, however, not only focused on reducing the EU's trade dependence but also on the ability to develop specialisation in twin-transition goods. A standard measure to capture specialisation in the literature on trade is based on the notion of revealed comparative advantage, measured with the Balassa index (see Equation 2 in the Appendix). Furthermore, this approach to capturing countries' specialisation is consistent with the economic complexity and capability approach mentioned in Section 1.

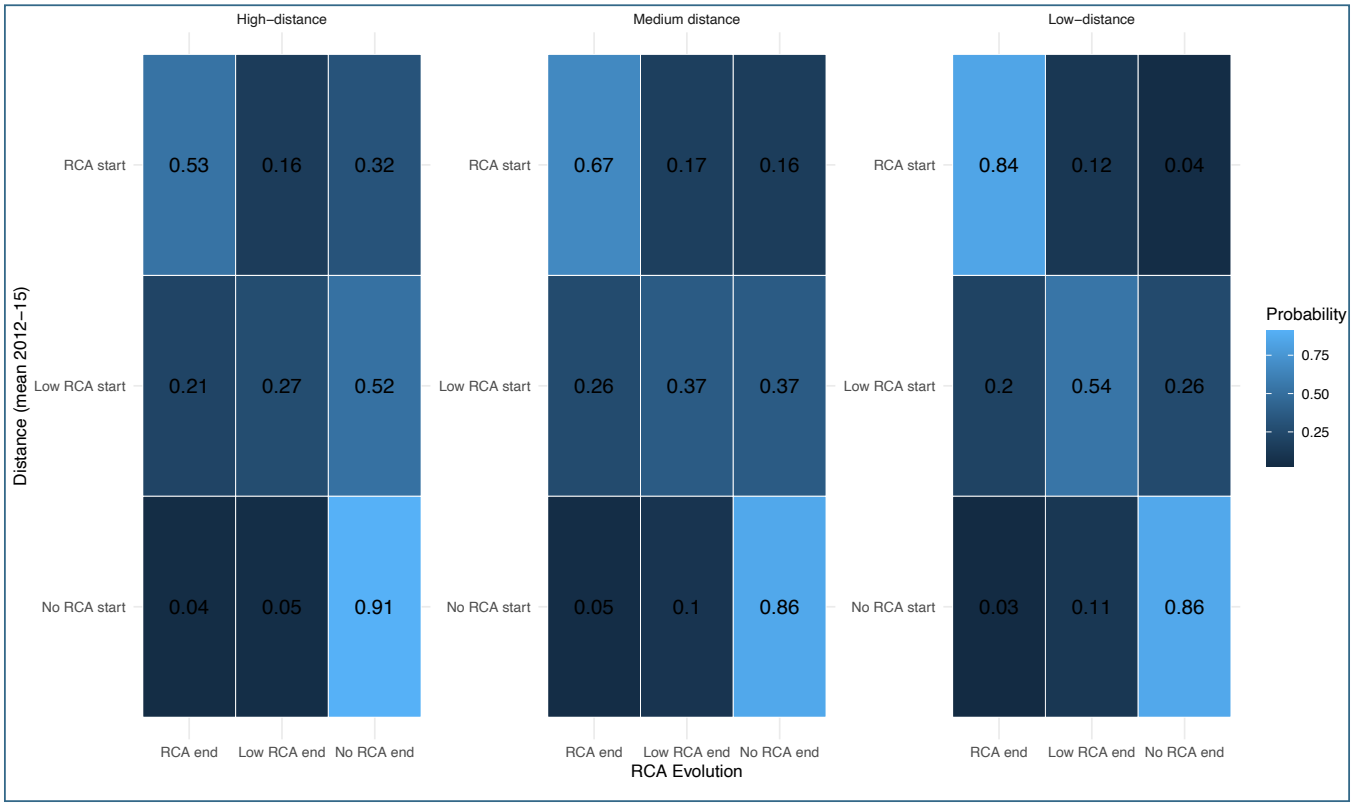
Balassa indexes vary between zero and infinity, but they are usually interpreted in a binary way, with one being the economic significant threshold. This means, however, that small changes at the margin of this threshold can be interpreted as changes in the specialisation pattern of a country in a misleading way. To avoid this, and much like our approach to changes in trade dependence, we focus on large changes in a country-product RCA and identify the three following possible states in the two periods 2012-15 and 2018-21: (i) RCA, with Balassa index above 1, (ii) Low RCA, with a Balassa index between 0.5 and 1, these refer to products that do not have an RCA strictly speaking but are not too far from it and (iii) no RCA, with Balassa indexes below 0.5.

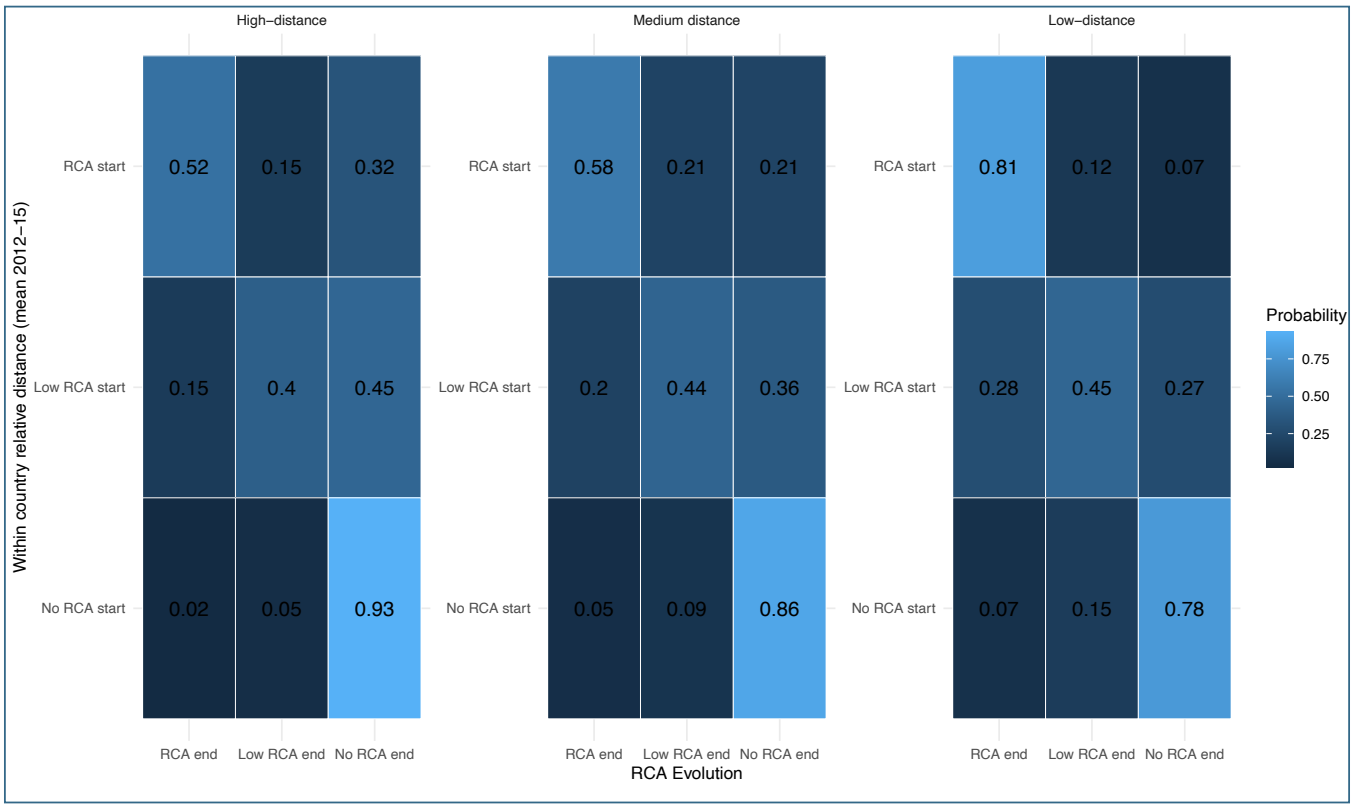
Looking at the top panel for Figure 8.7, dividing country-products based on absolute distance terciles, we observe that high-distance products that start off with an RCA are less likely (53%) to retain it than low-distance products (84%). In addition, high-distance products with an RCA are also more likely to end up having an RCA below 0.5 (32%) as opposed to low-distance products (4%).

[175] Specifically, high-distance low-dependence products have 45% (= 1-0.55, from the bottom row of the matrix in the top-left matrix) chance of transitioning to higher dependence, while low-distance products only have 20% chance (= 1-0.8, from the bottom row of the matrix in the top-right matrix) of the same happening.

[176] It is worth noting that this cannot be only explained by lacking endowments in natural resources since this pattern is found also among digital and green products which are for the vast majority manufactured goods rather than commodities.

Figure 8.7: RCA transition matrix for twin-transition products, absolute and relative distance





Note: The transition matrix looks at three possible states: RCA above 1, between 0.5 and 1, and below 0.5, corresponding to RCA, low RCA and no RCA, respectively. Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.

Source: Authors' elaboration on BACI-CEPII data.

Absolute distance does not seem to be related to gain of RCA. Products starting off with no RCA have very little chance to obtain an RCA at the end of the period, regardless of distance. Similarly, this is the case for low-RCA (0 < RCA > 0.5) products, 21% of high-distance products manage to develop an RCA starting from a low-RCA state, and that only goes down to 20% for low-distance products.

Results do not change significantly when we look at relative, rather than absolute distance in the lower panel of Figure 8.7, suggesting that overall distance is more relevant to explaining retention, rather than acquisition of an RCA.[177]

Therefore, both results on trade dependence and RCA show that distance is relevant only for changes in one direction, i.e. the loss of RCA, but not its gain, and the increase in trade dependence, but not its reduction. While this may be surprising at first glance, it is consistent with the fact that gaining RCA does not only depend on the relationship between a country's capabilities and a product, but also on external factors such as relative prices, global demand and transaction costs. These are also relevant, more in general, to increases in export flows, which are necessary for the reduction of trade dependence.

In contrast, both the loss of RCA and an increase in trade dependence only require a reduction in exports. Ceasing to export a product is significantly easier than starting to export it when a country does not possess a fitting capabilities structure.

The overall result emerging from Figure 8.7 is important from a policy perspective, for at least two reasons. First, the development of RCA and reduction of trade dependence do not depend in and of themselves only on a country's productive structure: economies are not completely bound in their specialisation possibilities by their initial production structure. While achieving competitiveness in new products is not an easy feat, this can occur irrespective of countries' distance vis-à-vis a given product.

Second, if countries wish to retain any comparative advantage they develop through selective industrial policy, they should bear in mind that if these new specialisations are not coherent with the country's industrial structure, they are likely to disappear and trade dependence will ensue.

This means that, very much in line with the structuralist literature emphasising the importance of inter-sectoral linkages and complementarities, policy efforts to develop new comparative advantages should not focus only on individual products. Rather, policies should aim at developing a coherent set of industries that can benefit from each other in terms of capability and technological complementarities.

8.4. Conclusions and policy recommendations

This chapter offers novel results that might help implement European industrial policies for the twin transition and EU OSA. We rely on a theoretical approach grounded in the capability-based and structuralists approaches to long-term development, and borrow a methodology from the economic complexity approach to relate EU country-product distance from twin transition specific products to their trade dependency.

Our results are two-fold. First, large and diversified manufacturing countries such as Germany and Italy tend to have a productive structure that is closer to most twin-transition products; this however changes when we look at distance in relative terms, i.e. looking at the product that is closest to a country, rather than the country that is closest to a product. Some small, specialised countries – notably Sweden and Czechia – see their prospects to steer their productive structure towards twin transition products improve significantly.

Second, distance is associated with an increase of trade dependence and the likelihood

[177] When we look at twin-transition product classes in Figure A.3 and A.4 in the Appendix, we also find robust results. It is worth noting, here, that CRM have a higher chance of losing RCAs over time, reflecting EU countries' lack of natural resources and suggesting this to be a particularly relevant area for policy intervention.

of losing specialisation in twin-transition goods. In contrast, the successful development of a revealed comparative advantage in twin transition products depends on other factors than distance alone. We hence argue that such policies should not focus on individual products, but rather aim to foster broader and coherent technological and capability ecosystem; this requires a systemic approach considering the complementarities across different activities (Hirschman 1958; Lopez Gonzales et al., 2019).

This paper crucially supports this view by claiming and showing that country-product distance and trade dependence are related and that opportunities for diversification towards twin transition products must consider both absolute and relative distance.

As EU countries are quite asymmetric in their opportunities for diversification to 'comply' with OSA and twin transition policies, it is very likely that EU-level policies might have differential benefits across countries and risk exacerbating existing inequalities, in contrast with EU cohesion principles.

While reconciling the EU and the national objectives has always been a delicate matter, this seems even more challenging in the case of OSA and twin transition industrial policy support.

As in many other realms, and as put forward in the very recent Draghi Report for EU competitiveness, it becomes necessary to ensure a high(er) degree of coordination of industrial policies at the European level to prevent duplication of efforts, while at the same time avoiding concentration of industrial activities in only a few countries.

Further analyses may complement the economic complexity approach, that is, a data-driven approach inferring capabilities from actual trade data, with information on actual production structures taken, for example, from input output tables. This would allow for the better measurement of important complementarities and backward and forward linkages that may guide industrial policies for the twin transition within a systemic approach.

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Methodology to identify country-product distance

To identify, within the three product ecosystems described in Section 2, those that are closest to each EU country's productive structure, we resort to bilateral trade data from BACI-CEPII (Gaullier and Zignago, 2010). For each country-product we compute Balassa indexes, that take value above one for those products in which a country has a revealed comparative advantage:

$$RCA_{ik} = \frac{x_{ik} / \sum_k x_{ik}}{\sum_i x_{ik} / \sum_i \sum_k x_{ik}}$$

Where is exports of country in product . Then we construct a product-by-product matrix with conditional probability of two products being exported with RCA by the same country. This is our proximity matrix, in line with the complexity and relatedness literature discussed in the previous section (Hausmann et al. 2007):

$$\Phi_{kk'} = \frac{\sum_i y_{ik} y_{ik'}}{\max\left(\sum_i y_k, \sum_i y_{k'}\right)}$$

Where is a vector populated with one for each country exporting product with RCA, and is the same for product . Starting from this product-by-product matrix, we can derive a country-product matrix, defining difference as one minus relatedness as computed in Boschma et al (2013):

$$dist_{ik} = 1 - Relatedness = 1 - \frac{\sum_{k'} \Phi_{kk'} * y_{ik'}}{\sum_{k'} \Phi_{kk'}}$$

In the equation above is a vector populated with one for products exported with RCA by a country. This amounts to comparing the proximity between a country-product pair to a hypothetical country exporting all products[178]. We then compute and obtain a measure of country-product distance.

The tension across countries with different specialisation mentioned in Section 2 can therefore be synthesised as the difference between a product's distance from a country in absolute terms as opposed to the product's distance relative to all other products a country could produce. To capture this latter concept, we normalise distance as follows:

$$RelDist_{ik} = \frac{dist_{ik} - mean(dist_{ik})}{sd(dist_{ik})}$$

Transition matrices

We report below the breakdown of Figures 6 and 7 from the main text, looking at the transition matrices for each twin transition product class, which we comment in the main text.

[178] Note that if a country is exporting all products with RCA then is a vector of ones and making Relatedness equal to 1 and distance to 0.

Figure A.1 – Trade dependence transition matrix for twin-transition products, absolute distance. Note: The transition matrix looks at three possible states: trade dependence above 0.75 (high), between 0.5 and 0.75 (medium) and below 0.5 (low). Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.

Source: Authors' elaboration on BACI-CEPII data.

Figure A.2 – Trade dependence transition matrix for twin-transition products, relative distance.

Note: The transition matrix looks at three possible states: trade dependence above 0.75 (high), between 0.5 and 0.75 (medium) and below 0.5 (low). Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.

Source: Authors' elaboration on BACI-CEPII data.

Figure A.3 – RCA transition matrix for twin-transition products, absolute distance.

Note: The transition matrix looks at three possible states: RCA above 1, between 0.5 and 1, and below 0.5, corresponding to RCA, low RCA and no RCA, respectively. Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.

Source: Authors' elaboration on BACI-CEPII data.

Figure A.4 – RCA transition matrix for twin-transition products, relative distance.

Note: The transition matrix looks at three possible states: RCA above 1, between 0.5 and 1, and below 0.5, corresponding to RCA, low RCA and no RCA, respectively. Each matrix refers to terciles of distance. Top panel uses absolute distance, bottom panel uses relative distance.
Source: Authors' elaboration on BACI-CEPII data

9. A Continent in Search of Skills? Aiding the Twin Transition Through Skill Formation Policy

Niccolo Durazzi[179], Patrick Emmenegger[180] & Alina Felder[181]

Executive summary

The twin transition demands a robust policy infrastructure. Central to this infrastructure is the development and availability of appropriate human capital. EU institutions have been actively working to ensure that Europe can provide the skills required for the twin transition, promoting various initiatives aimed at integrating European education and training systems. However, these efforts have been constrained by the EU's limited role in education and training policies, as the treaties primarily assign the EU a supportive role rather than allowing it to replace national policies. EU action has faced particular challenges in the realm of vocational education and training (VET), where national stakeholders have often resisted 'Europeanisation' efforts, defending national VET systems. This chapter suggests that these limitations can be transformed into advantages. We argue that the inherent treaty-based constraints on establishing a 'European' education and training system present an opportunity for EU policymakers to adopt a more place-based approach, which would not only be more effective within the institutional limits but also it would better address skill needs at the local level. Our analysis reveals significant cross-country heterogeneity in the demand for green and digital skills. Therefore, EU initiatives should prioritize supporting Member States in meeting the specific skill needs of their national and regional labour markets. In VET, this entails shifting focus from creating a unified European VET system to: (a) further supporting successful initiatives within national VET models, and (b) facilitating the recognition of VET qualifications and enhancing the mobility of VET workers within Europe, even when qualifications are awarded by different national systems. In higher education, this approach involves targeted expansion, aligned with the dominant sectoral specializations of Member States. For example, expanding STEM skills in countries leading in green technology production represents a more effective strategy in higher education policy.

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9.1. Introduction

The twin transition, characterized by the simultaneous greening and digitalization of economies and societies, presents a significant challenge and opportunity for Europe. Central to navigating this transition is the development of a robust policy infrastructure that ensures the availability of the necessary human capital. Recognizing this, EU institutions have initiated various efforts to equip Europe with the skills required to meet these emerging demands. These initiatives aim to harmonize and integrate European education and training systems, thereby supporting the twin transition. However, the EU's role in education and training is inherently limited by the treaties which assign the Union a supportive rather than directive role in these areas. This limitation has been particularly evident in vocational education and training (VET), where national stakeholders have often resisted efforts to 'Europeanise' their systems, choosing instead to safeguard their national models. This chapter argues that the constraints imposed by the treaties can be transformed into strengths. By embracing a more place-based approach to education and training policy, EU policymakers can effectively navigate these institutional limitations while better addressing the diverse skill needs across Member States. Our analysis shows significant variation in the demand for green and digital skills across Europe, suggesting that a one-size-fits-all approach is neither feasible nor desirable. Instead, the EU should focus on enabling Member States to meet the specific skill needs of their national and regional labour markets. In the realm of VET, this means shifting away from the aspiration of a unified European system and instead concentrating on supporting successful initiatives within national models and enhancing the recognition and mobility of VET qualifications across Europe. Similarly, in higher education, we recommend a strategy of what we term targeted expansion of higher education aligned with the sectoral specializations of individual Member States – such as promoting STEM skills in countries leading in green technology.

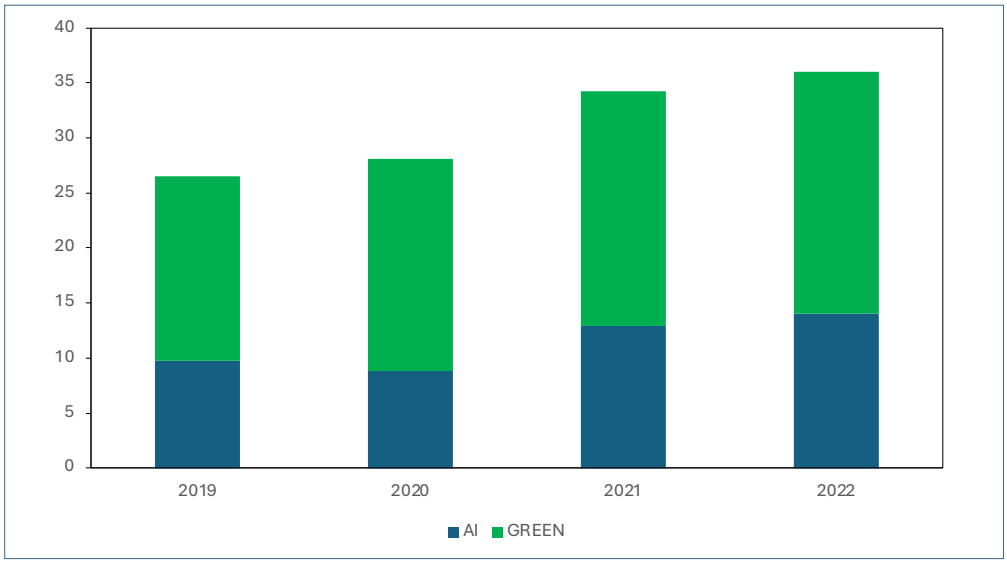
9.2. Demand and supply of digital and green skills

Measuring in a credible way the demand and supply of digital and green skills is a difficult task. As many other parts of the twin transition, its skill base is unfolding as we write, and a moving target is notoriously hard to pin down. Yet, the significant interest that the twin transition has triggered among academic and policy-oriented researchers in recent years led to the creation of some datasets that allow us to gauge the demand for skills that at the moment constitute the backbone of the human capital needed for the twin transition. In this section, we rely in particular on Bruegel's Twin transition skills dashboard (Gotti, Güner, and Stephany, 2024). This approach is based on web-scraping job adverts posted online across the European Union (EU) since 2019. The data scraped from the web has then been systematised to capture a variety of features that help us paint a picture of the demand for twin transition-related jobs, and therefore skills, across Europe. We focus on three main characteristics derived from job adverts: (i) the size of the digital and green sector, as proxied by the share of green- and digital- related job adverts across Europe; (ii) the skills that are most commonly listed in digital and green job adverts (i.e. what skills and knowledge recruiters want candidates to possess); and (iii) the occupations that digital and green job adverts are associated with (e.g. whether they are managerial or manual jobs), which we take as a proxy for the level and complexity of skills required to perform the job.

In terms of size, Figure 9.1 shows a clear upward trend in the demand for digital- and green-related jobs over time. The time series of the Bruegel data is limited to four years, but even within such a short timeframe, we observe a steady increase in demand for both digital and green jobs in the EU. In 2019, just above 25 per 1,000 job adverts were green or digital, while the figure grew to above 35 per 1,000 job adverts in 2022, with green jobs accounting for roughly two thirds of the total and increasing at a faster pace than their digital counterparts. Figure 2 shifts the focus from EU- to country-level data. It shows that green and digital jobs are positively correlated (.63), suggesting a mutually reinforcing relationship between green and digital and supporting the notion of a 'twin' transition, as opposed to 'two' transi-

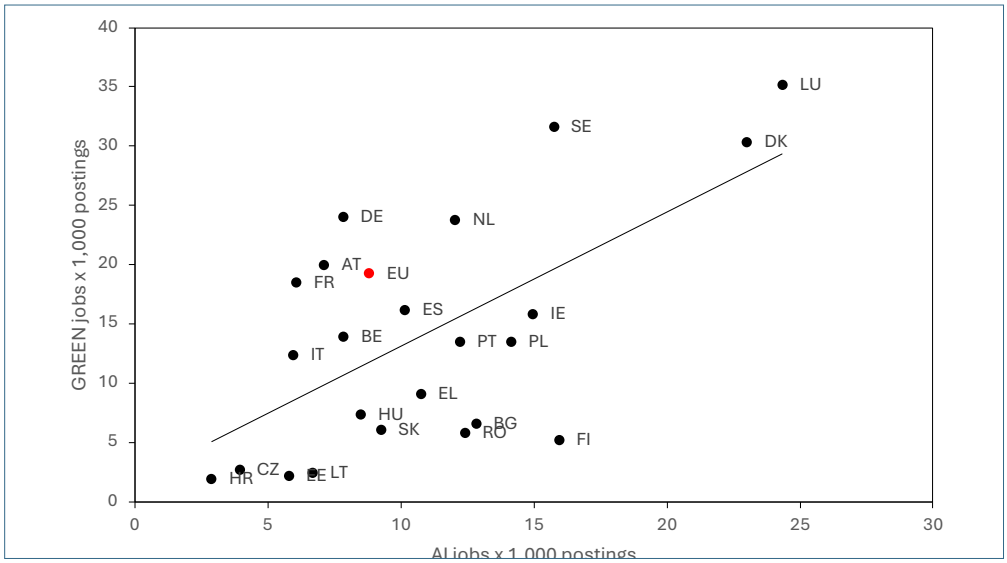
tions. At the same time, some countries seem to display a more circumscribed specialisation in only one leg of the twin transition. Such cases are, for example, Finland and Germany. The former shows above-EU-average demand for digital jobs but well below-average demand for green jobs. The reverse holds true for Germany. This is in line with existing accounts by scholars of comparative capitalism that noted how some countries' growth models have been relying more strongly on single sectors, compared to other countries that have branched out into multiple sectors overtime (Thelen, 2019). Germany's doubling-down in the realm of manufacturing (Diessner, Durazzi, and Hope, 2022), which included seizing new export markets in green manufacturing (Nahm, 2022), or Finland's strong drive into ICT markets in a context of de-industrialisation (Ornston, 2013) are examples of such economic strategies targeting primarily a single sector of specialisation.

Figure 9.1: The growth of digital and green jobs in the EU over time as postings per 1,000 job adverts



Source: own elaboration based on Gotti et al. (2024).

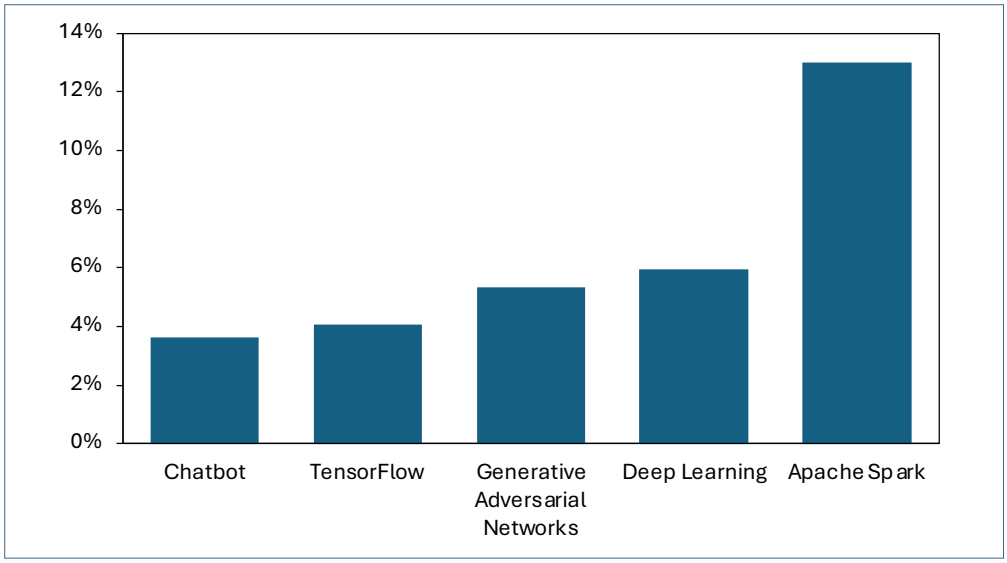
Figure 9.2: Digital and green jobs in EU countries per 1,000 postings in 2020



Source: own elaboration based on Gotti et al. (2024).

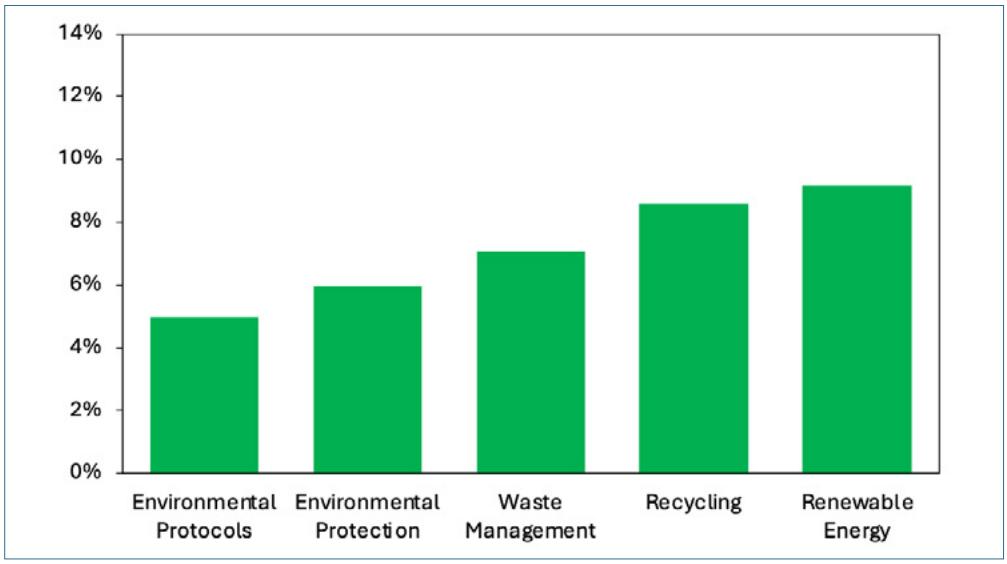
Figures 9.3 and 9.4 turn to the actual skills that are required across digital and green job ads, showing the five most popular ads across the EU. Here we note rather striking differences. Firms that advertise digital jobs look for workers who have knowledge of particular machine learning software to process big data (e.g. Apache Spark) or simulate human-to-human conversations (e.g. Chatbot). These are skills that point at highly specialised professional profiles, with high levels of formal education and training – a point which we shall return to later. The skills required in green jobs are instead more varied. Most of them (e.g. renewable energy; waste management) suggest the need for both highly specialised professional profiles – such as environmental engineers – as well as jobs that tend to be found in the 'middle' of the skill distribution, such as vocationally-trained workers performing jobs with a more practical orientation – such as the installation of solar panels, to stay within the remit of the renewable energy example.

Figure 9.3: Top 5 AI skills required in the EU (2020)



Source: own elaboration based on Gotti et al. (2024).

Figure 9.4: Top 5 GREEN skills required in the EU (2020)



Source: own elaboration based on Gotti et al. (2024).

Such an interpretation of the top skills required across digital and green jobs is corroborated by the breakdown of digital and green jobs by occupational category, which we report in Figure 9.5. Using the ISCO-08 major groups,[182] we note again striking differences between digital and green jobs. Digital jobs fall overwhelmingly in the major group 2, i.e. that of 'Professionals' (nearly 70%). Professionals are defined as those workers who

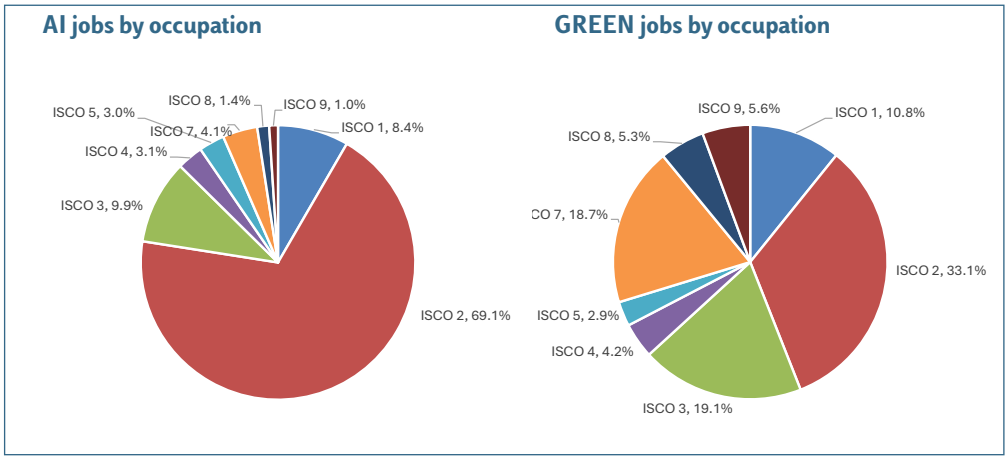
'increase the existing stock of knowledge; apply scientific [...] concepts and theories; teach about the foregoing in a systematic manner; or engage in any combination of these activities. Competent performance in most occupations in this major group requires skills at the fourth ISCO skill level [i.e. the highest level, usually associated with formal educational attainment at tertiary level]' (ILO 2012, p. 109).

Coders or data engineers fit squarely into this definition. If we look at the occupational breakdown of green jobs, instead, we find a very different picture. Highly skilled occupations top these jobs too, but their share is much more limited compared to digital jobs. The Professionals category is the top one across green jobs too, but its share at 33% is less than half compared to the same occupation in digital jobs. The second most represented occupational category is that of 'Technicians and Associate Professionals' (major group 3), who are also highly skilled workers but perform roles with greater emphasis on technical skills of the type that both higher education and advanced vocational training programmes may be able to provide. A significant proportion of green jobs (almost 20% of them) then falls instead into a radically different occupational category, namely that of major group 7 'Craft and Related Trades Workers', which are defined as workers who

'apply specific technical and practical knowledge and skills in the fields to construct and maintain buildings; form metal; erect metal structures; set machine tools or make, fit, maintain and repair machinery, equipment or tools; carry out printing work; and produce or process foodstuffs, textiles and wooden, metal and other articles, including handicraft goods. Competent performance in most occupations in this major group requires skills at the second ISCO skill level [i.e. intermediate skill level, commonly associated with upper-secondary vocational education and training]' (ILO 2012, p. 277).

The strong presence of both professional and craft workers among green jobs suggests that the green transition, compared to its digital twin, produces a bifurcated demand for skills in which highly specialised technical workers (e.g. environmental engineers) are high in demand alongside middle-skilled vocationally-trained workers.

Figure 9.5: Digital and green jobs by occupational category



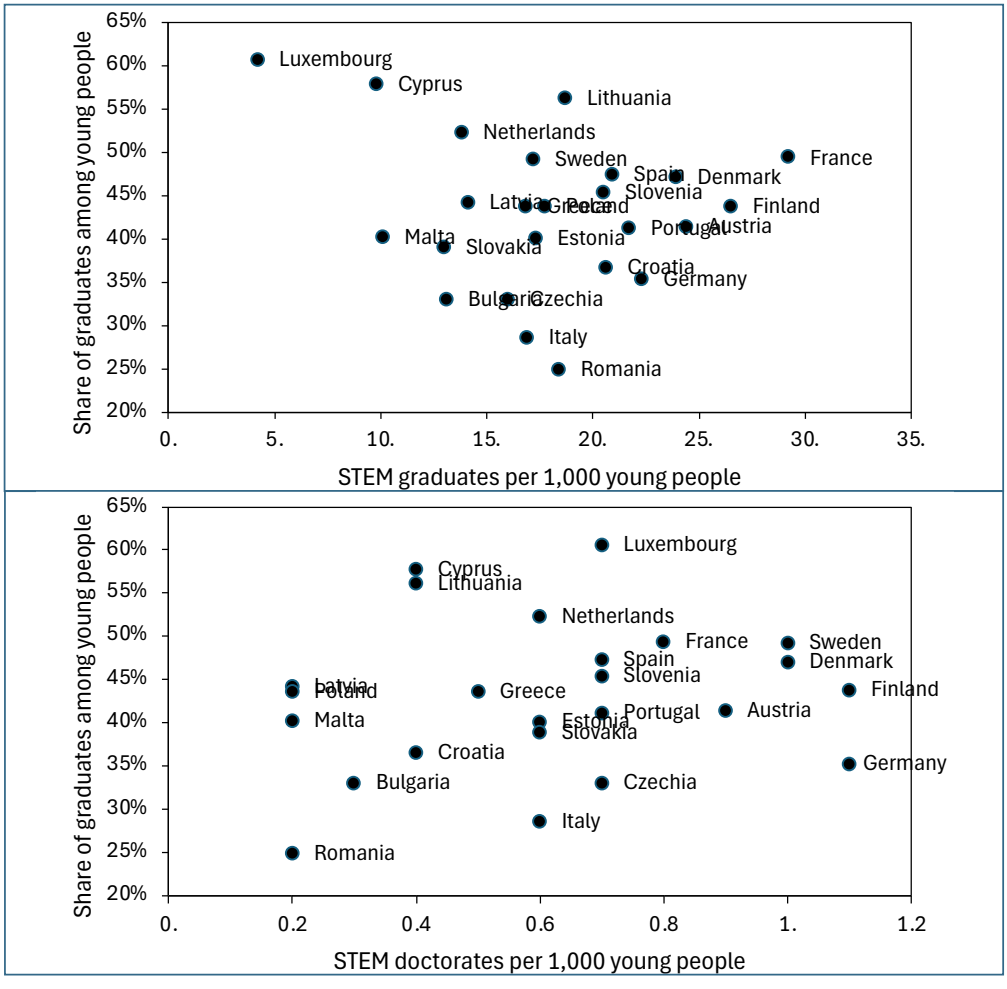
Source: own elaboration based on Gotti et al. (2024). Note: ISCO-08 codes correspond to the following occupations: 1=Managers; 2= Professionals; 3=Technicians and Associate Professionals; 4=Clerical Support Workers; 5=Services and Sales Workers; 7=Craft and Related Trades Workers; 8=Plant and Machine Operators and Assemblers; 9=Elementary Occupations

[182] ISCO-08 seeks to capture "a set of tasks and duties performed, or meant to be performed, by one person" and allows for the comparison jobs across countries.

How well-equipped are national education and training systems to meet the demand for skills in the context of the twin transition? We turn to the question of the 'supply' of skills in the

remainder of this section. Given the centrality of occupational profiles at the highest skill level across digital and (to a lesser extent) green jobs, the first basic requirement for a country's education and training system is to produce a significant number of graduates. In this respect, the picture is mixed across Europe. Some countries – e.g. Italy and Romania – have a share of graduates among the 25–34-year olds that is below 30%, while other countries – e.g. the Netherlands as well as a number of smaller European countries – stand at above 50% (see Figure 9.6 below). Yet, given the contours of skill demand outlined in the first part of this section, it is plausible to expect that in many instances the twin transition requires technically specialised professional profiles that may not be satisfied by 'any' university graduates. In the case of the green transition, the type of tertiary graduates that are expected to be most in demand are STEM and in particular engineering graduates (Durazzi, Emmenegger, and Felder, 2024). The digital transition requires graduates with advanced quantitative and programming skills that are less tied to specific degrees but that are still more likely to be found among STEM and social science graduates compared to, say, graduates in arts and humanities. To gauge the ability of national higher education systems to supply highly specialised professionals, Figure 9.6 therefore plots the overall supply of higher education graduates against the supply of STEM graduates (left panel) and STEM doctoral-level graduates (right panel). Figure 9.6 shows that some countries – such as Finland and Germany – produce above-average STEM graduates (and top the STEM doctoral graduates measure) with just average or (in the case of Germany) below average overall graduation rates. This suggests that countries may be able to satisfy a crucial demand for highly specialised skills in the context of the twin transition without necessarily moving in the direction of near-universal higher education. Rather, countries may satisfy a crucial source of skill demand through a strategy that we have defined elsewhere as targeted expansion of higher education (Durazzi, Emmenegger, and Felder, 2024) whereby the government actively promotes the expansion of STEM skills, rather than the expansion of higher education tout-court.

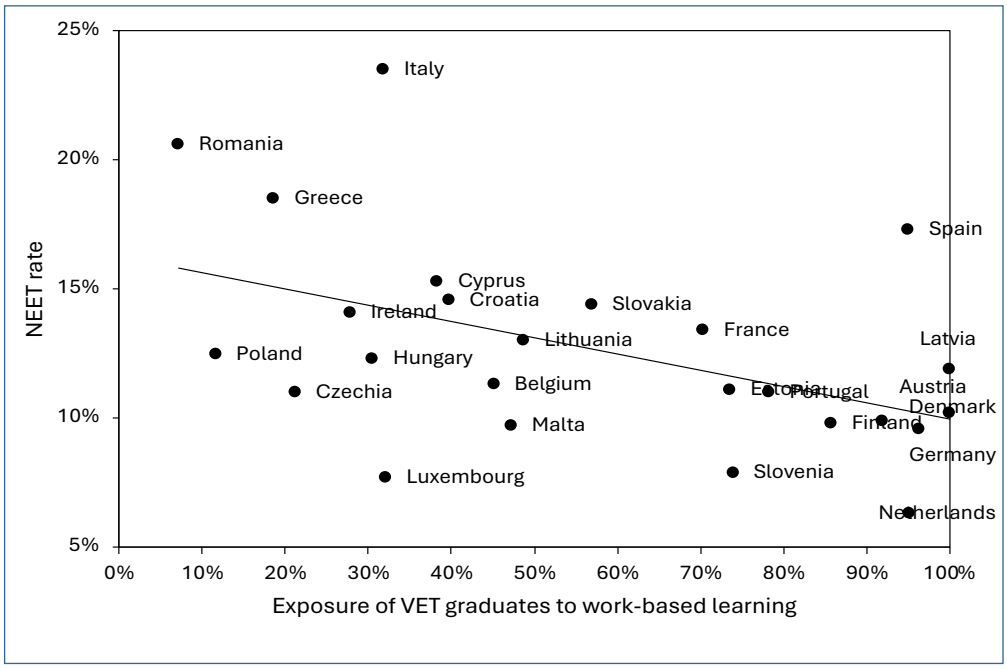
Figure 9.6: Young university graduates and young STEM specialists across Europe



Source: own elaboration based on Eurostat data. Note: All countries for which comparable data is available according to Eurostat are included

Yet, we have also noted earlier that high-level skills are predominant, but they do not account for the entire demand for skills in the context of the twin transition. Of particular importance for the green leg of the twin transition is the availability of well-embedded vocational training systems that are able to supply high-quality intermediate skills to the labour market. There is a two-fold challenge that vocational training systems are (theoretically) well-placed to address in the context of the twin transition. Firstly, they need to provide high-quality skills and be able to cope with skill requirements that are likely to change more frequently and more radically compared to the past, given that the twin transition is underpinned by fast changing technological advancements (Schmidt and Sewerin, 2017). Secondly, in the context of skill shortages induced by demographic changes and given the strong demand for skills at various levels that comes with the twin transition, European countries cannot afford to forego any human capital. Vocational training systems have a crucial role in this respect as they have traditionally been the segment of the education systems that have kept engaged those young people – often from disadvantaged socio-economic backgrounds – that are most at-risk of dropping out of the school system leading to both economic and social losses. Yet, if training systems are to (a) be responsive to fast-changing skills needs and (b) keep all young people engaged, including those from disadvantaged background, they need to be of high-quality. A crucial feature in this respect lies in the involvement of firms in the design and provision of training in cooperation with public authorities. This system of 'polycentric governance' at the crossroads of private and public sector has been already found to support the adaptation of traditional training curricula to the needs of the green economy (Carstensen and Ibsen, 2024). At the same time, training systems with a heavy practical component provided directly by firms have been time and again identified as offering an incentive set for academic low achievers to remain engaged with the education system (Soskice, 1994) and therefore limiting the risk of human capital 'loss'. Indeed, this relationship seems to still hold true today. Figure 9.7 plots the exposure of vocational education and training (VET) graduates to work-based learning against the rate of NEETs and shows a negative relationship. While no doubt this relationship is influenced by other factors too (e.g. the general status of the economy and the labour market), a greater involvement of firms in the design and delivery of training seems a desirable avenue to meet fast-changing skill needs while minimising the risk of human capital loss in an era of skill shortage.

Figure 9.7: Involvement of firms in VET and human capital mobilisation



Source: own elaboration based on Eurostat data.

To what extent has EU-level policy supported national education and training systems

in meeting the demand for skills in the context of the twin transition? We turn to this question in the next section.

9.3. A review of EU-level policy initiatives to create digital and green skills

Joint efforts among the European Union's Member States to adapt their skill formation systems to wider socio-economic transformations are not new. Knowledge has been identified as a precondition for economic competitiveness and thus has been at the fore of the EU's overall strategies at least since the 2000s. However, the recent manifold EU-level initiatives in the areas of higher education and VET point to unprecedented attention at the supranational level to policies facilitating the transition towards a 'Europe of Knowledge'. It is not only universities which feature prominently in EU action such as the European Universities Initiative, but the EU's Skills Strategy, the Alliance for Apprenticeships, and the European Year of Skills illustrate that VET features prominently among EU-level priorities as well. Regardless of whether the focus is on higher education or VET, however, a common characteristic of recent EU initiatives in the field of education and training seems to be the attempt to move toward European education and training systems, which practically meant promoting skills policy with limited appreciation of the vastly different labour markets and economic models that exist across Member States and that, therefore, produce different demands for skills (as section 2 exemplified).

While VET was acknowledged as an area for Community action already in the Treaty of Rome (Corbett, 2003), the EU is however only allowed to support Member States' policy action in education and training. Consequently, EU education and training policy ought to add to national policies and not replace them. Accordingly, Articles 165 and 166 of the Treaty on the Functioning of the European Union (TFEU) emphasize the contribution of EU support for the quality of and access to education and training, on the one hand, and the responsibility of Member States for educational and training content and systems, on the other hand.

European cooperation for skills development and exchange takes three different forms: (i) intergovernmental coordination, (ii) community programmes and (iii) organizational cooperation (Felder, forthcoming). Intergovernmental coordination manifests itself in the mutual recognition of diplomas and in the exchange of information and experience. Recognition is facilitated through the Bologna and Copenhagen processes, the European Qualifications Framework (EQF) and the European Credit Transfer System (ECTS). The primary outlets for best practice exchange for practitioners from the various education sectors are the working groups under the Open Method of Coordination in the European Education Area (EEA) strategic framework. Community programmes provide funding instruments which are supposed to increase the mobility of learners and teachers and the cooperation between educational institutions. The formation of practitioner networks supports intergovernmental coordination and the implementation of EU funding. European cooperation is further supported through dedicated EU institutions such as the European Centre for the Development of Vocational Training (CEDEFOP) and the European Training Foundation (ETF) and through regular reporting such as the Education and Training Monitor.

Supranational financial support in the area of skills bears manifold connections to other policy fields including research and innovation policy, labour market policy and youth policy. As such, the European Union offers financial support for reskilling and upskilling through various programmes such as the European Social Fund Plus (ESF+), the Recovery and Resilience Facility (RRF), the European Regional Development Fund, the Just Transition Fund, InvestEU, the Digital Europe Programme, Erasmus+, Horizon Europe, LIFE, the Modernisation Fund, and the Neighbourhood, Development and International Cooperation Instrument – Global Europe. The ESF+ is the primary funding tool for enhancing workforce skills, particularly by aiding institutions and services in assessing and anticipating skill needs and challenges, and by supporting reskilling and upskilling opportunities provided by both public and private sectors. The Reinforced Youth Guarantee aims to ensure that all young people receive a quality

offer of employment, continued education, an apprenticeship, or a traineeship within four months of becoming unemployed or leaving formal education. Reforms and investments in Member States' national recovery and resilience plans under the RRF often focus on skills development, particularly in connection with active labour market policies and youth employment support. Approximately 20% of the social expenditure in these plans is dedicated to employment and skills.

In contrast to the area of higher education, where the EU has succeeded to continuously expand financial and legal instruments, EU action for joint approaches to VET has resonated less strongly at Member State level. Not only has the European Credit System for VET (ECVET) been discontinued,[183] but also cross-border cooperation and mobility of individuals who are enrolled in VET/work in VET provision is more difficult to achieve. While the priority of the EU's first action programme for education from the mid-1970s was the transition from school to work, the programme was "taken up enthusiastically by academics" (Corbett, 2003, p. 324). As a result, the most successful measures of the programme were the supranationally funded joint study programmes and study visits, which ten years later were transformed into the Erasmus programme. While acknowledging that VET mobility is under researched, comparative studies on learner mobility document more obstacles to mobility in VET than in higher education (Kmiotek-Meier et al., 2019). This picture equally applies to intergovernmental coordination which came first for higher education with the Bologna Process and which informed the development of an analogue process for VET, i.e. the Copenhagen Process. Graf and Lohse show that policy transfer proves to be more successful for the area of higher education than for VET due to more favourable demand-side, programmatic, contextual and application conditions (Graf & Lohse, 2021). Even though the recent initiative of the European Alliance for Apprenticeship experienced greater Member State commitment, Rohde-Liebenau and Graf find that European and national-level initiatives have been developed in parallel and without much recognition of the corresponding EU-level policy (Rohde-Liebenau and Graf, 2023). The resistance of certain actor groups towards EU VET policy such as trade unions lies in the nature of EU initiatives for VET being strongly market-oriented (Trampusch, 2008). Interestingly enough, the European Alliance for Apprenticeships was not faced by the usual scepticism. Instead, those VET stakeholders who had been critical of previous initiatives were strongly involved in the drafting process of the alliance and uploaded their preferences (Rohde-Liebenau and Graf, 2023).

EU activities in matters of education and training were always supposed to support wider Community and Union principles such as mobility of labour and the freedom of establishment. Skill policy has become a distinguishable area of Union action with the Lisbon strategy, where knowledge has been coined as a condition for economic competitiveness. More recently, skills have not only been connected to the Single Market and its sustained resilience after COVID-19, but also to the digital and green transitions. The recent EU policy discourse centres on the skill demands for the digital and green transition. Next to referring to the core role of skilled labour to manage the twin transition, the decision on a European Year of Skills[184] emphasizes the central role of social dialogue partners in anticipating skills needs in the labour market. Moreover, recent EU legislation related to the Single Market such as the Regulation on establishing the Strategic Technologies for Europe Platform (STEP)[185] raises labour and skills shortages as a major concern for those sectors which are considered key for the green and digital transitions. The latter regulation calls "to boost the participation of more people in the labour market of the relevant sectors, in particular through investments in learning and life-long learning, the enhancement of relevant skills and the creation of quality jobs and apprenticeships for young and disadvantaged persons who are not in employment, education or training."

Even before the pandemic, an action plan for digital education existed at the EU level. It was renewed for the period 2021-2027 and strongly relates to Europe's Digital Decade. The latter provides the vision for a human-centred, sustainable digital society that empowers citizens and businesses. These goals include ensuring that 80% of adults have basic digital

[183] Council of the European Union. 2020. 'Council recommendation of 24 November 2020 on vocational education and training (VET) for sustainable competitiveness, social fairness and resilience (2020/C 417/01)'.

[184] Decision (EU) 2023/936 of the European Parliament and of the Council of 10 May 2023 on a European Year of Skills.

[185] Regulation (EU) 2024/795 of the European Parliament and of the Council of 29 February 2024 establishing the Strategic Technologies for Europe Platform (STEP).

[186] Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030.

skills by 2030.[186] The European Commission used Covid-19 as a challenge for the education sector to push existing goals and ideas. In April 2023, it published two proposals for Council recommendations: one on the key factors for successful digital education and training, and the other on imparting digital skills in general education and VET. The proposals stem from the structured dialogue on digital education and skills between the European Commission and EU Member States lasting from October 2021 to March 2023. At their meeting in November 2023, the EU education ministers adopted the two recommendations[187] which call on them to ensure universal access to inclusive and high-quality digital education and training and to provide digital skills at all levels of education. EU countries are urged to develop national strategies for digital education and skills, work closely with stakeholders, invest in digital equipment, infrastructure, tools, and content, and promote targeted training to support teachers in using digital technologies. The European Commission will support the implementation of these recommendations through conducting a survey on digital education in Europe and by facilitating the recognition of digital skills certifications. The development of digital skills is further supported through EU funding. By allocating one-fifth of the funds from the Recovery and Resilience Facility to the digital transformation, the Member States are supported in digitalizing their educational infrastructure.

Already the "Skills for Green Jobs" report by CEDEFOP from 2010 (Cedefop, 2010, p. 8) referred to "how the fundamental weaknesses in the EU's skills base matter more to its capacity for green growth than shortages in specialist 'green tech' know-how". The fundamental weaknesses concern deficits in management skills and technical job-specific skills related to STEM. Reiterating this issue, CEDEFOP's "European Green Deal skills forecast scenario" from 2021 (Cedefop, 2021, p. 11) emphasizes that the up- and re-skilling potential that results from green transition related "shifts within and across sectors and occupational categories". The skills forecast also points to the fact that digital skills enable the green transition as well, which points to difficulty of defining "green occupations". The CEDEFOP approach consists in extracting information from online job advertisements whereas 'greenness' is assessed by the job's skills. The European Commission's Green Deal Industrial Plan[188] aims to boost the EU's manufacturing capabilities to produce the necessary net-zero technologies and products. All sectors essential for the green transition, such as waste management, construction, and energy, rely on intermediate-skill jobs (at ISCED levels 3 and 4), which are typically accessible through VET.

9.4. Conclusions and policy recommendations

Since the emphatic Lisbon objective in 2000, the EU has launched numerous policy initiatives to promote skills. Many of these initiatives appear to be effective, but our analysis of existing EU policies and supporting measures suggests that the EU's skills needs should be better met in the context of the twin transition. We develop four main recommendations in this respect:

Although the green transition and the associated new skill requirements are recognized as a key challenge for the EU, efforts are undermined by the lack of a clear definition of green skills. This is not a failure specific to the EU, as there is no generally accepted definition of green skills or green jobs in the literature either (OECD, 2024). However, this lack of clear targets is likely to undermine the effectiveness of EU policy initiatives. We recommend therefore that greater efforts be devoted to refining our understanding of what green skills are and how their demand varies by country and sector. Similar forecasting analyses should be stepped up for digital skills too.

Our analysis suggests that VET might play a particularly important role in the provision of green skills for a significant share of occupations in the middle of the skill distribution. Yet, EU's policy initiatives in VET have not been particularly effective. The importance of a European strategy for VET has been recognized (Von der Leyen, 2024), but the EU's limited policy competencies in this field in addition to large institutional dif-

[187] Council Recommendation on improving the provision of digital skills and competences in education and training, 23.11.2023, 15740/23. Council Recommendation on the key enabling factors for successful digital education and training, 23.11.2023, 15741/23.

[188] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. A Green Deal Industrial Plan for the Net-Zero Age. COM/2023/62 final

ferences between Member States will continue to undermine efforts to provide sufficient VET skills to tackle the green transition. Improving VET should remain a policy priority at the EU level but, more importantly, also within Member States. Given the track record to date in fostering integration in VET, and given the notorious difficulties in replicating successful VET institutions outside of their home institutional environment (Finegold & Soskice, n.d.), we recommend that EU efforts move away from the ambition of creating a European VET system but rather veer toward (a) further support of national VET success stories and (b) easing the recognition of VET qualifications and thereby the mobility of VET workers within Europe even if such qualifications are awarded by different national VET systems.

An important extension of point 2 is that if VET systems are to be truly responsive to the skill needs of the labour market, they must be underpinned by bottom-up processes that allow locally embedded actors to flexibly align EU policy initiatives with local skill needs. EU policy should provide both financial and organisational incentives for the systematic involvement of local stakeholders in the governance of VET systems, without, however, imposing a governance structure.

Our analysis shows that there are numerous EU policy initiatives that aim to expand higher education. These policy initiatives are typically designed as horizontal industrial policy, which aims to improve general conditions and skill provision in all Member States and for all economic sectors. Education and skills policies are often argued to be prime examples of such horizontal industrial policies because they are likely to benefit all economic sectors. However, skill needs may be very different, and this chapter shows that such cross-country heterogeneity in the demand for skills occurs also within green and digital sectors. The literature has conceptualised these differences through the notion of growth regimes, which are modes of governance of the economy. Growth regimes differ not least with regard to the economic sectors that contribute to wealth and job creation with some Member States for instance specialising in advanced manufacturing for export, while others primarily rely on dynamic services for economic growth (Hassel & Palier, 2021). This sectoral specialisation results in different skill needs that can be further differentiated at subnational level given that sectoral specialisations within Member States are often territorially-bounded below the national level (Di Carlo, Ciarini and Villa, 2024). The EU and its Member States should therefore not move in the direction of near-universal higher education everywhere. While this may be desirable to meet the skill needs of advanced digital sectors, we have seen how the demand for green skills tends to be rather different and it may be satisfied via targeted expansion of higher education. Through the notion of targeted expansion, we seek to emphasise that higher education should also be understood as a form of vertical industrial policy, whereby the EU and Member States actively promote the expansion of those skills that are needed given different regions' sectoral specialisation (Durazzi, Emmenegger, & Felder, 2024). The expansion of STEM skills in those countries that are at the forefront of the production of green technology is a major example of how targeted expansion might be a better approach in higher education policy.

Our overarching message is therefore that EU education and training policy should align with its institutional constraints rather than trying to overcome them. By embracing the limitations set by the treaties, the EU has the opportunity to foster a place-based approach to both VET and higher education that is attuned to the specific needs of national and regional labour markets and their sectoral specialisations.

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10. Digital Industrial Policy. What are the future challenges?

Maria Savona[189]

Executive Summary

The digital transition is primarily driven by the rise of digital automation technologies, with Artificial Intelligence (AI) being a prominent example. These emerging digital technologies are largely reliant on vast amounts of data, including—but not limited to—personal data from both consumers and workers. This reliance on data introduces significant challenges, particularly with respect to asymmetries between individual consumers and workers, who are personal data subjects, and the public and private entities, such as large tech companies, platforms, public administrations, and governments, which collect and manage this data for various purposes. These asymmetries manifest in several ways, including disparities in the distribution of value, access to information, exposure to potential harms associated with these technologies, and the geopolitical dynamics between countries. To effectively address the governance of emerging digital automation technologies and data, a multidisciplinary approach is crucial. This requires expertise spanning across technical, legal, geopolitical, and economic fields. Central to this effort is the development of a new digital industrial policy that prioritizes data governance, with the overarching goal of reducing these asymmetries between the various actors involved in the acquisition and management of data at different levels of analysis. This chapter highlights some areas where these asymmetries remain relatively under-researched and insufficiently addressed by current European Union (EU) digital regulations, including the recent AI Act. One such area is data sharing, where further research is needed to explore governance mechanisms for both individual and business-to-business (B2B) data sharing. This could involve either mandatory rules or the creation of incentives that encourage sharing. Another area of concern is the uneven geographic distribution of digital infrastructure, with some countries—those with stricter data protection, intellectual property or tax regimes—offshoring their cloud services and data hubs to countries with weaker regulatory frameworks. The EU has historically been a leader in creating a comprehensive regulatory framework to guide digital transitions, much like it has been for previous waves of Information and Communication Technologies (ICT). In this context, the question becomes whether the AI Act will trigger a new wave of what has been termed the "Brussels effect," which refers to the EU's ability to influence global regulatory standards. While the EU's approach is commendable, there remains room for improvement, further research, and greater public scrutiny to ensure that the regulations are both effective and equitable. Ultimately, the goal is not to propose specific policy instruments, but to highlight the potential risks associated with failing to design appropriate tools for digital industrial policy. If these issues are not adequately addressed, the digital transition could exacerbate existing inequalities and leave certain actors disproportionately disadvantaged.

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10.1. 1. Introduction

This chapter aims to offer insights on the importance of placing data governance at the centre of the 'digital industrial policy' agenda, that is, the rationale and the instruments specifically focused on the digital transition. The digital transition raises novel challenges – compared to previous waves of technological transformations - that require awareness of the specific side effects of leaving these challenges unaddressed.

The digital transition is based on the emergence of digital automation technologies, including, but not limited to, Artificial Intelligence. Digital automation technologies require both physical investments in digital infrastructures such as data centres and cloud storages and intangible investments in data base and software. Most of the emerging digital technologies (see Savona et al., 2021 for a taxonomy of these digital technologies) are in fact based on the use of large amounts of data, including, but not limited to, personal data on consumers and workers.

This raises issues of *asymmetries* between individual consumers and workers, as personal data subjects, and the public and private actors (large tech, platforms, public administrations and governments) that acquire and manage data for different purposes. There are also *asymmetries* in the geographical distribution of digital infrastructures across countries.

It is important to set a policy agenda for a digital industrial policy that puts at its centre the governance of data with the aim of reducing such asymmetries between different actors at different levels of analysis involved in the governance of data acquisition and management. It is not only a matter of data extractivism (Rikap, 2023), nor only a matter of individual privacy protection (Goos and Savona, 2024). We offer here some brief reflections on what we consider the future relevant challenges that would benefit from more policy-relevant research.

There are fundamentally two reasons why we believe the issues addressed here are under-researched:

First, the unprecedented pace of development of digital automation technologies and artificial intelligence (AI) makes the identification of such effects and the formulation of tools for addressing challenges very complex.

Second, addressing the governance of emerging digital automation technologies and data requires a true multidisciplinary perspective, including techno-legal, political and economic expertise.

The *techno-legal* perspective concerns the pervasiveness of AI applications and the need to regulate them in very diverse realms, which are 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 *geopolitical* perspective, specific to AI, seems to have sparked a wave of "new protectionism" and ensuing tensions among China, the US and the EU on basically every aspect related to digitalization, from domestic chipmaking to the regulation of digital trade and cross-border data flows "with trust" (OECD, 2022).

The *economic* perspective includes, for instance, the need to adapt and possibly "upgrade" competition and antitrust regulations to digital markets; mitigate the effects of digital automation on labour 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.

Here we focus on two examples that have been selected as they are relatively under-re-

searched, would require a strong multidisciplinary effort and, most importantly, are clear examples of the asymmetries mentioned above:

- Data Sharing: Research on governing the process of data sharing at the individual and institutional levels, either through mandatory rules or the creation of incentives for sharing.
- Digital Infrastructures: there seem to be an uneven geography of 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.

Finally, we acknowledge that the EU has been at the forefront of providing an articulated regulatory framework for steering the digital transition, as it has been historically for previous waves of Information and Communication Technologies. Within this context, it is relevant to evaluate whether the AI Act might be able to compensate for the effects of the asymmetries mentioned above, even though it may require further debate and public scrutiny on such effects and might lead to a new wave of the so-called "Brussels effect".

10.2. Data sharing

The economic nature of data changes along the data "value chain," which includes the aggregation, processing and analytics of individual data[190] (Corrado et al., 2022; Goos and Savona, 2024). Individual data is a club good, excludable but not rivalrous (Savona, 2019), as individuals or businesses might prevent the use of their personal or copyright-protected[191] 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 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 maximise 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 requires 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 (see Zenner et al., 2024, for updated data on the EU regulations in the digital sector over the past decade).

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). Furthermore, 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

[190] 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).

[191] 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 co

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" behaviour, 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 characteristics of the data sharing legal and technical framework for the green mobility plan in Hamburg have been described, presented,[192] and discussed, although the outcome and the effectiveness have yet to be assessed, as the implementation is on-going.

Similarly, 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 to minimize the risks of shifting from big tech to big trusts.

Gräef 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 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 a crucial research and policy agenda in the near future.

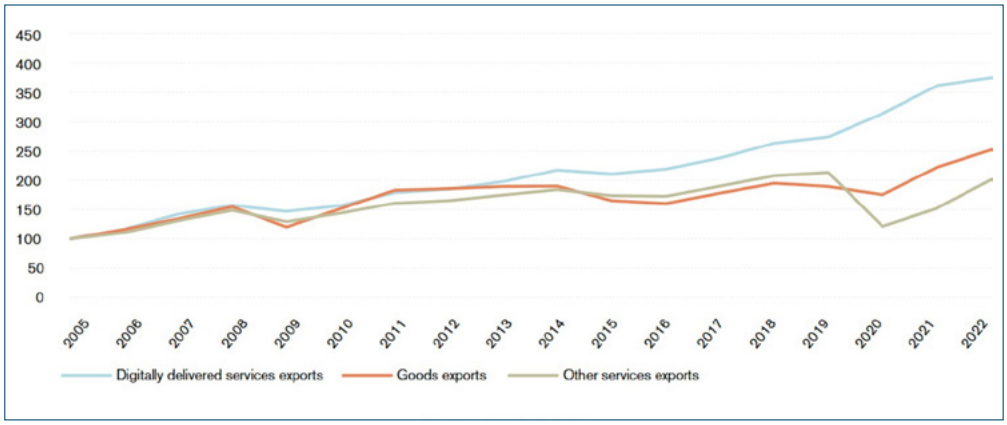
10.3. The geopolitics of digital infrastructure

Trade in digital services has increased considerably over the past decades (Figure 10.1) and relies on the investment capacity in physical digital infrastructure that supports cross-border data flows, including submarine cables, optic fibres, and, more recently, data centres and cloud storage of data and software. Data centres and cloud service providers are the tangible component of investments in emerging digital technologies such as data acquisition, data management, software, artificial intelligence, which are intangible in nature (Savona et al., 2022; Corrado et al., 2023).

As firms increasingly invest in emerging digital technologies, they need to scale up their capacity to process large data in a cost-effective and reliable manner. According to the IMF, the OECD, the UN, the WTO (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 resource usage that allows charging on a pay-per-use basis are increasingly used to replace ownership of on-premises IT equipment."

[192] A New Digital Industrial Policy and Data Governance for the Public Interest. LUISS LEAP, 27 October 2023.

Figure 10.1: Growth of goods, services and digitally delivered services exports (2005=100)



Source: WTO (2023)

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 and data management services to external cloud service providers and data centres.

In Papadakis and Savona (2024) we look at the geographical distribution of data centres and cloud service providers. Trends of digital service trade emerge as not the only factor underpinning the concentration of digital infrastructure in certain countries: Papadakis and Savona find that, not unexpectedly, high shares of global data centres are located in the US, Germany, and the UK, which are also the top digital services exporting countries. However, interestingly, the intensity (number of data centres per GDP or population) of data centres and cloud services is higher in a few small countries,[193] most of which are tax havens,[194]and are not necessarily specialised in digital services nor are the top digital services exporters. In addition, the uneven geography of data centres is relevant in the context of what we consider the new geopolitics of digital infrastructure, which we spell out as a 'data haven hypothesis' (Papadakis and Savona, 2024). We attempt a preliminary interpretation below.

First, the concentration of digital infrastructure might mirror the asymmetrical distribution of (digital) trade among headquarters 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 regulatory arbitrage, 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 hubs and might be concentrated in countries that are destinations of IP profit shifting or patent boxes (Haufler and Schindler, 2023; Alstadsæter et al., 2018; Accoto et al., 2023).

Third, in Papadakis and Savona (2024) we put forward the concept of a 'data-haven hypothesis' and argue that this might explain the asymmetries in the concentration of digital infrastructure, similarly to how the "pollution-haven hypothesis" has explained patterns of trade of green and brown products. We conjecture that – similarly to how 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) - countries with more stringent data protection, or IP or tax regimes regulatory frameworks, would offshore cloud services and data hubs to countries with more favourable tax regimes, for instance to benefit from favourable tax-rates on IP related profits, or laxer data protection regulations. There are contributions that have looked at the role of patent boxes[195] (Alstadsæter et al., 2018; Accoto et al., 2023).

[193] Gibraltar, Isle of Man, Jersey, Liechtenstein, Bermuda, Guernsey are among the countries with the highest intensity in data hubs per million capita (Papadakis and Savona, 2024).

[194] The Tax Justice Network assigns a Haven Score (HS) which measures the extent that a country's tax jurisdiction and financial system allow for corporations' tax abuse. The HS takes values from 0 to 100. The countries that rank at the top (≥85 HS) according to the HS are British Virgin Islands, Cayman Islands, Bermuda, Switzerland, Jersey, Singapore, United Arab Emirates, Bahamas, Cyprus, Guernsey, Isle of Man, Turks and Caicos Islands, and Anguilla.

[195] Patent boxes are u
sed to incentivise businesses to invest in R&D by taxing patent revenues at lower tax rates than other business revenues.

The idea of increasing 'data governance interoperability' (Bacchus et al., 2024), which suggests making national digital regulations interoperable across countries, might go in the direction of strengthening the role of national governments vis-à-vis private owners of data centres or cloud services. 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.

10.4. The EU AI Act

The European regulatory framework of digital technologies has always been at the forefront of what has been named the "Brussels effect": when the General Data Protection Regulation became law, US tech giants had to comply, and several governments chose to align themselves with the main principles and rules to protect citizens' privacy – and digital rights – more broadly.

After a long gestation time, the most recent addition to the EU digital regulations (Zenner et al., 2024) is the EU Artificial Intelligence Act, which aims to regulate broad applications of AI in the Union to prevent potential harmful effects of 'high risk' AI applications. The initial paragraph of the Act effectively summarises the context and principles of the regulation.[196]

From the perspective of a digital law expert, Edwards (2022) identifies the boundaries of the AI Act, which, she claims, "needs to be read in the context of other major packages such as the Digital Service Act (DSA), the Digital Market Act (DMA) and the Digital Governance Act (DGA)." The first two primarily regulate large commercial platforms and the private sector, while the DGA is concerned with data intermediaries and incentives to individual and institutional data sharing (see discussion above).

The AI Act, instead, is mainly, though not solely, aimed at the regulation of AI systems' use in the public sector. In addition, its scope covers the applications (albeit those of course emerged up to now) that carry the risk of harmful effects, from "high risk", such as biometric recognition, predictive policing, social scoring, deepfake, and algorithmic management in workplaces, to "minimal risk" such as the private sector targeted marketing.

The EU AI Act includes not only a systematization of high-risk cases, but also the objective of regulating foundation models such as Large Language Models, which have sparked much debate in the case of generative AI. As 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. Notably, obligations to comply fall mainly on providers, though also on importers and distributors too.

It has been pointed out (Edwards, 2021; Veale and Borgesius, 2021) that the Act's aim is rightly ambitious, yet it might be too broad in its scope. Despite the ambition, it seems that it fails to provide general criteria for AI risk assessment. The lack of general criteria might make the Act unfit to be applied to the future numerous applications that are still untapped. In addition, the focus on the 'providers' compliance to risk minimization might fail to trace the responsibility of other downstream actors, and certainly end users, who seem to have no role and no agency in the regulatory framework of the AI Act.

As already mentioned, it would be important to be aware of the development of the technology, the complexification of the actors involved in the creation, adoption and use of AI in firms and the public sector, and the specificities of sectoral applications. There is obviously a high degree of uncertainty in both the future development of the technology and in the future degree of pervasiveness in different sectors. This is the main reason why it is important to define general, foundational criteria of risk assessment, which countries preparing for complying with the Act can receive.

[196] "The purpose of this Regulation is to improve the functioning of the internal market by laying down a uniform legal framework in particular for the development, the placing on the market, the putting into service and the use of artificial intelligence systems (AI systems) in the Union, in accordance with Union values, to promote the uptake of human centric and trustworthy artificial intelligence (AI) while ensuring a high level of protection of health, safety, fundamental rights as enshrined in the Charter of Fundamental Rights of the European Union (the 'Charter'), including democracy, the rule of law and environmental protection, to protect against the harmful effects of AI systems in the Union, and to support innovation. This Regulation ensures the free movement, cross-border, of AI-based goods and services, thus preventing Member States from imposing restrictions on the development, marketing and use of AI systems, unless explicitly authorised by this Regulation." (EU AI Act, 2024).

As is well known, the US hosts the largest number of giant digital platforms. It will be interesting to see whether the EU Artificial Intelligence Act will trigger another Brussels effect. It would be important to monitor the effects of compliance, and the effect of the lack of or weak compliance in areas that are crucial in view of the (still uncertain) development and diffusion of Artificial Intelligence's applications.

This opens a Pandora's box and leads to the second point: under the Biden administration, there have been hints of the US moving closer to the EU's regulatory framework (Ruiz and Savona, 2023). 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 others 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). In October 2023 the US announced 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 US' desire to maintain its supremacy in the global AI race. However, it is not inconsistent with the Biden administration's Blueprint for the AI Bill of Rights.

In sum, the EU AI Act is a tremendous effort to prevent potential harmful effects that might result from the lack of governance of AI applications. Still, the technology itself has yet to develop its full potential, and the uncertainties linked to an increase of the still limited use of AI in new sectors are still high. The Act may require further debate and public scrutiny in the near future.

10.5. Conclusions and policy recommendations

This paper has focused on the future challenges of the governance of emerging digital technologies, with Artificial Intelligence being among them. We consider them of high policy relevance but they are relatively under-researched. While we do not aim to provide specific policy instruments, we rather aim to raise the potential side effects of failing to design appropriate digital industrial policy tools to tackle the issues mentioned here. There is a lot of untapped potential for the development of these technologies and hence their governance.

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.

In terms of data sharing, it would be important to combine elements of mandatory regulations, particularly when it comes to B2B exchanges in contexts that are of public interest, with the identification and implementation of the right incentives to share data for 'altruistic' purposes. We are not fully convinced that personal data intermediaries or a series of sectoral data trusts are the solution, as we have argued elsewhere (Savona, 2021).

In terms of digital infrastructures, mapping their global presence would be an important starting point. The research (and policy relevance) on this topic is still in its infancy. The normative implications of a high concentration of digital infrastructures will depend on a careful assessment of the environmental impact and geopolitical implications for hosting countries.

All this requires thinking out of the box and 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.

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11. An EU energy policy for the challenges of the twin transition of industry and open strategic autonomy

Alexandre Marin[197]

Executive Summary

This chapter explores the evolving landscape of the EU's energy policy, focusing on the challenges of the twin transition and ensuring strategic autonomy amid increasing geopolitical pressures. While energy policy has focused on market integration and functioning, the current framework must simultaneously secure energy supplies and decarbonize European industries while maintaining their competitiveness. The first section examines the EU's efforts to transition to a low-carbon economy, highlighting progress in increasing renewable energy through solar, wind, and hydrogen. Support mechanisms and contracts like CfDs and PPAs are now expected to play a role in the ramp-up of these technologies and the evolution of the energy mix. The second section addresses the structural vulnerabilities in the EU's energy policy, particularly its heavy dependence on imported natural gas, exacerbated by the war in Ukraine. Despite diversification efforts, such as tapping into LNG and forging new partnerships, the EU remains exposed to volatile global gas markets. This is in stark contrast to the United States, which has benefited from its domestic shale gas, and China, which has leveraged its proximity to Russian gas and control of critical raw materials to boost its competitiveness in clean technologies. The third section critically assesses the EU electricity market design, particularly the marginalist pricing system. Despite renewable generation accounting for a growing share of electricity production, fossil fuel technologies will continue to disproportionately influence wholesale market prices. This leads to higher electricity costs, which undermine industrial competitiveness and place additional strain on energy-intensive industries (EIIs), just when they need to accelerate their electrification efforts. The chapter concludes with policy recommendations, emphasizing the need for a sector-specific approach beyond horizontal reforms. Key recommendations include better coordination of national energy policies, expanding nuclear and renewable capacities, and shielding energy-intensive industries from rising network costs and energy taxes. A comprehensive review of energy cost differentials is also necessary. Targeted interventions are proposed to ensure that energy-intensive industries have access to electricity at production costs, at least for part of their consumption, while leveraging existing instruments like CfDs and PPAs. New flexibility instruments tailored to industrial constraints and over longer time horizons ('multi-days') are also explored. At the same time, a comprehensive review of energy cost differentials is necessary. Finally, the chapter advises caution when considering the outsourcing of energy-intensive industries based on price differentials, as this could lead to increased carbon imports and substantial Carbon Border Adjustment Trade Mechanism (CBAM) costs, undermining both environmental and economic goals.

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11.1. Introduction

In a June 2024 speech presenting the conclusions of his report on European economic competitiveness, Mario Draghi highlighted energy costs as a critical factor for the EU, citing the lack of resources, dependence on natural gas, insufficient decoupling of gas and electricity prices, and the urgent need for investments in clean energy generation and grid infrastructure (Draghi, 2024). While these issues have been addressed through recent reforms under the Green Deal and in response to the war in Ukraine, they are expected to remain a top priority for the next European Commission,[198] as they will likely determine the success or failure of the twin transition and the decarbonization of Europe's economy and industry. This chapter examines key aspects of these energy policies, focusing on the challenges hindering industrial decarbonization within an increasingly complex international and geopolitical environment.

Although the history of the European Communities began with the integration of energy, with the ECSC for the coal industry and EURATOM for the civil nuclear industry, it was not until the building of a Single market for energy in the 1990s that an EU energy policy actually came about (Petrini, 2019). The electricity and gas markets were then reinforced by the introduction of a legal basis for EU energy policy (Article 194 TFEU) in the Treaty of Lisbon, which enshrined this competence while carefully delimiting it. Under the terms of the TFEU, the Union's energy policy aims to ensure the functioning of the energy markets, the security of the Union's energy supply, promote energy efficiency and the development of renewable forms of energy as well as network interconnections.[199] However, Member States retain the right to determine the general structure of their energy supply and their choice between different energy sources.[200]

While preserving national sovereignty over energy mixes, the EU has successfully integrated the structure of its energy policy and system at multiple levels in recent years (Meeus, 2019). At the EU level, the governance of the Energy Union was established in 2015, aligning it with the bloc's climate policy.[201] This strategy requires MSs to develop integrated national energy and climate plans. At the network level, transmission system operators (TSOs) and distribution system operators (DSOs) collaborate through European bodies like ENTSO-E (for electricity) and ENTSO-G (for gas), with ENNOH for hydrogen expected by 2025. These organizations coordinate ten-year network development plans (TYNDP) and promote interconnections. Finally, national regulators play an increasingly coordinated role through the Agency for the Cooperation of Energy Regulators (ACER), established in 2011 and whose mandate has since been expanded.

The energy markets for electricity and gas in the EU have been liberalized, with network activities regulated and other market segments opened to competition. In this model, wholesale market prices are determined transparently through exchanges like EPEX, NordPool, GME, and OMIE. Every day, the EUPHEMIA algorithm[202] facilitates the matching of supply and demand across all bidding zones on the short-term market, operating within the principles of microeconomic theory. This system is supposed to ensure a competitive, transparent, and efficient price-setting mechanism across Europe.

[198] Von der Leyen, Ursula (2024), Europe's Choice. Political guidelines for the next European Commission 2024-2029, Strasbourg, July 18th 2024.

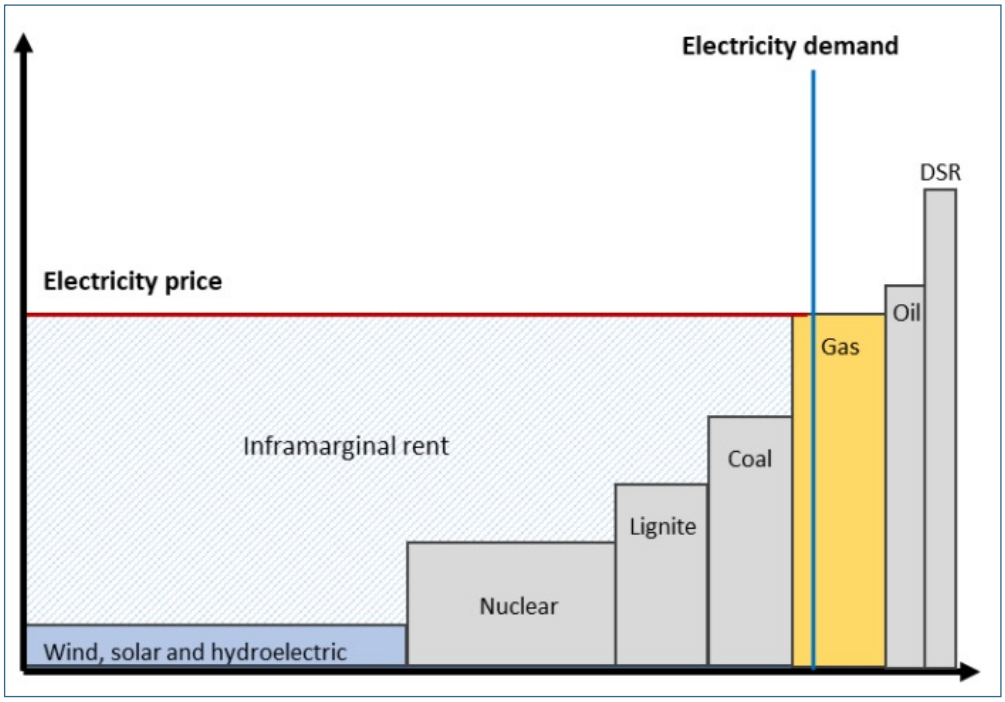
[199] TFEU, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12016ME%2FTXT.

[200] TFEU, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12016ME%2FTXT.

[201] European Commission (2015), Communication A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM/2015/080 final, 25.0.2015.

[202] The public description of the EUPHEMIA Single Price Coupling Algorithm is available on the NEMO Committee website.

Figure 11.1: Simplified merit order supply demand stack and marginal pricing principle in the current electricity market design



Source: EC JRC (Gasparella et al., 2023).

The recent goals of achieving the twin transition—industrial decarbonization and digitalization—alongside EU open strategic autonomy in response to rising geopolitical challenges (Defraigne et al., 2022; Guerrieri and Padoan, 2024) have prompted the EU to revise key legislations under the Green Deal. In 2024, this led to significant revision in both the gas (gas package[203]) and electricity framework (electricity regulation[204]). These changes reflect the central concerns of EU energy and industrial policies: first, ensuring the security of supply and energy resilience within the Union, and second, establishing a regulatory framework that promotes the decarbonization of European industry while safeguarding its global competitiveness.

In this policy chapter, we aim to first describe the recent initiatives aimed at increasing the share of renewable energy and phasing out fossil fuels and the challenges that still face the EU in this way and second, we analyse the structural problems of the energy policy compared to its main competitors but also from the industrial point of view, with special attention to the impacts of the electricity market design on industry competitiveness. Finally, we try to formulate some further steps and policy proposals to reform EU energy policy in order to achieve the objectives set by the European Commission.

11.2. The role of energy policy for the twin transition of industry and open strategic autonomy

Decarbonizing the EU economy across sectors like transport, construction, and industry will require significant efforts in both direct and indirect electrification, including technologies such as hydrogen. Ensuring access to affordable renewable or low-carbon energy sources has been a central goal of recent reforms aimed at achieving carbon neutrality. Since the early 2000s, and particularly following the adoption of the first Renewable Energy Directive (RED) in 2009, the EU has implemented various policies to increase the share of renewables in its energy mix. Renewable energy targets, set at both EU and national levels, have been revised upward over time. The latest revision, RED III (2023/2413), sets the 2030 target at 42.5%, with an ambition to reach 45%.

[203] Composed of the directive (EU) 2024/1788 and the regulation (EU) 2024/1789 adopted in May 2024.

[204] Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design.

11.2.1. Renewables in electricity generation

In recent years, several technologies have received dedicated strategies at the EU level to support the decarbonization of power production. They include solar energy (2022) – with the objective of 600 GW new capacity in 2030 –, wind energy – 37 GW/year new capacity required to reach 2030 target (Action Plan 2023) –, marine renewable energies – offshore, waves and tide – (2020, 2023), and a geothermal strategy has been requested by the European Parliament in 2024. Actions undertaken by the European Commission to promote these technologies focus on accelerating and streamlining permitting procedures – identified as one of the main obstacles,[205] improving access to public funding (e.g. through the European Investment Bank), and, more recently, making better use of trade defence instruments (TDIs) to protect European sectors from unfair competition amid growing geopolitical rivalry in clean technologies.[206]

Nuclear energy has long been a contentious issue among MSs, particularly in recent years regarding its inclusion in the EU Taxonomy, its role in producing clean hydrogen, and the support mechanisms it may qualify for. Despite these debates, nuclear power's potential for decarbonization (as a low-carbon energy source) and its advantages for grid management (centralized and on-demand generation) are increasingly recognized by the EU at the highest levels (including by Ursula von der Leyen in August 2024[207]). It is expected to play a role through various technologies, such as small modular reactors (SMRs) – which are the subject of a new alliance[208] – fission (eligible for CfDs) and other technologies considered net-zero technologies under the NZIA (2024/1735).

11.2.2. Renewables in the gas market

The decarbonization of European gas consumption is set to occur through the use of biogas and renewable fuels of non-biological origin (RFNBOs), particularly hydrogen (Conti et al., 2024). Hydrogen has been identified as a key solution for hard-to-abate industrial sectors, such as iron ore reduction, fertilizers, and the chemical industry. Both the EU[209] and individual MSs (e.g., France, Germany) have adopted strategies and policies to promote hydrogen, and the recent revision of the gas regulatory framework (the gas package) aims to create an entirely new hydrogen market and ecosystem to cover the needs for the transition.

One of the central aspects of this legislation is the definition of clean hydrogen, which, in Europe, will be produced through electrolysis. This process must comply with the stringent requirements of additionality (ensuring the creation of new renewable electricity capacity), and temporal and geographical correlation for the electricity used in the process, set by a delegated act adopted in February 2023.[210] The definition of low-carbon hydrogen is still pending adoption and, for this policy to succeed, a robust hydrogen transport infrastructure must be swiftly developed, which the creation of a European Network of Network Operators for Hydrogen (ENNOH) in 2025 might help.

In light of these challenges, a recent report by the (European Court of Auditors, 2024) raises questions about whether the EU's hydrogen consumption targets are too ambitious, despite the Commission's efforts and the creation of a Hydrogen Bank in 2022 to help finance projects. Beyond the "chicken-and-egg" issue of supply and demand to enable the sector to truly take off, hydrogen illustrates the critical role of internationally competitive electricity prices (CompassLexecon, 2024). It also underscores the importance of timely and effective support mechanisms, as is demonstrated by the comparison with the U.S. Inflation Reduction Act (IRA).

11.2.3. Support mechanisms

The state aid guidelines for supporting new renewable production capacity, originally established in 2014, were revised in 2022, with some aspects codified by the latest revision of

[205] European Commission (2022), Recommendation on speeding up permit-granting procedures for renewable energy projects and facilitating Power Purchase Agreements, C/2022/3219 final, 18.5.2022.

[206] European Commission (2023), Commission Staff Working Document, Reform of Electricity Market Design, SWD(2023) 58 final, Strasbourg, 14.3.2023.

[207] Keynote speech by President von der Leyen at the GLOBSEC Forum 2024, Prague, 30 August 2024.

[208] European Commission (2024), Commission to ally with industry on Small Modular Reactors, European Commission website, February 9th 2024; European Commission (2024), News announcement. DG ENER. Commission to ally with industry on Small Modular Reactors, 9.02.2024.

[209] European Commission (2020), A Hydrogen Strategy for a Climate-Neutral Europe, COM(2020) 301 final, 08.07.2020.

[210] Delegated Regulation (EU) 2023/1184 of 10 February 2023 establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin.

the Electricity Market Design (EMD) in 2024 (Jérémie and Baudinet, 2024). Contracts for difference (CfDs), particularly two-way CfDs (for details on their design, see Kitzing et al., 2024), are intended to be the primary support mechanism. They are meant to complement the current market structure by providing the long-term price signals necessary for the development of new capacity, especially for capital-intensive technologies such as nuclear power and their prolongation.[211]

Significant expectations have been placed on the growing use of PPAs, long-term contracts directly concluded between electricity – or biogas – producers and consumers (Hancher and Dezorby, 2024; see also CREG, 2024). PPAs are expected to play a critical role in advancing the integration of renewable energy into the overall energy mix, while also enabling large consumers to hedge a portion of their energy supply over extended periods. However, contrary to what is frequently suggested in official documents,[212] PPAs do not automatically guarantee per se competitive prices for EIIs. To fully understand their impact, it is essential to consider the consumer side's perspective and constraints, as will be discussed in the last section.

11.2.4. The next challenge: increase flexibility and upgrade the grid and infrastructure

Two interconnected challenges arise from the EU's energy mix choices and they can be seen as the logical next steps following the policies already laid out (ACER-CEER, 2024).

The first challenge is the increasing need for flexibility in the electrical system. As the energy mix increasingly relies on intermittent sources, maintaining balance between electricity production and consumption at all time will become more challenging. While some stability can still be provided through production adjustments and storage (e.g., pumped-storage hydroelectricity, batteries), the majority of the effort will shift to demand-side response (DSR), where consumers adjust their consumption based on price signals. While retail flexibility holds promise, industrial flexibility is already well-established, with many sectors utilizing DSR mechanisms to which the EU is committed to removing remaining regulatory obstacles (ACER, 2023). But for the transition to succeed without straining the system, though, the focus should shift from simply assessing how industry electrification can support grid flexibility (Boldrini and Koolen, 2024) to creating/adapting mechanisms that enable industrial consumers to maximize their flexibility potential, taking into account their commercial, organizational, social, and technical constraints. New schemes that extend beyond current timeframes to manage multi-day or weekly periods—that batteries alone cannot fully address—should for example be explored.

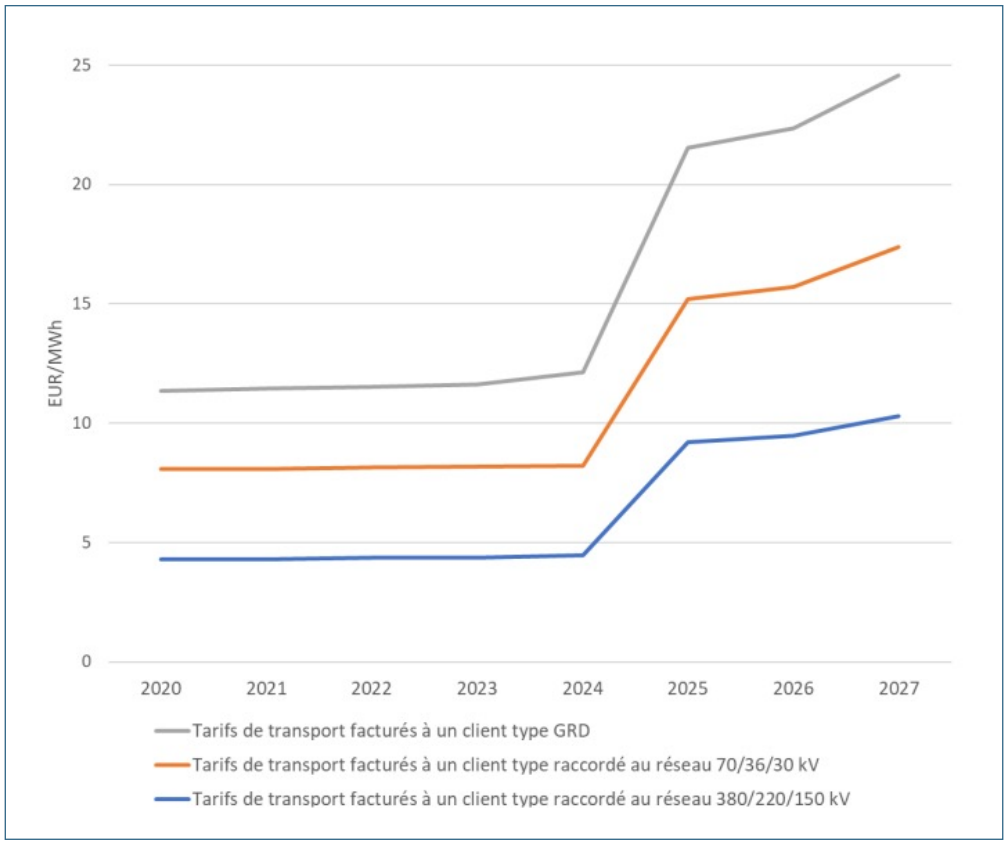
The second major challenge is the upgrade of the electricity grid, as highlighted in the recent Grid Action Plan,[213] alongside the development of new infrastructure for storage and hydrogen. Substantial investments are required to build new transport and distribution equipment, as well as upgrading existing/ageing networks, creating grid-scale electricity storage to handle decentralized and intermittent generation while connecting new industrial centres. The European Commission estimates that 584 billion euros will be necessary by 2030. French TSO estimates the required investment at around 100 billion euros, while Germany projects a figure three times higher. These investments will inevitably raise network costs, which will be passed on to consumers, potentially affecting industry costs when electrification is crucial. Careful decisions on cost distribution will be essential to prevent overburdening industries and maintaining their global competitiveness.

[211] The construction of new Czech and French reactors will resort to CfDs support schemes. So should the prolongation of French and Belgian existing ones (See the Invitation to submit comments published the 8th august 2024 by the Commission – State aid SA.106107 (2024/N) – Lifetime extension of two nuclear reactors – Doel 4 and Tihange 3).

[212] European Commission (2022), EU Solar Energy Strategy, COM(2022) 221 final, 18.05.2022.

[213] European Commission (2023), Communication Grids, the missing link - An EU Action Plan for Grids, COM/2023/757 final, 28.11.2023.

Figure 11.2: Evolution of electricity transport tariffs in Belgium 2024-2027



Source: CREG, ELIA, December 2023

A recent proposal by German authorities (BMWK 2024) to introduce local price signals to address grid constraints in a high renewable energy mix highlights how flexibility and grid-related issues can significantly affect industry. While this proposal is sound from a strictly microeconomic perspective,[214] it adds stress to the industry by failing to fully account for its operational and economic constraints in an open economy. This underscores the tension between economically sound policies in theory and their practical impact on industries navigating the transition, a recurring dilemma the EU is increasingly facing.

Indeed, in the European strategy, the decarbonization of energy system and the industry transition are meant to go hand in hand, progressing and supporting each other. Assessing the likelihood of this strategy's success requires analysing whether the European industry is well positioned to compete globally, considering the EU energy dependencies and relative standing of competitors in other regions. From this perspective, the current European regulatory and policy framework for energy and decarbonization still presents challenges and might lack coherence, which could hinder the industry's transition.

11.3. The structural problems of EU energy policy in comparison with its main competitors

11.3.1. A stronger dependency on foreign raw materials and energy sources

The problem of the EU's security of energy supply has emerged progressively since the gas crisis between Kiev and Moscow in 2006 and 2009, and even more urgently since 2022. These events highlighted the issue of the EU's overdependence on Russian gas, the supply of which is subject to the will of government-controlled Gazprom. Despite the target of the European Commission in 2015 to reduce the EU's dependence on Russian gas,[215] it was only after the outbreak of the war in Ukraine in 2022 that the EU diversified its supplies by turning to the international LNG market and establishing bilateral agreements with new suppliers

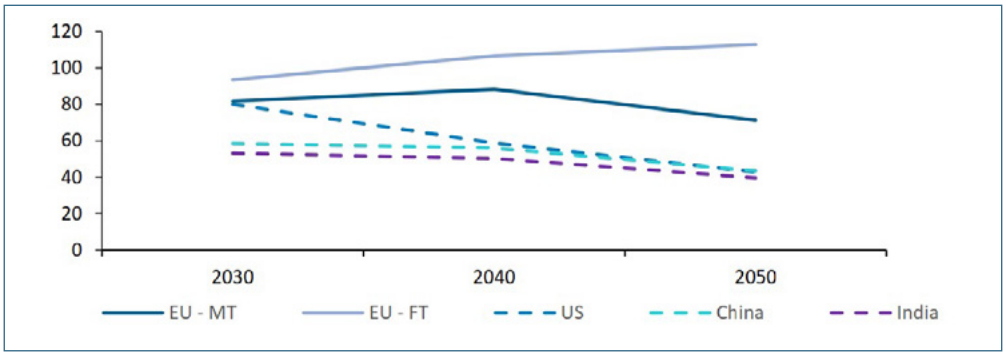
[214] See Zwölf Energieökonomen: Der deutsche Strommarkt braucht lokale Preise, Frankfurter Allgemeine Zeitung 10.07.2024.

[215] European Commission (2015), Communication A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM/2015/080 final, 25.0.2015.

(e.g. Azerbaijan and Algeria) (Goldthau and Sitter, 2022). This delay was caused especially by the reluctance of countries heavily dependent on Russian gas, notably Germany, to reduce this source of supply, not least because of the impact this would have on its industry. This highlights the difficulty of creating a genuine EU energy security policy in the presence of different national energy mixes across the bloc (Baechler, 2015).

Despite diversification efforts, the EU remains significantly reliant on natural gas (which accounted for 41% of its energy supply in Q4 2023) and other fossil fuels. The global LNG market is inherently volatile and subject to international competition, particularly between high-demand regions (Europe and Asia), which can drive up prices. As frequently observed in recent market evolutions, LNG supply is vulnerable to geopolitical tensions, disruptions to maritime routes, and technical issues at major exporting facilities (e.g., in the U.S. and Australia). These factors contribute to a widening structural price gap between Europe and other regions, impacting both the EU's energy markets (see next section) and the competitiveness of its industries, putting the EU at a disadvantage compared to its primary global competitors over the long term.

Figure 11.3: Electricity generation costs projections in a selection of jurisdictions (EUR/MWh) – 2030-2050

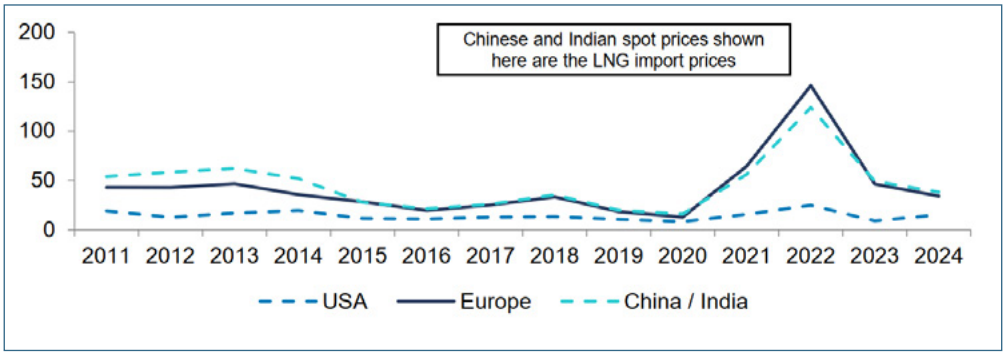


Source: CompassLexecon study for BusinessEurope, July 2024.

Note: "MT" and "FT" refer to the two scenarios envisaged by the study and stand for "managed" or "frustrated" transition.

The United States in particular has benefited from its shale gas production since the early 2010s, which has allowed it to avoid the energy supply tensions experienced in other regions. In fact, the U.S. has become one of the main suppliers of natural gas to Europe, having provided half of its LNG supply in 2023.

Figure 11.4: Historical monthly gas price (USD/MWh 2023)



Source: Ibid.

With greater energy security, the U.S. also enjoys several other advantages in the race for clean technologies and the transition. It boasts technological leaders in key sectors, such as electric vehicles (e.g., Tesla), and pursues a more assertive trade policy designed to protect its technologies and strategic markets (e.g., steel, EVs) from foreign competition, particularly from China. Moreover, the U.S. adopted a more pragmatic approach to supporting the energy transition. Rather than implementing a carbon pricing system similar to the European cap-and-trade model, it has chosen to incentivize the transition through simpler mechanisms, such as tax credits under the Inflation Reduction Act (IRA) and local content requirements aimed at boosting domestic industries.[216]

Europe's situation also stands in contrast to China, which has been described as a 'systemic rival' by the EU since 2019.[217] China's geographical and strategic proximity to Russia grants it access to natural gas via the Power of Siberia pipeline, soon to be reinforced by a second pipeline, while new energy corridors with Central Asia (e.g., Turkmenistan, Kazakhstan) further mitigate energy risks. China also benefits from extensive access to strategic raw materials essential for clean technologies, in stark contrast to the EU, which recently adopted the Critical Raw Materials (CRM) Act in an effort to mitigate this disadvantage. In addition, China has implemented an expansionist industrial policy characterized by opaque (WTO, 2024) and strategic subsidy practices (Mercier and Giua, 2023) aimed at dominating entire supply chains in key sectors. This strategy has enabled China to rapidly scale production capacities across several industrial sectors, leading to long-documented overcapacities in areas such as steel (OECD, 2024). More recently, concerns have grown within the European manufacturing sector regarding key technologies such as electric vehicles (EVs), photovoltaics (PVs), and batteries, which now face increased competitive pressure and overcapacities. Investigations and provisional duties already adopted by the EU[218] suggest that part of the cost differential between Chinese and European products is not entirely market-driven, further fuelling concerns over a competitiveness gap in Europe.

11.3.2. The problems of the organisation of the EU electricity market for industry competitiveness

The microeconomic theory of electricity markets (Léautier, 2019) has long demonstrated the merits of a market design based on the marginal principle and peak-load pricing (Zachmann and Hirth, 2023). Under this paradigm, the wholesale market price is set by the last unit needed to satisfy demand, which reflects scarcity and provides the correct price signal to economic operators. Additionally, the single coupling of the different European bidding zones (BZ) allows for the consideration of interconnections when calculating prices in the day-ahead market (ACER, 2022). However, when viewed from an industrial perspective in an open economy, these features pose several challenges in light of the EU's geopolitical dependencies and the relative positioning of industries in third countries.

First, the marginal principle inherently causes a disconnect between the actual emission factor of electricity production and the emission factor derived from the wholesale market: fossil fuel generation technologies set the market price far more frequently (in terms of hours per year) than their actual contribution to total electricity production (in share of total production in MWh). Despite the increasing share of renewable generation in the European electricity mix, this results in structurally higher electricity prices on the wholesale market, which are not entirely offset in the – few – European countries that choose to implement indirect cost compensation. [219]This effect has been confirmed by recent projections from the Commission (Gasparella et al., 2023).

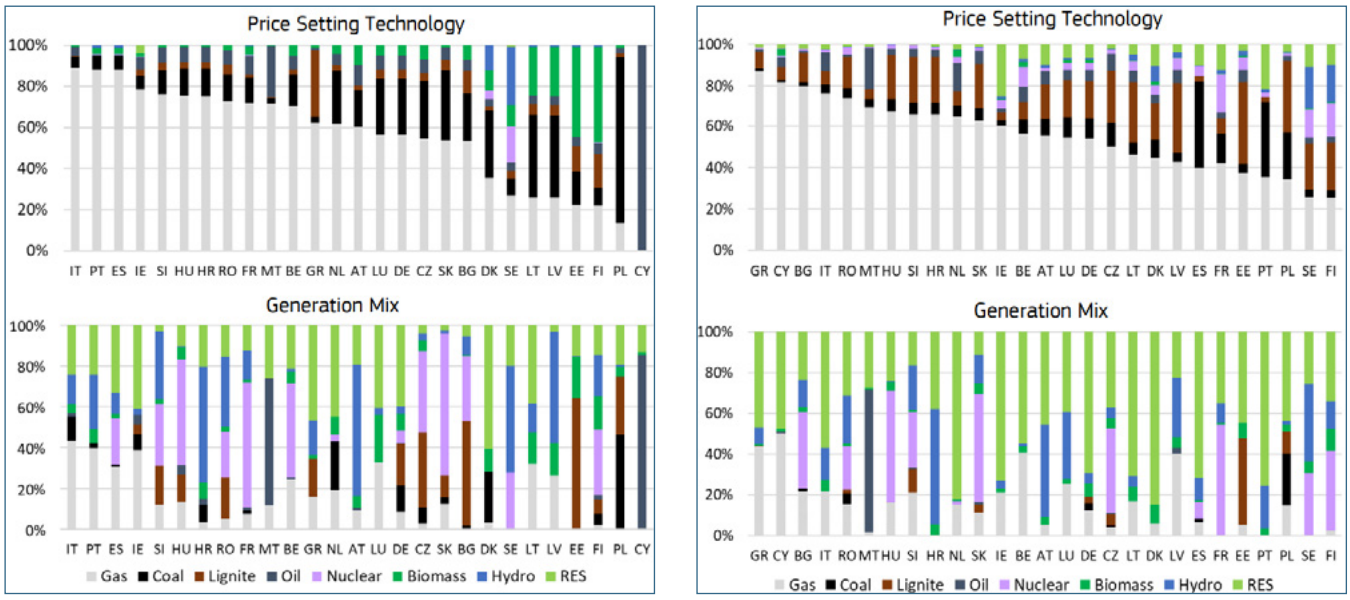
[216] White House, Inflation Reduction Act Guidebook, available at: https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/.

[217] European Commission (2019). Communication EU-China – A strategic outlook, Strasbourg, JOIN(2019) 5 final, 12.3.2019.

[218] In the ambit of its investigation, the European Commission imposed provisional countervailing duties on Chinese EV in July 2024 (Implementing Regulation (EU) 2024/1866 of 3 July 2024).

[219] Under the EU ETS and state aid rules, willing MSs can compensate part of this indirect cost of CO2 in electricity for exposed sectors. This compensation is however optional and unevenly applied across the EU and in terms of level of compensation and allocated budget.

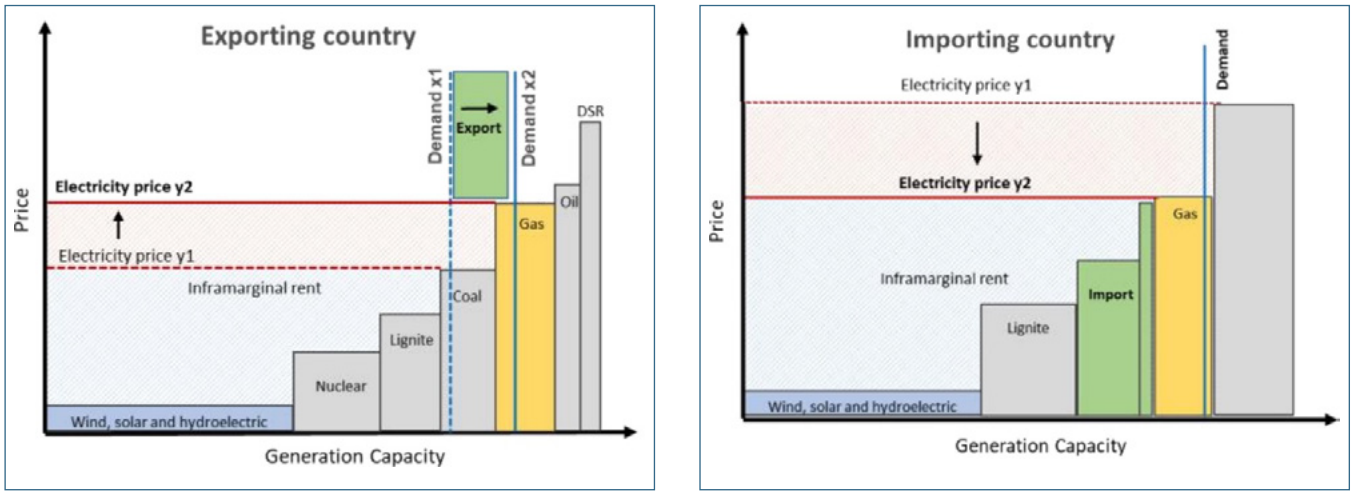
Figure 11.5: Price-setting technologies vs electricity generation mix by country in the EU (2022, projections 2030)



Source: EC JRC (Gasparella et al. 2023), based on METIS Simulation results

Second, while interconnections between BZ enhance supply security by coupling these zones, they also amplify the influence of fossil technologies as price setters: a single fossil fuel unit can set the price across multiple interconnected zones. As interconnections grow, zones function more like a single market, leading to a "contamination effect", where fossil fuel-based pricing spreads across regions. This paradox highlights how national choices in terms of energy mix can still impact neighbouring MSs.

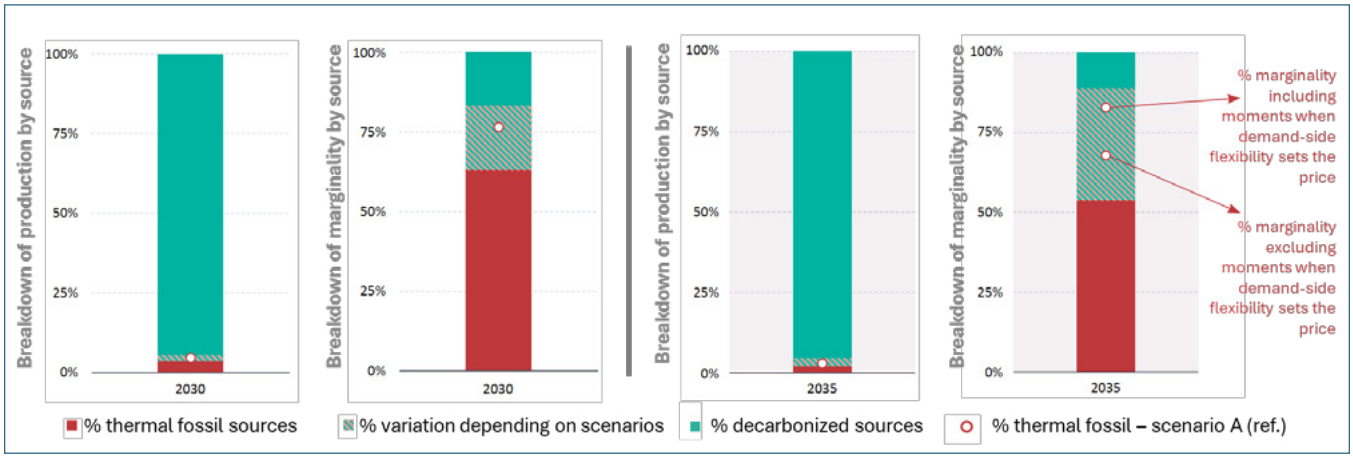
Figure 11.6: Import and export merit order impact



Source : ibid.

According to the French TSO's projections (figure 11.7), while more than 95% of electricity production in 2030 is expected to come from decarbonized sources (renewables and nuclear), fossil fuel technologies will still set the market price over 75% of the time, and still more than 50 % of the time in 2035 (RTE, 2024).

Figure 11.7: Comparison of the share of fossil sources in France's electricity production and the contribution of fossil sources to projected wholesale price formation by 2030 and 2035



Source: RTE, Economie du système électrique (July 2024)

Third, the overrepresentation of fossil fuel generation in the wholesale spot market also extends to other markets and instruments. On the future/forward markets, the price reflects the market's expectations for future spot prices (e.g., the CAL 2025 market price reflects the anticipated average spot market price for 2025). Since the spot is strongly correlated to fossil generation technology, this spreads to future prices. This overrepresentation also influences Power Purchase Agreement (PPA) price negotiations, where future market prices are often used as a benchmark or reference point for negotiations with off-takers. This raises questions about the extent to which PPAs can truly decouple gas and electricity prices: they might instead fix an image of these intertwined markets, locking in a situation where fossil fuels disproportionately influence pricing.

11.3.3.A legislative framework for decarbonising the European industry affecting its competitiveness

The EU has engaged the decarbonisation of its industry through the implementation of the European Trading System (ETS), adopted in 2003 in response to Europe's commitments under the Kyoto Protocol (1997).[220] Following the Paris Agreement (2015) and in the ambit of the Fit-for-55 package, the ETS was strengthened and complemented with a Carbon Border Adjustment Mechanism (CBAM).

11.3.3.1. Despite CBAM, the European industry risks facing a higher carbon price than other regions

The Carbon Border Adjustment Mechanism (CBAM) entered its transitional phase in October 2023 and will mark the gradual phase-out of free allowances for a few key industrial sectors. This is expected to have a significant impact on the competitiveness of European industry, particularly in the context of intensifying foreign geoeconomic competition.

Energy-intensive sectors, such as steel, aluminium, hydrogen and fertilizers, are especially vulnerable due to the risk of 'carbon leakage' that justified the free allocation mechanism. While the phase-out of free allocations will allow the European carbon pricing system to realize its full potential by exposing industries to the real cost of their direct emissions (Pellerin-Carlin and Vangenechten, 2022), the current design of CBAM presents several limitations. Some of them, such as the need for an export solution, extension to downstream sectors, and prevention of circumvention, could potentially be addressed before the mechanism enters its definitive phase in 2026. However, other limitations are inherent to the system. For instance, CBAM seeks to establish a level playing field only in terms of carbon costs,[221] leaving other crucial factors affecting industrial competitiveness—such as energy cost differentials

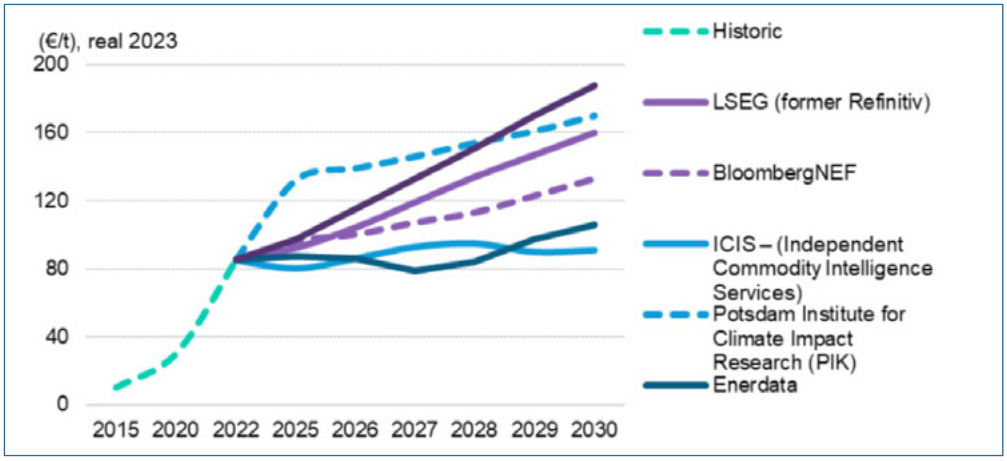
[220] European Commission (2001), COM(2001) 264 final, A Sustainable Europe for a Better World. A European Union Strategy for Sustainable Development, 15 May 2001.

[221] Which is also questionable. European installations will bear the full carbon cost under the EU ETS, while their non-EU competitors will only incur this cost for the portion of their production exported to the EU and subject to CBAM.

and distortions in energy markets—unaddressed.

Under the EU ETS, electricity producers, who do not face a carbon leakage risk, do not receive free allowances and must internalize the carbon cost, which is passed through in the marginal bidding of the wholesale market: when a gas-fuelled power plant sets the market price, a portion of that price reflects the carbon cost incurred by the producer under the ETS. This carbon cost component is expected to increase significantly in the coming years, exerting additional upward pressure on electricity prices (see previous section).

Figure 11.8: Historical Trends and Forecasts of Carbon Prices in Europe (EUR/EUA)



Source: ERCST, State of the EU ETS report, may 2024. Prices are in real 2023 EUR per metric ton.

All these factors combined are likely to make electricity significantly more expensive for EIIs, even though their transition pathways often require a substantial increase in their electricity consumption.

Finally, the potential integration of indirect emissions into CBAM for energy-intensive goods is also complicated by current market design disparities. For non-EU producers, indirect emissions could be calculated using the average emission factor of their country's electricity mix, as most countries lack liberalized, transparent markets and do not rely on marginal pricing. In contrast, EU producers would bear the carbon cost of their indirect emissions through higher wholesale electricity prices, driven by fossil-based price-setting technologies, despite often having a low average emission factor in their electricity mix. This disparity could result in significant differences in carbon costs exposure, distorting competition further.

11.3.3.2. In the current regulatory framework, PPAs present difficulties to energy-intensive industries

Given these challenges, PPAs may seem like a viable way to boost Europe's industrial competitiveness during the energy transition. However, the regulatory framework and market design limit their effectiveness as a stand-alone solution for hedging and supply. While renewable PPAs help secure Guarantees of Origin for ESG purposes, their ability to offer competitive prices is often overestimated (European Commission, 2022, 2023),[222] as intermittency poses significant risks for the off-taker, reducing their value as a hedging tool from the consumer's perspective:

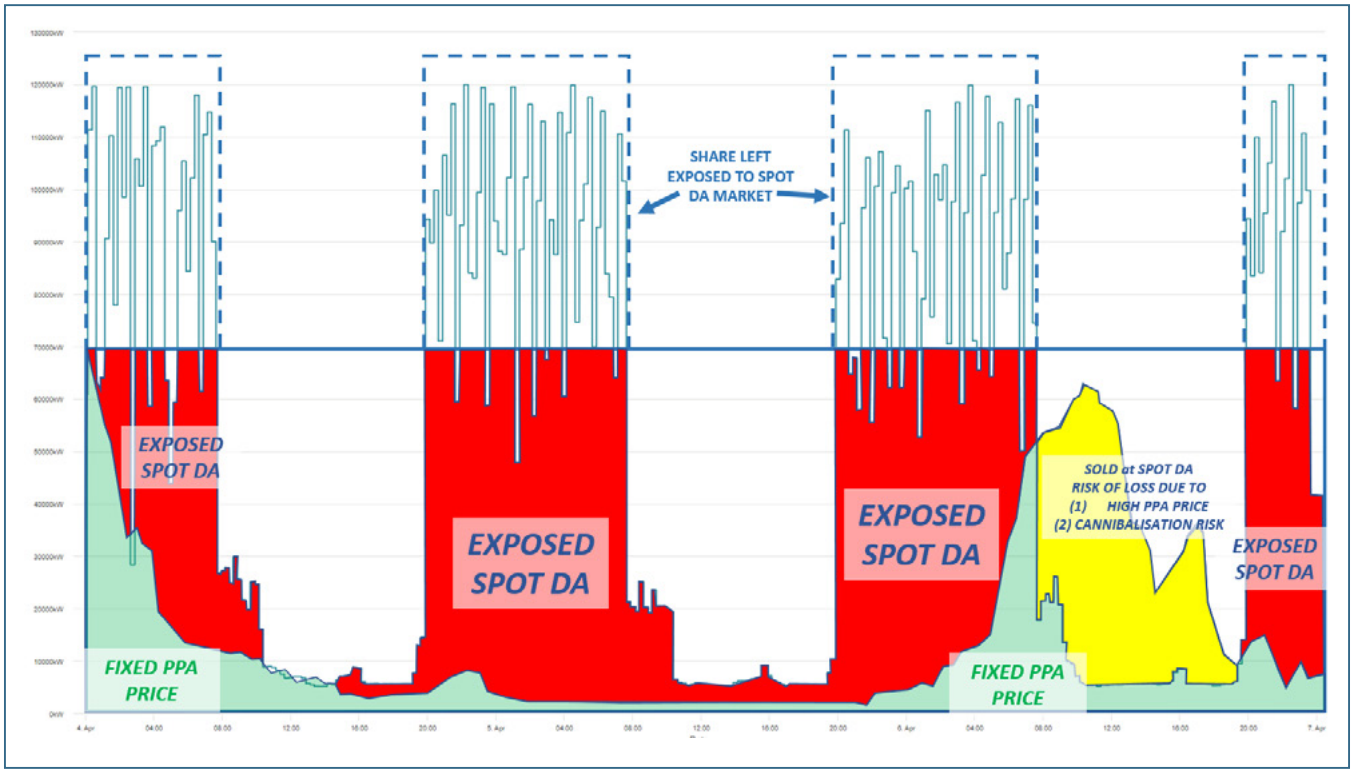
Price Risks: The cannibalization effect creates an opportunity cost—in the current market design, during high renewable output, spot prices may drop or become negative, but industries with long-term contracts miss out on these lower prices for PPA contracted volumes. Additionally, in pay-as-produced PPAs, the off-taker must resell unused electricity at the spot price, risking losses (as selling at negative prices means buying a second time) during high

[222] European Commission (2023), Communication European Wind Power Action Plan, COM(2023) 669 final, 24.10.2023.

renewable output.

A volume Risk: When renewable output is low, the PPA may not deliver, forcing the consumer to buy from the spot market, where prices can spike due to reliance on fossil fuel generators.

Figure 11.9: Illustration of risks posed by intermittency in a PPA for a typical EAF steel consumption profile



Source: author.

Explanation: The figure represents the load profile (electricity consumption) over a few days of an electric arc furnace (EAF) steelworks, which consumes up to 120 MW during steel production. The production schedule is optimized for off-peak hours (i.e. nighttime). This example illustrates a theoretical pay-as-produced PPA based on a 70 MW offshore wind asset, showing the asset's electricity generation during this period. Green areas: the PPA generation matches the EAF's consumption, electricity is purchased at the PPA's contractual price. Red areas: the EAF consumes electricity while the wind asset does not generate power. In this case, electricity must be sourced from the spot market, unless another hedging strategy is in place (e.g. future market). Yellow areas: the PPA generates electricity, but the EAF does not consume it. The surplus electricity is still purchased at the PPA price but must be sold on the wholesale spot market, posing a high risk of loss.

Although these risks can theoretically be mitigated through shaping (e.g., securing biomass backup or storage), doing so raises overall costs of the contract and is more challenging for EIIs due to the often very large scale of their energy needs.

Despite the EU's effective and ambitious policies to increase the share of renewable and low-carbon energy in its energy mix, recently reinforced doubts persist about the ability of its energy system and markets to support the industry's transition and competitiveness (BCG, 2024). These concerns are amplified by a shifting geopolitical environment, with competitors increasingly defending and promoting their industries in clean technologies. Other regions

also enjoy better access to natural resources – natural gas, renewable potential – and rely on different market structures to support their EIIs. Negative interactions between EU policy instruments – ETS, CBAM, EMD – risk further exacerbating these disadvantages for European producers, necessitating targeted interventions to ensure a successful industry transition.

11.4. Conclusion and policy recommendations

So far, competitiveness in relation to energy policy and industry has often been treated in the EU as a single challenge that could be addressed through a horizontal approach aimed at improving the integration and functioning of the energy sector.[223] (European Commission, 2023). Instruments such as PPAs and CfDs, recently reinforced and promoted, were often viewed from a supply-side perspective rather than addressing the urgent energy-competitiveness challenges faced by EIIs that also stem from external factors and distortions.

They may not be enough and in the face of all the challenges reviewed in this chapter, it appears that a sectoral intervention is necessary not only to achieve the transition but also to keep industry in Europe. To this end, during the next mandate, the EU could strive to:

Better coordinate national energy policies and continue diversification of natural gas supply through partnerships, in line with the External Engagement Strategy.[224]

Develop new low-carbon generation capacities, maximizing the potential of two-way CfDs without imposing overly restrictive legal frameworks in upcoming decisions, particularly for on-demand generation so as to minimize flexibility need and grid upgrades.

Protect as much as possible industrial sectors from foreseeable increases in all non-energy costs of their supply: network costs or taxes on energy, whether related to renewable energy support or not.

Conduct a comprehensive inventory of energy cost differentials with other jurisdictions and investigate the underlying factors, such as variations in market design (e.g., liberalized versus non-liberalized markets, tariff structures) and market distortions (e.g., subsidies). These factors should be better accounted for in CBAM and TDIs (such as recently adopted the Foreign Subsidies Regulation).

Consider specific, targeted sectoral interventions for EIIs exposed to international competition in order to facilitate their energy transition or ensure that already decarbonized sectors remain in the EU. Ideally, these interventions would strive to give EIIs access, for at least part of their consumption, to electricity at prices close to generation costs.

Leverage existing instruments, such as two-way CfDs, to drive the creation of new capacity at the lowest strike price with possibility to carve part of the capacity out of the support mechanism to sign PPAs at a price close to the strike price with EIIs exposed to international competition.[225]

Consider new flexibility mechanisms better suited to industrial consumers to address their specific constraints and challenges and at the same time free a flexibility potential on longer time horizons ("multi-days").

Although alternative market design proposals pose significant challenges, less intrusive modifications could be considered, especially during periods of tension in gas supply. For example, the 'shock absorber' mechanism (see Hogan et al. 2022) and its variations (Frangioni and Lacalandra, 2024), which modify the clearing process to reduce total costs without altering the merit order, would only require adjustments to the algorithm.

Finally, the EU should exercise great caution when considering economic analyses that

[223] European Commission (2023), Delivering on the EU offshore renewable energy ambitions, COM(2023) 668 final, 24.10.2023.

[224] European Commission (2022), Communication on EU external energy engagement in a changing world, JOIN/2022/23 final, 18.05.2022.

[225] Such a mechanism combining CfDs and PPAs is already being considered for the Belgian Princess Elisabeth offshore wind farm. The only missing element is prioritizing the EIIs vulnerable to international competition.

suggest energy-intensive industries, due to price differentials and their supposedly low value-added for the EU economy, should be permanently outsourced to regions with greater renewable energy generation potential.[226] First, as discussed, part of the higher energy costs in the EU is self-imposed, and many other countries do not yet have liberalized and transparent energy markets. Instead, they often rely on single-buyer models which allows for lower, averaged administrative—and frequently subsidized—tariffs for industry, which may divert investments flows more effectively than renewable energy potential. Second, such a strategy would mean abandoning industrial segments that are already among the most environmentally efficient globally, such as recycled steel (carbon and stainless) or aluminium, all of which are based on recycling processes in Europe. In contrast, production in third countries often relies on primary production routes – driven by lower energy costs –, resulting in a higher imported carbon footprint. This would undermine global climate goals and, in addition, impose significant CBAM costs on EU downstream sectors and consumers.

[226] Only certain sectors deemed strategic or selected based on economic criteria would be preserved, leading to a 'bonsai industry'—one that is small and carefully pruned to meet specific goals.

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12. EU Defence Industrial Policy : Towards a New European Military-Industrial Regime?

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Executive Summary

The transformation of the European military-industrial regime could be an appropriate political response to the geo-economic challenges facing the European Union (EU) and its member states, including the war in Ukraine. This new European military-industrial regime requires the activation of four politico-institutional changes: the supranationalisation of defence industry governance within the EU, the strengthening of interventionist policy instruments vis-à-vis the market, the integration of the European Defence Technological Industrial Base (E-DTIB) and the strengthening of the EU's actorness to regulate foreign dependencies, known as 'strategic autonomy'. However, despite certain political and institutional adaptations that have accelerated since 2022, EU Member States have not implemented the 'great transformation' that is a condition for the emergence of a more effective institutional organisation and policy instruments to govern the defence industry within the EU in a context of increasing conflictuality and international instability. How can a new European military-industrial regime emerge within the EU to respond more effectively to the geo-economic challenges of the 2020s? The first part of this chapter takes stock of the European military-industrial regime before the start of Ursula von der Leyen's second term as the head of the European Commission (2024-2029). The second part outlines the inadequacy of the European military-industrial regime to meet the geo-economic challenges of the 2020s. The third part demonstrates the reasons that make the proposed new European politico-military regime more desirable for both states and companies, while listing the political, institutional and economic obstacles to its establishment. The fourth part makes three recommendations aimed at removing these obstacles and activating changes in the short term – i.e. before 2027 – that will enable the EU, its member states and its companies to respond more effectively to the new strategic context.

Recommendation 1: Create an eleventh formal configuration of the EU Council, bringing together the Ministers of Defence, with qualified majority voting as the basis for decision-making.

Recommendation 2: Provide the European Commission with the budgetary instruments it needs to 'get the ball rolling' by defending a €100 billion investment plan in the defence sector, which could take the form of Eurobonds, and achieve the target of 3% of GDP for the 27 EU Member States in the next MFF (2029-2034).

Recommendation 3: Ensure the rapid success of the three major armament programmes (SCAF, MGCS, and RPAS), which are currently under negotiation between Germany, France, Italy and Spain, by making them the top military-industrial priority at the level of heads of state and government.

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12.1. Introduction

Transforming Europe's current military-industrial regime could be an appropriate political response to the geo-economic challenges facing the European Union (EU) and its Member States: the rise of China, the accelerating disengagement of the United States from Europe, the war in Ukraine, and the hybrid attacks on critical industrial infrastructures. The European military-industrial regime is defined as the political organisation and policy instruments used by the EU and its Member States to govern the defence industry. This new European military-industrial regime requires the activation of four politico-institutional changes: the supranationalisation of defence industry governance within the EU, the strengthening of interventionist instruments vis-à-vis the market, the integration of the European Defence Technological Industrial Base (E-DTIB) and the strengthening of the EU's actorness to regulate foreign dependencies, known as 'strategic autonomy'.

However, despite certain political and institutional adaptations that have been underway since 2022, the EU Member States have not encouraged the structural transformation of the European military-industrial regime that has been underway since the beginning of the 21st century. The current European military-industrial regime can be defined as intergovernmental (the EU's agency is weak), liberal (limited intervention by the EU vis-à-vis the market), fragmented (industry is led by national champions) and transatlantic (strong dependence of European states on the United States and its companies).

How can a new European military-industrial regime emerge within the EU to respond more effectively to the geo-economic challenges of the 2020s?

12.2. The current state of Europe's military-industrial regime

At the start of Ursula von der Leyen's second term as the head of the European Commission (2024-2029) following the 2024 European elections, and before the College of Commissioners is appointed in autumn 2024, the current European military-industrial regime is defined by four political-institutional features.

Firstly, the governance of the defence industry is intergovernmental within the EU. The most strategic decisions are taken by the heads of state and government in the European Council, by the ministers in the informal Defence Council and by a unanimous vote. Extending the institutionalisation of the Common Security and Defence Policy (CSDP) initiated in 2001, the heads of state and government decided to create the European Defence Agency (EDA) in 2004. An intergovernmental body under the authority of the Council, the EDA's mission is to identify capability requirements shared by European states in order to rationalise and Europeanise demand (Karampekios and Oikonomou, 2015). Denmark joined the CSDP and therefore the EDA in 2022 following a referendum held in the context of the war in Ukraine, with 67% of voters choosing to lift its opt-out. In addition, the Permanent Structured Cooperation (PESCO) created by the Lisbon Treaty in 2009 was activated in 2017, with all EU Member States taking part except Malta. By 2024, PESCO will have 68 military-industrial projects, including the European unmanned aerial vehicle (RPAS, also called Eurodrone), a programme involving France, Germany, Italy and Spain.

In 2019, a supranationalisation of defence industry governance emerged. While the European Commission had begun to put defence industrial policy on its agenda as early as the 1990s (Faure, 2022a), the European Commission became a fully-fledged player in the early 2010s, generating institutional rivalries with intergovernmental players such as the EDA (Fiott, 2015). For the first time in the history of the EU, the European Commission included defence industrial issues in the portfolio of the Commissioner for the Internal Market, Thierry Breton, and created a new Directorate-General for Defence Industry and Space (DG DEFIS). Thierry Breton could start a second term as European Commissioner for the period 2024-2029 with a portfolio entitled 'Industry, Strategic Autonomy' before the hearings within the European

Parliament begin. However, DG DEFIS cannot aspire to play the role of 'game changer', and remains confined to the role of 'gap feeder' – to quote a DG DEFIS agent during an interview – insofar as it has only a small number of officials and a limited budget.

Secondly, the EU's defence industrial policy is liberal in the sense that EU public intervention in the market is limited. Following a proposal from the European Commission, two directives known as the 'defence package' were passed by the Parliament and the Council in 2009 (Blauberger and Weiss, 2013). The European Commission's ambition was to limit the repeated use of Article 346 TFEU by the Member States in order to create an internal armaments market and consolidate the E-DTIB. The aim was therefore to enhance the competitiveness of companies and the efficiency of the market by deregulating national norms ('market making' strategy) rather than preferring an interventionist policy aimed at organising and regulating the market within the EU ('market correcting' strategy) (Scharpf, 1999). However, a political turning point was reached in 2017 when the European Commission created the European Defence Fund (EDF). For the first time in its history, the EU obtained its own budget to finance industrial projects in the defence sector (Hakansson, 2021). Part of the 2021-2027 multiannual financial framework (MFF), the EDF, which is managed by DG DEFIS, is financing the research and development phase of armament programmes carried out in Europe to the tune of 8 billion euros over this seven-year period.

Thirdly, the E-DTIB remains largely fragmented around national champions such as Dassault Aviation, Leonardo, Rheinmetall, Saab, Safran and Thales, which dominate the European defence industry (Faure, Joltreau and Smith, 2019). The list of failed European consortia projects is long, from the aborted attempt to bring EADS and BAe Systems together in 2012 to the blocking of the takeover of French company STX by Fincantieri in 2021. However, industrial consolidations led to the creation of MBDA in the missile sector and EADS in the aerospace sector in the early 2000s and the transformation of EADS into Airbus in 2014. In the land sector, a merger took place in 2015 between Nexter and Krauss-Maffei within the Franco-German consortium KNDS, which remains weakly integrated (Möhring, 2024). In the naval sector, the Naviris consortium brought together the French company Naval Group and the Italian company Fincantieri after 2020 (Faure, 2024a).

Fourthly, European states produce and acquire armaments through ad hoc inter-state cooperation outside the EU, such as the armament programmes currently under negotiation for the SCAF fighter aircraft (Germany, France, Spain) and the MGCS tank (Germany, France), when they do not choose to import equipment from outside the EU, mainly from the United States (Faure, 2020).

12.3. Europe's military-industrial regime out of step with geo-economic challenges

The war in Ukraine has revealed the inadequacy of the current European military-industrial regime to meet the geo-economic challenges facing the EU and its Member States in the 2020s.

At state level, it has taken two years of war, resulting in the deaths of 200,000 civilians and soldiers on European soil (Cooper et al., 2023), for a majority of EU Member States to reach the target of 2% of GDP for military spending. This political objective had been formulated within NATO a decade earlier, following the annexation of Crimea by Vladimir Putin's Russia in 2014. However, this 'rearmament of Europe' is not a finished process for several reasons.

Firstly, a quarter of the countries have still not reached this target, namely Belgium, Croatia, Italy, Luxembourg, Portugal, Slovenia and Spain (NATO, 2024). Secondly, a state that devotes 2% of its GDP to its military budget is insufficient in a context of high-intensity warfare that lasts over time. Such a level of budgetary commitment does not correspond to a 'war economy', a discursive framing chosen, among others, by French President Emmanuel

Macron (2024). By way of comparison, Ukraine was spending 35% of its GDP on military expenditure by 2022 (Bellais, 2023). Thirdly, these budgetary investments have been made by European states without any prior political coordination. The possibility of national rearmament by states, leading to increased industrial competition in Europe and a weakening of the EU's shared capacity for action, cannot be ruled out (Béraud-Sureau, 2022; Faure, 2024b). Fourthly, national military budgets remain fragile and uncertain in the medium term due to the low growth rate in the eurozone as a whole, which accentuates Europe's 'economic lag' from the United States (Draghi, 2024). Fifthly, austerity policies in the defence sector (Hoeffler, Mérand and Joana, 2021) could shape national military policies in the upcoming years in some European countries. This policy frame was the one chosen by the French Prime Minister, Michel Barnier, in his first public appearance as the primus inter pares. PM Barnier was appointed in early September 2024 by Emmanuel Macron, almost two months after the unexpected dissolution of the National Assembly decided by the Head of State.

In the defence industry, companies face a twofold problem in the context of interstate warfare on the European continent, which is mirrored in other industrial sectors such as automotive, steel and new technologies (Defraigne, Wouters, traversa and Zurstrassen, 2022; Draghi, 2024). On the one hand, companies do not have sufficient commercial outlets with their client state: the markets are too small on the demand side. On the other hand, their production apparatus is not efficient enough to meet growing demand: production output is too low and too slow on the supply side, resulting in high production costs (Cottarelli and Virgadamo, 2024) and an inability to meet the targets set by the EU. In 2024, the defence industry was able to transfer only half of the one million rounds of 150mm ammunition that the EU had promised Kiev a year earlier (Fiott, 2024a). Moreover, the fragmentation of the European defence industry poses a problem for the standardisation and interoperability of military equipment: 'For 155 mm artillery alone, EU Member States have provided ten different types of howitzers to Ukraine from their stocks, and some have even been delivered in different variants, creating serious logistical difficulties for Ukraine's armed forces' (Draghi, 2024: 51).

At EU level, the political will of European actors is embodied in the emergence of political notions such as 'European sovereignty' (Fiott, 2021), 'strategic autonomy' (Franke and Varma, 2018) and the 'Geopolitical Commission' (Haroche, 2023a), which, only ten years ago, were alien to their discursive practices. This shift in political framing has been described as a 'geo-economic turning point' within the EU (Fiott, 2024b): armament policy is no longer shaped solely as a problem of economic competitiveness embodied in the 'defence package', but as a politico-military problem requiring the implementation of an industrial policy. This change in political framework has had the effect of putting industrial defence issues at the top of the EU's political agenda. There have never been so many European Councils at which EU defence policy, and in particular its industrial policy, has been discussed since 2022. This has led to a number of political decisions that would not otherwise have been taken, or not as quickly, by the heads of state and government and the Presidents of the European Council and the European Commission (Hofmann, 2024).

In 2023, the Council and Parliament voted in favour of the ASAP (500 million euros to increase the production of munitions and missiles by European companies) and EDIRPA (300 million euros to support joint procurement by European states) regulations. In 2024, a few months before the European elections, the European Commission and the EEAS extended this work by publishing EDIS and a proposal for a regulation (EDIP), with a budget of one billion euros, currently being negotiated by the Parliament and the Council (Faure and Zurstrassen, 2024; Fiott, 2024c). In the same year, the twenty-seven EU heads of state and government, including Hungarian Prime Minister Viktor Orban, decided to increase the budget of the European Peace Facility (EPF) to €18 billion (Faure, 2024b). The EPF is a financial instrument that was created in 2021 with a budget of just €5 billion, and which has been used to deliver arms to the Ukrainian armed forces since the start of the war.

The total budgetary resources available to the EU for action in the defence sector

reached 30 billion euros in 2024 (Fiott, 2024a). This volume of budgetary commitment had seemed unthinkable in 2019, at the start of Ursula von der Leyen's first term of office. Against the backdrop of the Covid-19 pandemic, the heads of state and government had decided to reduce the EDF budget from €13 billion, the objective formulated at the start of the European negotiations, to €8 billion, the amount that the EDF will finally be spending on the 2021-2027 MFF. However, many experts on defence industrial issues consider that this budget envelope is largely insufficient to support Ukraine and to defend Europe (Faure, 2022b; Haroche, 2023b; Fiott, 2024d). European political decision-makers have only partially succeeded in transforming the setting of military-industrial objectives into policy instruments with sufficient budgetary and institutional resources not just to adapt but to transform the current European military-industrial regime.

Outside Europe, the dependence of European states on US industry has not diminished, but rather increased since the start of the war in Ukraine. In 2023, the volume of imports of US military technology doubled: 78% of the weapons purchased by European states were imported from states outside the EU, with almost two-thirds (63%) coming from the United States (Letta, 2024). These data converge with those that demonstrated the 'illusion' of Europe's strategic autonomy even before the outbreak of the war in Ukraine (Brooks and Meijer, 2021). This dependence of European states on American companies and therefore on the United States is a political issue in the context of a war being fought near the EU's borders against a nuclear power that is increasing industrial demand, but also of political instability in the United States. Donald J. Trump is leading in the polls two months before the November 2024 presidential election, in which he is running for a second term. His return to the White House could accelerate the United States' military disengagement from Europe by reducing its budgetary contribution to the Ukrainian armed forces and to NATO.

12.4. Comparative advantages of the new regime and obstacles to its establishment

The inadequacy of the current European military-industrial regime poses a fourfold challenge for European political and industrial decision-makers: the lack of funding and budgetary investment by governments for the defence industry, the insufficient production capacity of companies in Europe to meet military threats, the lack of coordination between political and administrative actors within the EU to take decisions quickly in the context of a crisis, and the increased dependence of European governments on American defence industry. Faced with these challenges, the new European military-industrial regime defined in the introduction has four comparative advantages that make it desirable to both large companies and governments.

On the one hand, no European state, not even Germany or France, has sufficient budgetary resources to invest in the defence industry to make it a competitive and autonomous sector on a global scale vis-à-vis American or Chinese companies. To achieve this, the EU could encourage massive, coordinated budgetary investment through an interventionist industrial policy to meet the geo-economic challenges. Such an interventionist policy would be desirable for large companies, which have for years been calling for more public funding to enable them to embark on technological breakthroughs and successfully complete the major armament programmes (SCAF, MGCS, RPAS) currently being negotiated. In this way, major companies would be able to use these EU budget resources to further their technological ambitions and commercial objectives, while at the same time promote the creation of skilled jobs on European soil. In addition, the pursuit of a political agenda based on the strategic industrial and technological autonomy of European states vis-à-vis the American defence industry would favour large companies as well as small and medium-sized enterprises (SMEs) established within the EU (Béraud-Sudreau and Faure, 2021). Such a 'European preference' would make it possible to use European public funds to invest in the European defence industry rather than help to finance the American, Korean or Turkish industry by importing military equipments from outside the EU.

On the other hand, the Member States could also benefit from this new European military-industrial regime insofar as the integration of the E-DITB would lead to large-scale industrial dynamics of mergers/acquisitions in each branch of the sector (land, aeronautics, naval, electronics) and to a continent-wide division of industrial labour around European champions. This reorganisation of the defence industry in Europe would make companies fewer in number and more efficient through increased specialisation, leading to lower production costs and higher productivity. In addition, the supranationalisation of defence industry governance would not weaken or marginalise the political positions of the Member States, but rather strengthen them. Supranational governance would promote coordination and the political effectiveness of states negotiating within the EU, following the model of the European integration of monetary policy in the 1990s (Jabko, 2007). Moreover, since Brexit, no 'populist' political party or leader has defended the exit from the Eurozone of the country he or she governs or aspires to govern.

Although the new European military-industrial regime, seeing the comparative advantages, is counting on the current regime to meet the geo-economic challenges facing the armaments sector, several groups of stakeholders are defending the political-institutional status quo and are opposing the emergence of a new regime for a variety of reasons.

Firstly, national political leaders who defend a sovereignist vision of the defence industry, such as the Polish conservatives of the PiS, Viktor Orban in Hungary or the Rassemblement National (RN) in France, oppose any change to the intergovernmental and liberal paradigm of the current European military-industrial regime in the name of protecting national sovereignty in line with their preference for a Europe of nations more autonomous from the United States. The intergovernmental order would be unsurpassable insofar as the States are the only political actors in the EU with the political legitimacy derived from national sovereignty, which enables them to govern a core state power such as armaments policy. This political line is defended by far-right groups in the European Parliament such as the Patriots (PfE) and the European Conservatives and Reformists (ECR), as well as a majority of conservative MEPs in the European People's Party (EPP). This is the position of French MEP François-Xavier Bellamy, who was appointed rapporteur for the EDIP programme in the European Parliament in September 2024.

However, the political status quo in favour of intergovernmental governance carries the risk of the EU stalling, i.e. of an institutional crisis, in addition to the slowness of decision-making and the lowest common denominator trap that are intrinsic to the principle of unanimous voting, problems that have arisen time and again. Indeed, the PiS conservatives at the head of the Polish government until autonomous 2023 and Viktor Orban, Hungarian Prime Minister since 2010, have always found themselves in a political minority at the European Council negotiating table, which has led them to accepting the proposals put forward by the majority of other Member States in favour of military and political support for Ukraine. However, the balance of power at the European Council could be different if more 'populist' national political parties were to take the helm of other governments, especially those of large states, as in France with Marine Le Pen's Rassemblement National (RN).

Secondly, the civilian and military agents in the defence ministries of each Member State are working to maintain their dominant bureaucratic position in the European governance of the defence industry, which is leading them to oppose new transfers of powers or resources to the EU. For example, the majority of French civil servants in the Ministry of Defence are opposed to the supranationalisation of the EU's political regime, which they see as a threat to the national sovereignty of which they see themselves as custodians. In Germany and the Netherlands, the administrative players are reluctant to accept more dirigiste public intervention mechanisms from the EU institutions because of their attachment to bureaucratic practices that are more rigorous on the budgetary front within the state and more liberal with regard to the market. In Denmark and Italy, but also in Latvia and Romania, the prospect of European strategic autonomy is perceived by the bureaucratic players – and sometimes to the detriment

of the political leaders of these countries – as a threat of accelerated disengagement from the United States rather than the strengthening of the EU's military and industrial agency.

Finally, the large national companies that dominate the defence industry in Europe aim to retain the quasi-monopolistic position they often enjoy with their client state within the national institutional framework. These companies do not see it in their interest, at least in the short term, to open up the defence market to European competition. Instead, they work to preserve their industrial rent in order to retain their commercial outlets.

12.5. Conclusions and policy recommendations

This final section puts forward three policy recommendations for transforming Europe's military-industrial regime so that the EU and its Member States are better organised and better resourced to meet the geo-economic challenges.

Recent years, and in particular since 2022, have shown that the political will of certain key players is constrained by the intergovernmental order of European defence industry governance. The same causes are likely to produce the same effects in the future. To avoid such a dynamic of institutional status quo, one of the political priorities must be not only the creation of a formal Council of Defence Ministers, but also one that can operate by qualified majority voting. To avoid a political campaign of opposition from sovereignist political leaders, the heads of state and government would retain their right of veto within the European Council.

The second obvious conclusion to be drawn from this analysis is that it is unlikely to enhance the effectiveness of the European military-industrial regime without granting the EU more resources, particularly budgetary funding. Negotiations on the next MFF – which finances the EDF among other things – will be the main challenge of the 2024-2029 EU mandate. The rise of far-right national governments in addition to those led by the conservative right is likely to make it difficult to achieve a substantial increase in the EU's Community budget (3% of the GDP of the 27). Contemporaneously with waging this essential political battle, the creation of a €100 billion investment fund for the defence industry along the lines of the proposals put forward by Thierry Breton is a more flexible proposal institutionally, since it would be an ad hoc fund from which the member states and their companies could benefit directly.

We can expect political opposition from certain states on this front of budgetary effort, which could be overcome by demonstrating not only political will but also institutional creativity by playing on Europe's variable geometry and multi-speed governance (Faure and Smith, 2019). The European Investment Bank (EIB) is an institution whose raison d'être is to support EU policies. In December 2023, when she was still Prime Minister of Estonia, the new EU High Representative, Kaja Kallas, proposed the creation of EU defence bonds to boost investment in the sector (Greenacre, 2024). This ambitious and innovative idea should be taken up and supported by institutional and political players with ambitions to make the European military-industrial regime more efficient for states and companies alike. In the same spirit of institutional innovation to address the limitations of the system without resorting to treaty reform, the mechanism of Important Projects of Common European Interest (IPCCE) could prove suitable for the establishment of a new European military-industrial regime. These proposals are compatible and convergent with the recent reports prepared by Enrico Letta (2024) and Mario Draghi (2024; see, Brzozowski, Michalopoulos and Moller-Nielson, 2024).

A third obvious point is that the political work carried out inside the EU must be articulated with the institutional and industrial efforts undertaken outside the EU. The European Commission could take the political initiative for a new partnership with the UK by approaching the new Labour government led by Keir Starmer, who has been less reluctant to engage the EU than his predecessors since the Brexit. This recommendation has already been proposed by British experts such as Anand Menon (2024). Moreover, this would not mean falling into two pitfalls: on the one hand, dispersing energy and political will to create yet another bi-

lateral agreement when the priority objective should be to strengthen the tools at the service of the EU and its Member States; on the other, having overly high expectations of the British partner. While post-Brexit UK remains a major military power in Europe, the companies that make up the British defence industry are no less dependent on the US market and the US Department of Defense than they were when the UK was still part of the EU (Béraud-Sudreau and Faure, 2024).

A more appropriate and urgent lever for institutional and industrial change to establish a new European military-industrial regime is to push ahead more rapidly and effectively with the three major armament programmes: SCAF, MGCS and RPAS. To achieve this, these armament programmes must be priorities on the political agenda of heads of state and government, and not just at the level of defence ministers and their administrations. If there are no regular meetings at the highest political level of the states concerned to cement decision-making, history has shown that the failure of European cooperation programmes can occur after several years of negotiations (Krotz, 2011; Faure, 2020; Pannier, 2020). Intensive political efforts are still required to ensure that the SCAF, MGCS and RPAS programmes are 'too big to fail'. Much stronger political and economic incentives should be put in place to achieve the EDA objective, taken up by EDIS, of doubling the volume of armaments (from 18% to 35%) produced in cooperation between several states on the European continent. The success of these major programmes would be a powerful instrument for consolidating and integrating the E-DITB, boosting industrial productivity and ensuring military technological excellence for decades to come.

The political path to strengthening the EU's industrial policy in the defence sector during the 2024-2029 mandate will be narrow and steep, but it exists and has already been marked out.

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13. The Challenges of the New European Industrial Policy: Strengthening Competitiveness while Enhancing Economic Security

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Executive Summary

Since the COVID-19 pandemic and the Russian invasion of Ukraine, the global environment has undergone dramatic shifts, with security issues now taking center stage in shaping the global economy. The concept of security itself is evolving, as the traditional notion of national security now extends beyond defense to include economic dimensions, creating significant challenges for the EU, whose institutions were originally designed for a rules-based world that no longer exists. The two key challenges facing Europe in the new fragmented world are: strengthening sustainable growth and competitiveness, on the one hand, and enhancing defense and economic security, on the other. These challenges should serve as the foundation for Europe's "Open strategic autonomy" (OSA), which involves incorporating national security considerations into the EU's economic and industrial policies, similar to approaches seen in the US and Japan. In the report's final chapter, we focus on the reformulation of European industrial policies and highlight three key directions to be followed: first, revitalizing the single market and advancing digital services; second, fostering common initiatives in industrial and technological sectors; and third, securing adequate funding and tools, including at a significant common level.We emphasize the importance of deeper integration of the digital market and knowledge-intensive business services (KIBS), which could be critical for Europe's future competitiveness. Equally important is the implementation of a common industrial policy, potentially centered around a Strategic Fund, recently renamed the Common Competitiveness Fund. Additionally, Europe could benefit from establishing its own version of the American DARPA. The Projects of Common European Interest (IPCEI) should also be re-launched and strengthened, with more resources and streamlined implementation procedures. In terms of enhancing the defense and the economic security of Europe, we suggest that in the implementation of the European Defense Industrial Strategy (EDIS) greater autonomy should be pursued particularly in developing advanced technologies and production capabilities in this area. To achieve these objectives, Europe requires more resources and instruments than it currently possesses. Various financial strategies, as indicated in this chapter, should be explored, including creating a centralized investment and fiscal capacity, launching new projects and common resources in a post-Next Generation EU framework (an "enhanced NGEU"), reforming the EU budget, and completing both the Banking Union and the Capital Markets Union to support private investment. Additionally, the role of the European Investment Bank should be significantly bolstered. The next five years of the new European legislature will be crucial for implementing these initiatives. In this context, greater differentiation in the path of European integration may become an unavoidable step, with integration in selected areas by groups of countries based on their preferences taking different forms. The greatest risk would be to maintain the status quo, as this would likely render the EU unable to address the many challenges that lie ahead.

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13.1. Introduction

Radical changes have characterized the global economy since the Covid pandemic and the Russian invasion of Ukraine. Uncertainty and risk increasingly influence economic life, with interdependence becoming a source of both opportunity and vulnerability, often referred to as "weaponized interdependence" (Farrell and Newman, 2019). The global environment has changed radically as security issues have taken the front position in impacting on global economy (Bergsten, 2022). The role of security itself is changing. While initially being considered a short-term and possibly reversible shock, it is now becoming a long-term feature. The security dimension is here to stay.

This new world has created difficult challenges for the EU, whose economy and institutions were designed to operate in a rules-based world (Guerrieri and Padoan, 2020). The European Union had developed a model of increasing integration, concentrated on economic, social, and financial issues, but with little attention to the direct provision of security (Zuleeg, 2023).

There are two fundamental challenges in the new global context facing Europe. First, the green transition makes the fundamental transformation of European economy and manufacturing imperative. It involves shifting away from energy-intensive production towards less energy-intensive industrial segments and embracing digital technologies to enhance competitiveness. The process of environmental renewal and greater energy security must be pursued in conjunction with the strengthening of the competitiveness of the European economy and industry, linking climate change policies with industrial and technological policies. More and more evidence shows that for a significant period of time a green industrial strategy will have a negative impact on productivity (Bijens 2024). This presents a formidable challenge for Europe amidst global industry and technological competition, particularly between the United States and China, both of which are implementing expensive industrial policies and mobilizing substantial public resources.

Second, the new global context particularly in light of geopolitical tensions and global economic shifts poses significant challenges to the economic security of the EU. The traditional concept of national security is evolving to include economic security beyond traditional defense. The European Commission released its latest package of economic security measures at the end of January 2024 (European Commission, 2024). It includes a broad range of initiatives: enhancing screening for inbound and outbound investments, controlling sensitive exports, and increasing research funding for dual-use technology. The package implements and further develops the European Economic Security Strategy launched in June 2023 (European Commission, 2023a). The objective is to foster growth, protect the EU against unfair trade practices, and collaborate with allies, aligning it with the principles of "promoting, protecting, and partnering."

Europe therefore faces a multiple challenge: enhancing economic security while strengthening sustainable growth and competitiveness. A greener and more competitive Union can indeed provide an effective response to make the EU more resilient and secure. The two challenges are in many ways closely intertwined.

This multiple challenge must form the basis of Europe's so-called "open strategic autonomy" (OSA), a concept that has long been debated in Europe (Tamma, 2020; Meunier & Nicolaidis, 2019; Tocci, 2021; Schmitz and Seidl, 2023; Lavery, 2023; Wigger, 2023) and has played a significant role in defining the strategies of the von der Leyen Commission in recent years (Steinberg and Wolff, 2023).

The goals of enhancing economic security and strengthening industrial competitiveness through an OSA entails integrating 'national' security considerations into EU economic and industrial policies, akin to approaches taken in the US and Japan. It is a task that requires a series of overly complex initiatives and policies, both domestically and internationally, with

positive complementarities to be exploited and a lot of trade-offs between them.

This final chapter analyzes the policies and strategies that Europe can adopt to boost industrial competitiveness and sustainable growth on the one hand, and to strengthen defense and security on the other, and the interaction between these two sets of policies. The chapter argues that achieving OSA and the twin goals of enhancing industrial competitiveness and economic security requires maintaining openness and deepening international European integration together with increasing financial resources at the European level and providing effective EU governance.

13.2. Digital competitiveness and KIBS services

In the medium to long term, the EU's new sustainable growth strategy revolves around the Green Deal and a new industrial policy (European Commission, 2023b; Baccaro and Hadziabdic, 2023). The transition to a green economy offers the opportunity to modernize and restructure the European economy (Von der Leyen, 2022), which has seen modest growth in recent years compared to China and the US. To regain competitiveness, Europe needs to upgrade its production structure, shifting from energy-intensive to less energy-intensive sectors and towards clean and digital technologies as planned in the Green Deal.

In particular, the EU has lost competitiveness compared to the United States and China, especially in terms of digital technological capacity. This has significant implications for key sectors central to the current digital revolution, such as microprocessors, big data, and artificial intelligence. We are talking about products and sectors with high potential for future productivity growth in all leading economies, in which European countries must succeed in positioning themselves optimally (Canter, 2023). Not least because the transition to clean technologies will also radically transform industries that are traditional pillars of European competitiveness, as the rapid growth of electric cars in the automotive industry demonstrates.

It is thus essential that Europe develop an appropriate adjustment process to the new technological paradigm that is emerging. Europe cannot afford to repeat what happened at the turn of the 21st century when the world economy was first digitally transformed with the introduction of information and communication technologies (ICT). Europe's response then was deeply disappointing, its adaptation was late and partial, and this weighed on Europe's economic and productivity growth in the years that followed (Guerrieri, 2021).

To offer a different response this time, Europe needs an industrial strategy with a medium and long-time horizon in order to promote upstream research, innovation, and the creation of the industries of the future, and all consistent with the framework of economic security and competitiveness of the European production model.

In this perspective, it is important to strengthen and leverage the single market, which remains a key asset for the growth and competitiveness of European businesses. The Single Market not only stands as a cornerstone of European competitiveness but is poised to become the focal point for the EU's sustainable growth with the Green Deal.

Targeted policies are needed to improve the functioning of the Single Market, such as more effective and simplified regulation and management of public procurement, thereby also enhancing attractiveness and thus investment from outside the EU. In particular, the strengthening of the Single Market must include extending it to the services that have remained outside its scope, notably those related to digital diffusion and transformation, telecommunications, and energy (Letta, 2024).

Services now account for the bulk of the income generated in advanced economies, and business services - the so-called advanced tertiary sector - are fundamental and complementary inputs to manufacturing output. They include digital services, and in particular

knowledge-intensive business services (KIBS), where the EU's competitiveness has declined significantly in recent years. These are fast-growing sectors that are driving structural changes, and productivity gains essential for countries' long-term economic growth in the climate and digital transition. Supporting productivity growth is essential as we know that one of the causes of Europe's growth gap with the United States over the last decade has been Europe's lower productivity growth in services where integration has been most lacking (business services, financial consulting, large-scale distribution, etc.) (Guerrieri and Padoan, 2020).

Further liberalization and integration of services market would provide strong incentives for the restructuring of European economies and enterprises at a continental scale, fostering positive changes in production and innovation systems, leveraging economies of scale and facilitating appropriate facility relocations within the EU. A recent IMF study suggests that deeper integration within the EU could potentially boost Europe's GDP by 7 percent (IMF, 2023; Guerrieri, 2021).

13.3. A common industrial policy and European champions

Strengthening and restoring the industrial and technological competitiveness of the EU goes beyond national policies. No European country will be able to do it alone. It requires a concerted effort at the European level, avoiding protectionist tendencies and benefitting on a European scale (Aghion, 2023).

Europe has lost most ground in frontier technologies, which require substantial economies of scale that extend well beyond the economic space of a single country. Scale economies are the key to success in many areas, such as Artificial Intelligence where Europe is particularly lagging behind. Indeed, a fundamental challenge in many sectors and segments is precisely the creation of large European groups. To compete with non-EU big tech, Europe needs to join forces so that "European champions" can emerge from national industrial ecosystems on a global scale.

Some initiatives have recently been launched to promote Europe's economic resilience and industrial and technological capacity, particularly in the green and digital sectors. These include the European Chips Act, the Green Deal Industrial Plan, and the Net-Zero Industry Act (Tagliapietra, Veugelers 2023). However, the European Union is still a long way from having implemented an effective and adequate industrial policy strategy.

Focusing efforts and strengthening the Digital Single Market, increasing investment in knowledge and human capital, and improving risk capital for start-ups are essential. In addition, strategic investments in critical technologies are needed, ensuring that some production is EU-based and is sourced from a diversified supply chain. As in the case of quantum computing and detection technologies.

As EU Commission President von der Leyen has reiterated, the EU must achieve the industrial transition to zero emissions by creating opportunities for sustainable growth without generating new dependencies. More generally, a common industrial policy is a kind of "European public good" to be pursued because of its potential to generate widespread benefits (Buti et al., 2023). To do this, it needs a plan.

The Commission's Green Industrial Plan proposed the creation of a European Sovereign fund aimed at generating positive externalities for the benefit of all Member States in many of the directions mentioned above. This is the case for many R&D investments where Europe has lost a lot of ground and is lagging behind its main competitors. Such a policy at the European level could indeed be a way of reconciling public support for economic competitiveness with maintaining the good functioning of the common market, compared with the risks of fragmentation inherent in an alternative present strategy based on relaxing the constraints on state aid.

As is well known, deep divisions among member states have blocked the project of a strategic fund for now. In its place something quite different and much less ambitious has been approved: the Strategic Technologies for Europe (STEP) platform, which aims to bring together the EU's existing programs for high-tech projects.

Nevertheless, in her program presented last July to the European Parliament, re-elected President Von der Leyen proposed something similar to the Strategic fund naming it a new "European Competitiveness Fund" (Von der Leyen, 2024). It will be focused on common and cross-border European projects that will drive competitiveness and innovation – notably to support the Clean Industrial Deal. It is the right path to take, also in view of the majority of countries that this time will be able to approve it. However, the financing constraint remains, to which we will return later.

In this perspective, the Projects of Common European Interest (IPCEI) should also be re-launched and strengthened, both in terms of resources and implementing procedures. As currently configured, IPCEI approval times and procedures are excessively long, and the objectives of the projects approved are too limited (Poitiers and Weil, 2022). IPCEIs, if their approval and implementation procedures are suitably streamlined and if they are endowed with more public and private resources, could become part of the policy tool kit of instruments to promote and support sectors of strategic importance for Europe, such as microelectronics, hydrogen, batteries, sustainable mobility, health, and cybersecurity. Similarly, the role of the European Investment Bank should be significantly strengthened, by providing it with additional resources and tools.

In the same vein, a European version of DARPA, the public research agency that has been operating for decades with relative success in the United States, could be created, considering that European companies face the greatest obstacles and difficulties in developing the technological and innovative implementation phases. Its mission should be to select and promote innovative technologies and processes in the transition phase from basic research to implementation and commercialization. A European version would be particularly suitable for the selection of high-risk innovative projects.

Finally, it should be noted that it is certainly important that industrial policy initiatives be designed and implemented without harming the competitive conditions of the internal market, which are now threatened by the relaxation of state aid restrictions. However, as leading-edge technologies require significant economies of scale, the Commission should review and update its competition rules to help companies grow and better compete in global markets. In this vein, Mario Draghi's report and speeches have called for the rethinking of EU competition policy and enforcement to allow for market consolidation and the creation of so-called "European champions". In presenting her program to the European Parliament, re-elected President von der Leyen also said, "I believe that we need a new approach to competition policy, one that is better focused on our common goals and more supportive of companies growing in global markets, while always ensuring a level playing field." Furthermore, she said, "This should be reflected in the way we assess mergers so that innovation and resilience are fully taken into account."

13.4. Defense and economic security

The other major goal is enhancing the defense and the economic security of Europe. The process of European integration since the Treaty of Rome has always been primarily driven by economic motivations. Foreign policy and defense capabilities have remained almost entirely in the hands of individual member states. However, such configuration is no longer sustainable. Economic and geopolitical risks can no longer be managed separately. The ultimate goal must be to make the Union and its member states more resilient in the face of challenges and geopolitical shocks (Fiott, 2024), while minimizing the negative impact of these measures and policies on Europe's competitiveness and growth dynamics.

Regarding defense, several obstacles stand in the way of a full-fledged common European defense policy given that the EU is not a Federal State. In concrete terms, this means, in the first stage, limiting to coordinating military expenditures of individual states and promoting a more integrated single market for defense procurement which would help reduce costs through better exploitation of comparative advantages and the scale of production.

In this context, the Commission proposed the European Defense Industrial Strategy (EDIS) at the beginning of March 2024. It aims to promote an increase in European production capacity through a positive interaction between domestic supply and demand and the development of related technologies. At the same time, it aims to reduce the dependency on imports of military equipment, which is currently very high. Given the correlation between increased security and procurement costs, it would be appropriate to focus on greater autonomy especially in developing advanced technologies and production capabilities, and to concentrate on reducing import requirements in this area. The Commission's plans, at least so far, have somehow neglected this aspect.

Regarding economic security issues, some initial responses came as already noted in a document of the Commission in June 2023 (European Commission, 2023) and more recently, by the end of January 2024, in the second package of economic security measures (European Commission, 2024) that includes a broad range of initiatives: enhancing screening for inbound and outbound investments, controlling sensitive exports, and increasing research funding for dual-use technology.

These are all relevant actions to be implemented with an underlying limitation. While the Commission advocates for the "Europeanization" of EU economic security rules to ensure consistency among Member States' measures, the latest proposals are not interventions at the EU level. Primarily they urge Member States to take further action and engage in consultations for additional joint policy initiatives (Rosen and Meunier, 2023). It should also be considered that the evolving global landscape necessitates responses to shocks, including the use of "offensive" instruments like sanctions alongside defensive ones such as bans on exports. But this is a difficult area for Europe to tackle. The EU's treaties, designed to support openness to international investment and finance, rule out restrictions on capital and payment movements between the EU and third countries. Consequently, strengthening the EU's ability to act effectively on the international stage is essential (see below).

It should also be considered that the above-mentioned instruments regarding economic security were initially developed with an implicit focus on China (Beaucillon, 2023), although they were designed to be applicable in a broader context in relations with third countries. Particularly in strategic sectors like clean energy, where items such as batteries for electric vehicles, photovoltaic panels, wind turbines, and critical materials are vital, Europe's primary concern is mitigating its over-reliance on Chinese companies and global supply chains (European Commission, 2023b).

The costs of reducing and/or cutting ties with China are, of course, very high, and more so for Europe than for the United States (European Commission, 2020). More recently, the EU has proposed a strategy of "de-risking" to address vulnerabilities stemming from economic interdependence with China. This strategy aims to diversify supply sources, preserve technological independence and preserve control over GVCs. In other terms, Europe wants to prioritize national and European security interests in economic and political relations with Beijing (Guerrieri and Padoan, 2024).

Nevertheless, the EU's internal litigations remain a significant obstacle in its relationship with China. While some Member States have taken steps to enhance economic security by adopting measures against China, different views on China persist within the EU. This lack of cohesion allows China to exploit divisions within Europe, undermining its ability to negotiate independently on the international stage (Bergsten, 2022). Achieving consistency and a

unitary European strategy towards China should thus be a paramount objective of a unified European economic security strategy.

13.5. Industrial Policy and Openness

In Europe, the concept of strategic autonomy has often been defined as "open strategic autonomy," (OSA) stressing the need for a delicate balance between safeguarding European strategic assets and the imperative of maintaining the EU's economic openness and integration with international markets (European Commission, 2021). This implies that European industrial policy, while pursuing the complementary goals of economic security, should avoid creating tensions at the international level with European allies and trading partners. On the contrary, by strengthening its industrial and technological capacity, the EU must contribute significantly to protecting and reforming the international economic order and preventing fragmentation (IMF, 2023).

A world divided into two blocs as well as disorderly economic fragmentation would severely damage and marginalize European economies. Openness and international cooperation will remain essential for European growth (Georgieva, 2022).

Europe's industrial policies, however, risk coming into conflict with those of other countries engaged in equally ambitious and competing processes of environmental and industrial transformation, as has already happened with the US IRA (Tyson and Zysman, 2023).

Some observers argue that this state of affairs will not lead to conflict between countries as incentives and subsidies will help not only the country that activates them, but also other countries in the fight against climate change.

Unfortunately, reality is not that simple. As large theoretical and empirical literature has argued for some time, climate change policies are a form of the so-called strategic industrial and trade policies and pose classic "collective action" problems (Krugman, 1986; 1987). As we argue in our recent book, far from helping governments to develop green technologies and diversify their supply chains, these policies could end up jeopardizing the achievement of their objectives (Guerrieri and Padoan, 2024). Coordination and cooperation agreements between countries are needed to avoid this (Lake, 2021).

Europe and its Member States must avoid a misleading approach under the banner of "Europe First", a short-sighted and self-defeating strategy, and recognize the benefits of an industrial policy that acknowledges the need for coordination with other countries. This would require establishing common rules and limits to make subsidies and incentives compatible and acceptable to all (Hoekman, 2019).

International coordination is more important when one looks at the near future, when the ecological transition will entail industrial restructuring on an increasingly large scale and pose complex domestic problems of political, economic, and social governance in every advanced country.

To be sure, proposing international cooperation agreements is highly problematic today, given the fragmented and conflict-ridden state of international economic and trade relations (Dadush, 2022). Cooperative solutions at the global level are also complicated by the intertwining of economic and security issues, which increases the tendency of countries to pursue conflict rather than cooperation.

This is undoubtedly a great and difficult challenge, but it should convince Europe to prevent conflicts and to take the lead in coordinating interventions, first with the other G7 countries and then with other interested countries. Such cooperation will become even more necessary as government intervention in industry becomes more widespread and contributes

significantly to reducing emissions, promoting new green technologies, and ensuring national security conditions between now and the end of the decade (IMF, 2022).

13.6. Financing Investments and Strengthening Economic Governance

The relevance of OSA lies in the fact that the agenda of defense and economic security cannot be separated from that of European sustainable competitiveness and growth, as it was done in the past. They must be pursued together. Nevertheless, implementing these interacting strategies necessitates additional financial resources and political instruments at the European level (Guerrieri and Padoan, 2024).

The green industrial and digital transition requires a monumental financial effort, spanning both public and private investments (Baccianti, 2022). And such additional burden cannot fall entirely on the shoulders of individual member states, already burdened by public debt consolidation. Moreover, the new Stability and Growth Pact, enacted in 2024, leaves limited fiscal space for member states to address the additional financial demands associated with the green industrial transition.

It thus requires the creation of an investment and financing capacity at European level (Pisani Ferry, 2023). In short, the time has come to give substance to the concept of centralized fiscal capacity albeit limited in the short term, financed by resources raised at EU level. This would be a decisive step towards changing the growth model from export-led to domestic demand-led.

Another solution could be to launch a new project and new common resources for the post Next Generation EU, which proved to be a positive European response to the outbreak of the Covid 19 crisis. The economic governance framework proposed by this program differs markedly from that which prevailed until the sovereign debt crisis at the turn of the decade. The NGEU is based on stimulating growth on both the demand and the supply side, financed by "European" bonds. Its instruments are, primarily, public investment and structural reforms, the full economic and political benefits of which will only materialize in the medium to long term. The NGEU has indeed demonstrated that issuing common debt to finance European programs is not only feasible but can meet criteria of efficiency in resource allocation and meet market favor. It is a path that could also be pursued in the future for financing industrial transition policies. In other words, a return to sustainable industrial growth in Europe requires the full implementation of a model that we could call "enhanced NGEU".

The Union's budget must also be reformed. It is now extremely modest, representing around 1% of the total gross national income of the 27 Member States, and is inadequate to finance the ambitious policies that the Union intends to implement in the coming years, partly because its composition is extremely rigid and difficult to change. The Union's next budget should therefore be larger and more flexible. This process, set to commence earnestly by 2025, will shape the EU's spending priorities and revenue sources for the period 2028-2034.

Addressing the scarcity of resources for private investment across Europe is another critical aspect. Currently, this scarcity persists partly due to the underdeveloped state of the Unification of the European capital markets, incomplete European banking union and the absence of a European safe asset. Completing both the Banking Union and the Capital Markets Union is imperative. The lack of a truly integrated capital market, on a par with the United States, has penalized and continues to penalize the growth potential and innovative capacity of European firms (Guerrieri e Padoan, 2020). And it is not a technical problem, because solutions can be found. The problem is political in nature and requires leadership, which Europe lacks today. Without fundamental steps in this direction, achieving the dual industrial and digital transition in Europe would remain elusive (Guerrieri and Padoan, 2024).

Finally, there is a problem of restructuring and renewal of EU's economic governance.

The current decision-making mechanisms are overly complex, untransparent and cumbersome, and are ill-suited for agile crisis management. In general terms, overcoming the unanimity rule in favor of qualified majority voting in pertinent fields is imperative to facilitate swifter, more effective decision-making aligned with Europe's growth and security objectives. In particular, on the current governance of the EU's industrial policy, apart from the adoption of policy tools already mentioned, a key issue is the improvement of coordination between Member States and the organizational reforms to be implemented to reach this objective.

13.7. Conclusions and policy recommendations

There are fundamental economic challenges in the new global context facing Europe. The green transition must be pursued in conjunction with the strengthening of the competitiveness of the European economy and industry, linking climate change policies with industrial and technological policies. In addition, the new global context in light of the geopolitical tensions and global economic shifts poses significant challenges to the economic security of the EU because the traditional concept of national security is evolving to include economic security beyond traditional defense. These challenges must form the basis of Europe's so-called open strategic autonomy (OSA) by integrating "national" security considerations into EU economic and industrial policies, akin to approaches taken in the US and Japan. In this perspective, closing the gap with the US and China in technological prowess, particularly in the digital realm, is crucial for economic security and the attainment of genuine strategic autonomy of Europe.

As shown in this chapter, to address these challenges is a task that requires a series of overly complex initiatives and policies, both domestically and internationally, with positive complementarities to be exploited and a lot of trade-offs to address.

These are initiatives and actions that it will be primarily up to the new Commission and the new European Parliament to initiate and implement with the utmost urgency and commitment. In the chapter on the reformulation of European policies, we point to three directions that need to be followed: first, a revitalization of the single market and more advanced digital services; second, a common industrial and technological policy; and third, the search for adequate funding, including at a significant common level.

We stress a deeper integration of the digital market and KIBS services which could be pivotal for Europe's future competitiveness. Just as important is the implementation of a common industrial policy centered on a Strategic Fund or as recently renamed a Common Competitiveness Fund which aims at generating positive externalities for the benefit of all Member States and many R&D investments where Europe is lagging behind its other main competitors. Particularly worrying is the fact that the EU's industrial policy has so far introduced the easing of the restrictions on the use of state aid. This could lead to intense competition not only between firms but also between Member States themselves.

In terms of enhancing the defense and the economic security of Europe, we suggest that in the implementation of the European Defense Industrial Strategy (EDIS) greater autonomy should be pursued especially in developing advanced technologies and production capabilities in this area. Furthermore, the "Europeanization" of EU economic security rules and policy tools is needed to ensure consistency among Member States' measures.

To implement all these interventions, Europe needs more resources and instruments than it has today. The European system as it is currently structured cannot work. As far as financing is concerned, a variety of paths should be followed, as indicated in this chapter: the creation of an investment and centralized fiscal capacity; the launch of a new project and common resources for the post-Next Generation EU (an "enhanced NGEU"); the reform of the Union's budget; the completion of both the Banking Union and the Capital Markets Union for financing private investment; and finally, the role of the European Investment Bank should be

significantly strengthened, both organizationally and by providing it with additional resources and tools.

Unfortunately, little or no progress has been made in these areas in the recent past. If anything, there have been some steps backwards in the last two years. The problem is that many European countries were, and still are, opposed to the many common solutions. The five years of the new European legislature will be crucial for overcoming this resistance to the implementation of common projects.

In this context, greater differentiation of the path of European integration is an option that may prove to be an unavoidable step, and integration in selected areas by groups of countries according to their preferences could take different forms. The greatest risk to avoid would be to maintain the status quo, as it would become almost impossible to finance and implement the abovementioned set of policies and measures to support the ecological transition and the strengthening of industrial competitiveness and economic security.

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