



CENTRO STUDI SUL FEDERALISMO

**research paper**

**OLIMPIA FONTANA, SIMONE VANNUCCINI**

**HOW TO INSTITUTIONALISE  
EUROPEAN INDUSTRIAL POLICY  
(FOR STRATEGIC AUTONOMY  
AND THE GREEN TRANSITION)**

***February 2024***

**ISSN: 2038-0623**

**ISBN: 979-12-80969-12-5**

**Copyright © Centro Studi sul Federalismo**

***All rights reserved. Quotations from this document can be made according to copyright law, providing information on the source.***

## ABSTRACT

We present some novel ideas on the tools and financing of a truly supranational industrial policy in the European Union (EU). We begin by reviewing the evolving rationales for industrial policy, and highlight the growing acceptance of a pro-active role of the State in the economy as a response to external challenges of global scale and transformative impact, with the climate emergency at the forefront. At this historical juncture, a polycrisis and a permacrisis are reshaping globalisation, fuelling rivalries and interventions aimed at increasing autonomy and sovereignty over strategic assets. We posit that the European Union (EU) can break this zero-sum game by institutionalising a European industrial policy, and we claim that this can be done successfully through the establishment of instruments characterised by a pure European public good nature. Our proposal suggests the creation of a framework fund on the model of the NGEU, with the ‘Europeanisation’ of the Important Projects of Common European Interest (IPCEI) and better designed centrally managed programmes. We underline the importance of linking the design of industrial policy with the discussion of the Union’s own resources, since in Europe there will be no real strategic autonomy without real fiscal autonomy.

**Keywords:** European Sovereign Fund; European Union; green transition; industrial policy; IPCEI; strategic autonomy

**JEL Codes:** H41; H87; F60

**Olimpia Fontana** is Mario Albertini Fellow at the Centro Studi sul Federalismo and Research Fellow at Università Cattolica del Sacro Cuore

Email: [fontana@csfederalismo.it](mailto:fontana@csfederalismo.it)

**Simone Vannuccini** is Chair Junior Professor in Economics of Artificial Intelligence and Innovation, Université Côte d'Azur, Nice (France)

E-mail: [Simone.VANNUCCINI@univ-cotedazur.fr](mailto:Simone.VANNUCCINI@univ-cotedazur.fr)

**1. Introduction • 2. There is always a new industrial policy • 3. Grand challenges and global rivalries motivating industrial policy • 4. European industrial policy: general coordinates • 5. Achieving a European industrial policy today • 5.1 A classification of European Public Goods • 5.2 The ‘Europeanisation’ of IPCEIs: EU public goods by aggregation • 5.3 The discarded proposal of a European Sovereignty Fund • 5.4 Centrally managed programmes for industrial policy: the case of InvestEU and the Innovation Fund • 5.5 The NGEU as a model for a framework ‘fund’ • 6. Conclusion**

## **1. Introduction**

The world economy is restructuring. It always does, shaped by different forces in different eras. In this historical moment, emerging geopolitical fault lines, amplified by profound technological transformations and compounding crises of planetary scope, are driving change. A practical implication of this is the considerable pressure that policy makers come under, pushing for greater state intervention in the economy to tackle rivalries and reduce vulnerabilities. This has led to different flavours of industrial policy gaining new momentum. In this paper, we discuss what this context means for the European Union (EU). We posit that the development of a truly supranational industrial policy becomes a necessary (even though not necessarily sufficient) condition for the EU to maintain its position at the global frontier of advanced industry, lead the ecological transformation of the economic system, and escape nationalistic ‘races to the bottom’ in a landscape that is evolving rapidly and drastically. In particular, we highlight the interplay of two types of challenge that shape the logic of and draw the boundaries for the design of a European industrial policy: on the one hand, the transformation of globalisation into a still interconnected, but more factionalised process that incentivises economic, technological and, unfortunately, military arms’ races for dominance or autonomy over strategic assets. On the other hand, the ‘grand’ challenges that affect the whole of humanity, even if asymmetrically. Of all the major contemporary challenges, climate change exerts the greatest pressure for a structural transformation of socio-economic systems. Therefore, the incentive to strengthen industrial capacity for vital assets could be (and partially is) strongly tied to that of accelerating the green transition.

Recent years have seen much discussion of the rationales and tools of industrial policy (Evenett et al. 2024). We build on these discussions, but foreground a new research question: *how can industrial policy for the green transition and strategic autonomy be made permanent – and, hence, institutionalised – in the EU?* The key terms are ‘institutionalised’ and ‘permanent’: we explore the paths that can lead to the establishment of industrial policy as a non-temporary, explicit pillar of European policy making, to be balanced with the existing exclusive competences of the Union in matters of competition and trade. There has been some progress on this front in recent years: in 2022, the European Commission’s President, Ursula von der Leyen, introduced the idea of a European Sovereignty Fund (ESF) as a response to growing US assertiveness on domestic industrial grounds. However, this promising proposal to support a ‘Made in Europe’ industry faded away, without furnishing further details on its design and implementation. The ESF idea inspired a series of similar proposals revolving around the establishment of funds and the related changes required in terms of the fiscal capacity of the EU (Garicano 2022; Arnold et al. 2022; Abraham et al. 2023).

Hence, the question of how to achieve a lasting, supranational industrial policy for the EU remains a priority and a matter of debate. Successful innovation on this front would be a positive outcome: the crystallisation of European industrial policy into permanent institutional vehicles will facilitate the provision of European public goods related to industrial production, technological advances, and security. This will enable the practice of industrial policy to go beyond the national perspective (and, thus, methodological nationalism) in addressing global challenges. We are aware that the main obstacles to a European industrial policy are political – as intervention in the domain of industry is a matter of *State* intervention, and the EU is not yet a federal State. However, we suggest that current external pressures create not only risks, but also an imbalanced situation from which new power arrangements can emerge. We have witnessed a glimpse of this with the institutional innovations launched in response to the Covid-19 pandemic as part of the Next Generation EU (NGEU) package. Although the NGEU shows possible directions for breaching the wall of national resistance, its departure from the past in terms of tools and financing is limited by the temporary nature of the initiative. Therefore, the true political challenge is to make institutional innovations permanent – or, at least, move in that direction. We present a series of proposals to address this issue. In particular, we suggest the ‘Europeanisation’ of the Important Projects of Common European Interest (IPCEI) instrument, and the creation of a framework fund on the model of the European Sovereignty Fund that can host these and other pure European programmes, modelled on already existing ones (e.g. InvestEU) but better endowed and more focused on the critical issues of green transition and strategic autonomy. Throughout the paper, we stress the importance of linking the design of industrial policy with the discussion of the Union’s own resources.

A note on the focus of this paper: universal lessons exist from past analyses of industrial policy; however, distinct frameworks and priorities apply when focusing on developed or on developing contexts. In our analysis, we focus on the experience of advanced economies, given our aim to outline proposals for the EU that build on its historical path, and structural features. Furthermore, while one of the main tensions within the EU is between policies focused on competition and those aimed at nurturing champions or picking winners (whether firms or entire sectors), we do not delve into issues of increasing market concentration, decreasing labour share, and industry dominance by a handful of transnational (tech) giants. While these are vital issues that will shape the future evolution of modern economic systems, our work is dedicated to discussing the possible architecture of a European industrial policy.

The paper proceeds as follows: in Section 2, we summarise the fundamentals of industrial policy, and highlight new elements of analysis, such as the rationales for intervention linked to the production of strategic assets. In Section 3, we paint a picture of the current landscape confronting political and economic actors, characterised by global challenges so existential and intertwined that they dictate emerging (industrial) policy narratives and justifications. We describe the paradigm shift from industrial policies shaped by a context of open globalisation to a world of growing rivalries, immersed in a contextual ecological emergency, and discuss the reasons for increasingly accepted state intervention in the economy based on narratives of technological sovereignty and strategic autonomy. In Section 4, we shift attention to the EU, placing the issue of European industrial policy in historical and political contexts. We identify some general principles and instruments around which a federal industrial policy could be built for times of global challenges. In Section 5, we review the current experience of European industrial policy and relate

existing and proposed future instruments to a taxonomy of European public goods. Section 6 offers a conclusion.

## 2. There is always a new industrial policy

We begin by tracing the boundaries of our focus of analysis – industrial policy. We assume the reader has some familiarity with the topic, and discuss only tangentially the plurality of views on industrial policy, even though they underlie critical differences in assumptions about the functioning of the economy and the world. Instead, we highlight common principles, present key issues, and introduce conceptual tools that will support our claims in the following Sections.

As an evolving, contested and politically charged notion, industrial policy has many definitions. Warwick (2013) lists around twenty different ones, and despite several systematisation exercises in the field (Crisuolo et al. 2022a), industrial policy tends to elude clear cut categorisations. A first useful distinction is between the conception of industrial policy as *industrialisation policy* and that as *targeted sectoral policy*. Many alternatives to this can be and have been proposed, but this distinction has the merit of mapping the classic separation of scope between horizontal (generalised) and vertical (specialised) interventions. Furthermore, it helps to reflect on whether the overarching goal of industrial policy is to promote industrialisation and technological upgrading as a general organising principle of any economic activity, or whether the priority is to identify sectors of economic activities that ‘must’ be developed, by virtue of their expected societal benefits or strategic relevance. The former idea echoes former American President Roosevelt’s view on the scope of the Tennessee Valley Authority created under the New Deal: “touching and giving life to all forms of human concerns” (Kline and Moretti 2014, p.275). The latter view is captured by Hausmann and Rodrik (2006, p.24)’s abstract definition of industrial policy as “the provision of inputs that are specific to subsets of activities”. In both cases, industrial policy is eminently *political*. Lane (2000, p.210) makes this explicit, suggesting that industrial policy is any “intentional political action meant to shift the industrial structure of an economy”. All existing, elaborate definitions of industrial policy can be seen as more detailed linear combinations of the previous abstract interpretations. For example, among the more recent contributions, Evenett et al. (2024, p.6) consider industrial policy as “any targeted government intervention aimed at developing or supporting specific domestic firms, industries, or economic activities to achieve national economic or noneconomic (e.g., security, social, or environmental) objectives”, while Juhász et al. (2023, p.4) define it as “those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal”.

Common elements – although sometimes implicit – can be identified in all definitions of industrial policy: (i) the idea that interventions are motivated by some public objectives (e.g. growth, innovation, productivity, export promotion, green transition); (ii) the idea that they are the result of discretionary choices by public authorities; and (iii) the idea that the results achieved by implementing the policies are preferable, in terms of societal welfare, to those occurring in their absence. The difficulty of testing counterfactuals to interventions explains some of the resistance to industrial policy: critics highlight the risk of government failures due to political capture (e.g. by

large, powerful private actors) and limited knowledge, reducing (or reversing) the benefits of intervention to manipulate the structure of an economy and its vector of evolution.

Industrial policy has several domains of intervention (Naude 2010) and a vast set of instruments to choose from, ranging from information signals to direct investments and production, to the provision of complementary assets to sectors' main activities (Warwick 2013). Its wide scope makes it interdependent and overlapping with other policy areas, such as science, technology, competition and trade policy. Indeed, industrial policy can be seen as an umbrella framework for all these policy areas or, alternatively, all these policies can be considered to include important industry-related aspects. For example, one could see export controls of strategic high-tech components as a trade-based industrial policy initiative, or as a trade policy focused on high-tech industrial products. Similarly, supporting the scale-up of industrial champions is an industrial policy decision, but at the same time it represents a discretionary limitation imposed on the principles of competition policy. The same holds for technology policy: Cherif and Hasanov (2019) suggest that 'true' industrial policy is technology and innovation policy, while Steinmueller (2010) lists several designs of technology policy – including supply-side subsidies and financing for innovation, demand-side incentives for technology adoption, and interventions on complementary factors, e.g. in training talent or infrastructure building. Many of these policies for technology apply to high-tech industries and, therefore, are industrial policies too. Mosconi (2006) claims that technology, competition and trade policies are all part of the (European) industrial policy 'triangle'. In practice, pinpointing where one domain of policy begins and another ends is less important than understanding the priorities of policy makers. However, tensions and trade-offs between policy domains remain a relevant issue when conflicting objectives collide. For instance, the tension between competition and industrial policy is a fundamental one for EU policy design.<sup>1</sup> Crucially, this tension reflects the shifting relevance of what happens within the Union's borders and the pressures exerted from outside.

From a theoretical point of view, the economic case for undertaking an industrial policy is solid. As Bartelme et al. (2019, p.1) argue: “[t]he textbook case for industrial policy is well understood. If some sectors are subject to external economies of scale, whereas others are not, a government should subsidize the first group of sectors at the expense of the second”. In other words, the external effects (externalities) generated by the growth of a specific sector are not internalised in the decisions of economic actors (e.g. on the allocation of investments). The market fails, as the resulting privately-driven expansion of the industry tends to be lower than what is socially desirable. The classic justification for policy intervention derives from this misalignment of social and private incentives. In most real-world situations, the cost of incurring market and coordination failures tends to outweigh in importance the possible losses from government failures. The case for public intervention works precisely as it does in other areas where the debate is less politically

---

<sup>1</sup> A good example is the case of 'green antitrust', according to which restrictions on competition are justified when market power is accrued by companies that engage in sustainability efforts, as these are expected to create welfare gains for consumers (Schinkel and Treuren 2021). While this trade-off is often an excuse for companies to elude regulation and make their position uncontested, green antitrust serves as an example of the possibility that industrial policy priorities (e.g. allowing the accumulation of market power to firms that are environmentally responsible) and competition policy (e.g. avoiding the risk of monopolisation regardless of the non-market implications) end up being in conflict.

charged, such as basic science, health, or education. Despite this, industrial policy carries with it a bad reputation, due to the high societal costs of past political failures and the lack of empirical analyses capable of identifying unambiguously the effect of the policies (Lane 2020). As Juhász et al. (2023) point out, this has led the debate on industrial policy to focus on the ‘whether’, rather than the ‘how’ question. However, the persistent return of industrial policy to the forefront of political debate suggests that dealing with industry is unavoidable, as that is the locus of learning and new knowledge production, which in turn are the key to the generation of wealth that sustains our economies (Vannuccini 2015). In other words, while the discourse on industrial policy swings between taboo and necessity, policy makers are always ‘doomed to choose’ (Hausman and Rodrik 2006), and opting not to intervene is a choice too.

The utility of industrial policy in building a resilient economic backbone of a society emerges so clearly from practical problems that we see it repeatedly discussed throughout history: in the period of ‘Great Divergence’ in per capita income between the West and ‘the Rest’ in the 19<sup>th</sup> century (Juhász and Steinwender 2023), in Alexander Hamilton’s Report on Manufactures (1791), and even earlier, as documented in Reinert (2020). Hamilton cites many of the justifications still in use today: protection of infant industry, issues relating to the limited size of domestic demand, defence of intellectual property, and creation of new institutions as vehicles for policy intervention. The tension between monopoly and competition is also already present, with reference to the need to create national champions. Overall, the debate on the key themes and rationales of industrial policy, as well as on its practice, has gone through different phases, as outlined by Andreoni and Chang (2019): from the priority assigned to the protection of infant industries starting from the 18<sup>th</sup> century, to focus on inter-sectoral linkages, followed by a more inward-looking focus on competition starting in the late 1970s, subsequently evolving into a ‘mainstreamed’ view of industrial policy in economic thought. Recently, a ‘new empirics’ of industrial policy (Lane 2020) made possible by the availability of granular data and more sophisticated approaches to measurement, has allowed researchers to reconsider past interventions and better assess new ones. Both economic history and econometric studies are now more supportive of the positive impacts of industrial policy, in specific cases (e.g. the growth of NASA contractors after the Moonshot – Kantor and Whalley 2023) and at a more aggregate level (Crisuolo et al. 2022b, reviewing the OECD evidence). Furthermore, industrial policies could produce even more positive effects than measured, when the compounding of market distortions across production (input-output) networks is accounted for, as shown in Liu (2019).

Although different frameworks share a belief in the economic case for industrial policy, not all approaches are alike. For example, Piechucka et al. (2023) limit their justification to ‘classic’ market failures, advocating for efficiency-enhancing industrial policies. The ‘new economics of industrial policy’ promoted by Dani Rodrik and co-authors (Juhász et al. 2023) recognises the more multifaced forces shaping today’s policies, as compared to historical counterparts. Other frameworks approach the issue from different angles to extend the reach and modes of possible public interventions. The idea most successful in kickstarting a public debate as well as real-world initiatives has been Mariana Mazzucato’s ‘mission economy’ driven by the ‘Entrepreneurial State’ (2021). According to it, the State must act not only to fix markets, but to create them – it must influence the *direction*, rather than the *rate* of investments. This can be done by subscribing to a mission-orientation approach inspired by the goal-oriented allocation of resources experimented



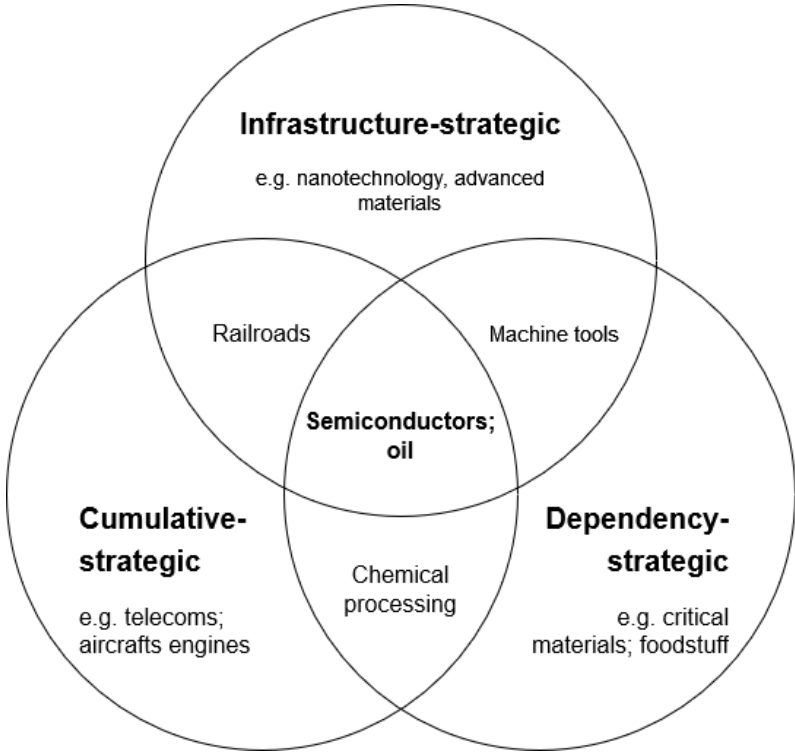
with Project Manhattan or the Moonshot. However, this time, missions should be built to tackle global challenges and to achieve the United Nation’s Sustainable Development Goals – the development of the Covid-19 vaccines being the clearest example of this framework in action. Bassanini et al. (2021) highlight the evolving balance between state and market in driving economic change, and suggest the notion of the ‘Instigator State’ (*Stato promotore*) as the emerging mode of public intervention in the economy in the current context. The idea is developed by Cantner and Vannuccini (2018), who discuss the room for action for a ‘Catalytic’ State in the domain of research and innovation. A catalytic policy approach is one that recognises the importance of public intervention in kick-starting dynamics that would otherwise lack critical mass, but which at the same time is able to retreat and leave space for action to the private sector after incentives for innovation and experimentation form, become self-sustaining, and private activity becomes economically viable. Echoes of the emerging consensus on the market-creating role of the State can be found in the principles of ‘the economics of investment in America’ (or ‘Bidenomics’) underpinning the recent wave of industrial policy and targeted public investments in critical, innovation-driven industries in the US (particularly semi-conductors, clean energy, and infrastructure for charging electric vehicles).<sup>2</sup>

A final aspect to consider in the context of industrial policy is the strategic nature of the assets financed, produced, or protected through policy intervention. This aspect is gaining traction as one of the main motives for industrial policy interventions in the current global landscape, as we will see in the next Section. Ding and Dafoe (2021) introduce a framework to add nuance to the concept of strategic asset. They unpack the concept of externality, the presence of which constitutes the fundamental economic case for industrial policy intervention, into three different ‘logics’: i) the *cumulative-strategic* logic, which covers those assets and sectors, such as aircraft, which are characterised by high entry barriers and sizeable sunk costs of production, scale and learning economies, and for which it takes time (hence, the cumulative aspect) to develop technological capabilities and market leadership even with government intervention; ii) the *infrastructure-strategic* logic, which applies to assets and sectors of an infrastructural nature, such as railways, electric distribution networks, or the radar, which are subject to coordination failure but feature large externalities as they facilitate distribution and circulation; iii) the *dependency-strategic* logic, which applies to assets and sectors (e.g. rare earth materials) characterised by few substitutes and a lack of markets for inputs. All logics capture aspects of externalities and can be used to justify industrial policy. When used in combination (see Figure 1), they help to identify the assets and sectors that are truly strategically vital. Furthermore, policy makers can identify ‘strategic false positives’ that could lead to policy overspend, an indicator of government failure. Assets and sectors that are cumulative-, infrastructure-, and dependency-strategic in nature become the true protagonists of industrial policy in a global context characterised by multiple crises and growing rivalries.

---

<sup>2</sup> <https://www.whitehouse.gov/wp-content/uploads/2023/07/Economics-of-Investing-in-America.pdf>

**Figure 1. The logics of strategic assets**



Source: Based on Ding and Dafoe (2021).

In summary, despite the narrative pendulums and ideological debates that are function of historical and political dynamics, a pragmatic consensus on the potential economic benefits of industrial policy exists. The growing availability of granular data and techniques to test counterfactuals is bringing fresh support to the idea that, despite limitations, industrial policies have played a key role in fostering economic growth in the distant and recent past and will continue do so in the future. Thus, there will always be a ‘new’ industrial policy on the horizon, even after the ‘previously new’ industrial policy loses momentum, is less effective than expected, or becomes ill-suited to the surrounding economic and political contexts. We now find ourselves in the midst of the rising tide of another new industrial policy moment. Recent initiatives such as the Inflation Reduction Act (IRA) legislative package in the US have mobilised resources for the industry and revitalised a climate of international technological rivalry. At the same time, it has stimulated genuine interest in State activism in the economy, given the expected positive impacts particularly in the field of green transition (e.g. the simulated IRA-driven gains in clean energy coupled with emissions reduction – see Bistline et al. 2023). In doing so, they have once again shifted the narrative from the question of ‘whether’ to the question of ‘how’ to engage in industrial policy. Today, this ‘how’, particularly for the EU, is shaped largely by the forces at play on the global stage. We turn to these next.

### 3. Grand challenges and global rivalries motivating industrial policy

Industrial policy interventions are a constant in modern economic history, as they build on a solid economic case. However, the narratives around the need for industrial policy have had mixed fortunes, as they are based on more turbulent political cases. The same holds for policy instruments and styles, which must align with the prevailing narrative at a given time, and for key motivations for intervention, the weight of which varies with the landscape. Therefore, it is important to map the current socio-economic context globally, in order to assess what motives are driving the current wave of industrial policy support and actions. This is a context characterised by extremely complex challenges. As with many other themes discussed in this paper, this is not a new fact *per se*: the fact that diverse forces interacting at different scales produce restless change is a persistent feature of world geopolitics and geoeconomics, as highlighted by studies on the succession of cycles of dominance and decline of great powers (Arrighi 1994) or of technological revolutions (Perez 2010). The question therefore arises whether the contemporary landscape really presents unprecedented challenges or, to put it differently, whether ‘this time is really different’. Lombardi and Vannuccini (2022) argue that actors face a unique environment – what they have labelled the ‘cyber-physical universe’ – in which digital and physical processes are increasingly intertwined and jointly shape reality. This landscape is rife with challenges of global scope, each potentially leading to looming crises, from the ecological to the technological, from the financial and distributional to growing anti-democratic sentiments and regimes around the world. Furthermore, these crises are interconnected, so much that authors group them under the concept of ‘polycrisis’ (Tooze 2022).<sup>3</sup> Even more worryingly, they are compounding, as they tend to reinforce each other in testing the resilience of the social fabric. This is why the theme of grand challenges has become an important compass for guiding policy initiatives (Soete 2023).

Importantly, in addition to being multiple, overlapping and compounding, the very existence of global challenges creates an atmosphere and a narrative of future catastrophe that echoes the pre-World War era. Borrowing from Mark Twain (to whom the quote is usually attributed), history might not repeat itself, but it often rhymes, and the growing gap between statistics of growth and societal improvements (Pinker 2011) and pervasive negative perceptions rooted in society closely resemble the phase of economic growth during the ‘roaring twenties’, which led to the much less-roaring decades. This perception is coupled with the idea that the punctuated but persistent appearance of global crises, especially leading to and following the Covid-19 pandemic and the war in Ukraine, outlines a ‘permacrisis’ as an additional dimension of the polycrisis. Contemporary societies – or at least contemporary Western societies – feel forced to learn to live in a constant state of flux, anxiety, emergency, and disequilibrium. It goes without saying that the feeling that the contemporary world is a world in permacrisis influences policy, and also electoral choices.

The polycrisis and permacrisis arise from the lack of institutions and tools for the provision and governance of global public goods (Buchholz and Sandler 2021) and global commons (Mazzucato 2023): the climate emergency and the exploitation of natural resources; the pandemic risks; resurgent nationalisms; the growing polarisation of wealth; and the evolving nature of value creation moving towards decentralised, digitally-enabled modes of production. These challenges

---

<sup>3</sup> See also <https://cascadeinstitute.org/technical-paper/a-call-for-an-international-research-program-on-the-risk-of-a-global-polycrisis/>

are affecting humanity as a whole, yet are not governed by humanity as a whole. All this while new geopolitical powers, and China in particular, demand their rightful place as rule-makers on the international stage, igniting rivalries on the technological and trade fronts. As a result, we have entered a new ‘zero-sum logic’ of globalisation (Tyson et al. 2023). National actors have scrambled to deal with these transformations on their own or with limited coordination, focusing on those actions aimed at preserving their ability to act in the complex landscape around them. In other words, in the current landscape, (industrial) policy can be seen as an attempt to regain control over exogenous pressures and uncertainty, despite evidence that internationally coordinated industrial policies are more transformative than unilateral ones (Lashkaripour and Lugovskyy 2023). For instance, Castillo et al. (2021) illustrated the value of government investment in expanding the global vaccine capacity during the Covid-19 pandemic, including investments in removing bottlenecks in intermediate goods along the vaccine supply chain (e.g. glass vials, bioreactors). Despite this, the emerging state of the art goes in the opposite direction: industrial policy is increasingly de-risking and decoupling policy.

The relevance of global challenges and rivalry-driven justifications of industrial policy is proxied by the emergence of new notions, such as (open) strategic autonomy (in the EU) and technological sovereignty. The latter captures the underlying ambiguity of current public incentives, and the importance gained by the dependency-strategic logic of governing externalities. Edler et al. (2023, p.2) define technological sovereignty “as the ability of a state or a federation of states to provide the technologies it deems critical for its welfare, competitiveness, and ability to act, and to be able to develop these or source them from other economic areas without one-sided structural dependency”. The notion is not necessarily nationalistic, but it urges a reflection on how vital technologies – the strategic assets we outlined earlier – are provided, and how their key inputs are sourced and, thus, can be enlisted as a cornerstone in the development of broader industrial policy frameworks, particularly for the EU (Crespi et al. 2021). Indeed, this is what is happening in the EU with the notion of open strategic autonomy (OSA), developed in the field of trade policy. OSA has been defined as “the ability to shape the new system of global economic governance and develop mutually beneficial bilateral relations, while protecting the EU from unfair and abusive practices, including to diversify and solidify global supply chains to enhance resilience to future crises” (European Commission 2021).

Empirically, the logics of dependency and sovereignty appear in the motivations declared by actors for implementing industrial policies. Evenett et al. (2024, p.7) examine 2,850 records of industrial policies for the year 2023, and, out of the sample with stated motivations, they find that “[m]otivations related to climate change and supply chain resilience account for 28% and 15% respectively. National security and geopolitical tensions combined have been the motivation behind around one in five measures”. Bown (2023) confirms that the emerging rationales of supply chain resilience, supply chain responsiveness and control, and climate change inform new industrial policies, although, in practice, this mostly boils down to advanced economies attempting to curb competition from China. While technological sovereignty and related concepts do not aim for autarky, they play on a knife’s edge. The positive impact of industrial policies we discussed in the previous Section is undermined by the zero-sum game played at the global level. Racing competition can lead to rising frictions and transaction costs, duplication of investments and allocation of resources to inferior technologies or less efficient firms. More concerning, the rivalries

narrative echoes the one prevailing in the period between the two world wars, in which, as Albert Hirschman wrote, trade was used as a tool to strengthen national power (Hirschman 1980).

As we have highlighted, re-emerging rivalries have ‘mainstreamed’ industrial policy. The fact that industrial policies encounter less resistance when they feed arms’ races for manufacturing upgrading is also *deja vu*. Jowett and Rothwell (1986) describe in detail the information technology race and the policies adopted by the US, the UK, Japan and Europe to stay ahead of rivals amid the information technology revolution. Irwin (1996) discusses the American-Japanese commercial conflict over semi-conductors that led to a widely debated trade agreement in 1986. That case of leveraging trade policies for strategic assets seems familiar when compared to the contemporary American export bans on advanced computing devices and manufacturing equipment against China – even though Japan’s erstwhile challenge was market dumping, while China’s challenge today is a challenge of security and geopolitical power. The fact that with the current export bans the US has managed to convince third-party states (in particular the Netherlands, which is home to the major chip process technology manufacturer, ASML) to join the export controls through bilateral agreements that circumvent the international multilateral organisation gives an indication of how much current policies are inspired by motives of national power.

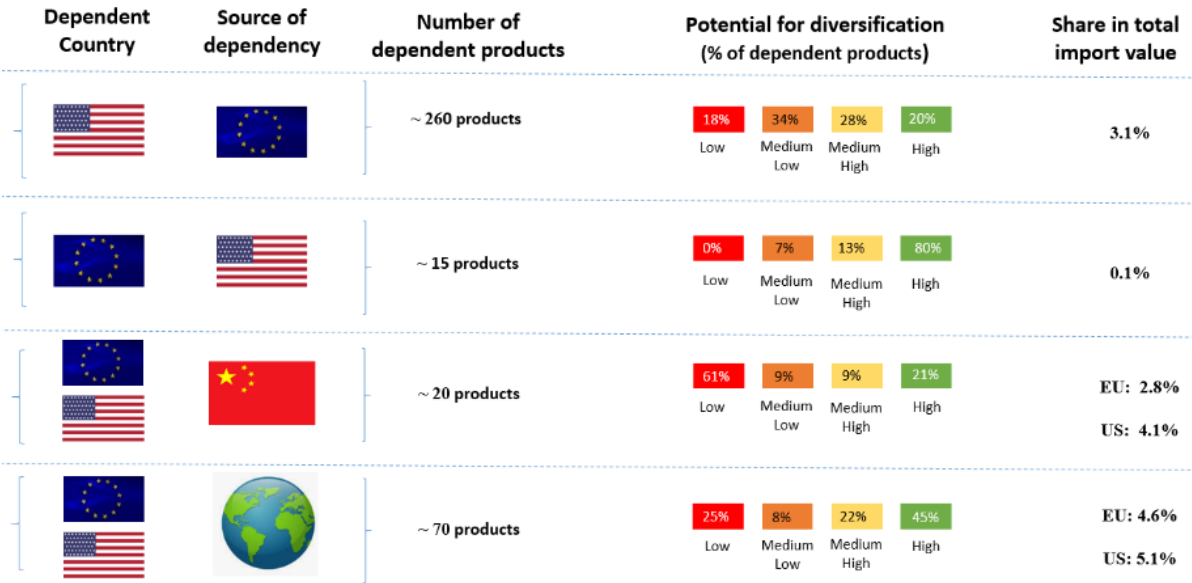
The priority given to the strategic rationales for intervention has led governments (including the EU) to engage in a series of reviews of strategic dependencies. For example, the US has launched exercises like the one proposed by the National Science Foundation (NSF) through the National Network for Critical Technology Assessment (NNCTA).<sup>4</sup> The European Commission (2021a) has mapped trade dependencies (defined as reliance on few suppliers coupled with limited internal capabilities to produce certain goods, services or production inputs) and identified a few but important ‘sensitive ecosystems’, such as health, aerospace and defence, electronics, renewables, digital, and energy-intensive sectors. Figure 2, with a focus on the EU and the US, summarises the dependencies, reverse dependencies (cases in which the US is dependent on EU products), and common dependencies (from China and the rest of the world) resulting from the exercise. For the EU, 137 of the 5,000 traded products depend on imports, mainly energy, raw materials, pharmaceutical and chemical ecosystems, from a limited set of suppliers – mainly China, Brazil, and Vietnam. Around half of these products (accounting for 4.5% of total EU imports) are concentrated in just two or three source countries. These results are confirmed and extended by Arjona et al. (2023). Their findings are important for the design of European industrial policy: while some dependencies can be addressed by diversifying sources using trade policy tools, other products, such as chips and solar panels but also products in the health industrial ecosystems (e.g. antibiotics, vaccines), are characterised by a high risk of ‘single points of failure’. These require the development of internal capacity and thus the selection of appropriate instruments aimed at developing deficient capabilities, capacity expansion, and possibly stockpiling. A further analysis by the European Commission (2024) evaluating the EU’s OSA in both the economic and innovation domains offers a further nuance: the exposure affects the EU comparatively more at the level of technologies, rather than of overall industrial ecosystems (with the exception of the digital one, characterised by higher vulnerability). This has further implications for the choice of industrial policy instruments and focus, which require policy makers to deeply understand the technology

---

<sup>4</sup> <https://nncta.org/files/documents/nncta-final-report.pdf> (Last access: 31/01/2024).

systems that are currently driving economic and social change. For instance, Soete and Sterna (2023) highlight how renewable energy production is structurally local and that European regions have heterogeneous capacity to contribute – from this understanding comes the need to focus on investments in infrastructure for energy distribution.

**Figure 2. Trade dependencies of the EU and the US**

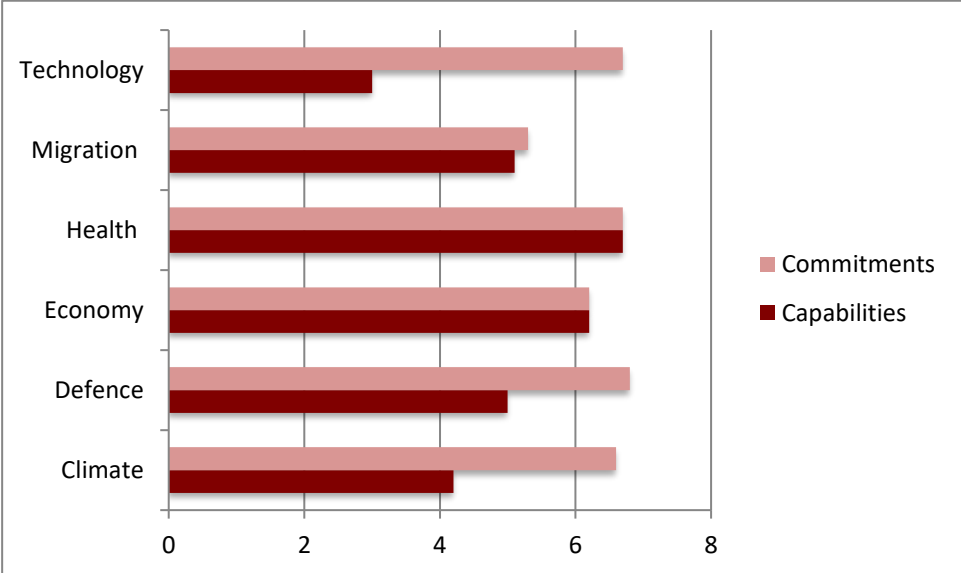


Source: European Commission (2021a).

Given their importance for the green transition, particular attention has been given to the so-called critical raw materials (Kowalski and Legendre 2023). Carrara et al. (2023) study 15 emerging technologies, including lithium-ion batteries, fuel cells, electrolyzers, wind turbines, heat pumps but covering also robots, drones, or satellites, and show that the EU is substantially vulnerable along their supply chains, as most technologies rely on a common set of raw materials: copper, nickel, silicon metal, and manganese. Given that the EU has a negligible share of global raw material production (around 7%), vulnerabilities in the technologies studied are concentrated upstream in the supply chains. However, in some cases, they reverberate downstream to final products, as in the case of batteries, photovoltaic solar panels, computer devices and drones. Structural dependencies along the supply chain of photovoltaic technology have been confirmed by Caravella et al. (2024). The importance of critical input has pushed the European Commission to propose a dedicated European Raw Materials Act.

The state of the art of European ‘sovereignty’ is captured by indicators such as the EU Sovereignty Index (EUSI) measured in 2022 by the European Council of Foreign Relations.<sup>5</sup> It is a multi-dimensional index that helps to identify the main strengths and weaknesses of European sovereignty, based on countries’ efforts in different strategic terrains. Figure 3 shows the EU’s overall sovereignty score by comparing commitments and capabilities. The EU appears to be ‘good’ only in the terrains of economy and health, ‘satisfactory’ in climate, defence and migration, and ‘poor’ in the technology domain, where the gap in terms of ambition is the greatest. In no area is European sovereignty ranked as ‘excellent’. More importantly, in many cases the EU is doing much better in terms of commitments than actual capabilities, suggesting that while the EU has the will to act, it lacks the resources to strengthen autonomy. While this could be a sign of the positive integration of the EU in the previous phase of globalisation, the evidence suggests that dependency is a sound justification for policy intervention.

**Figure 3. Commitments and capabilities to European sovereignty at the EU level, by terrain**

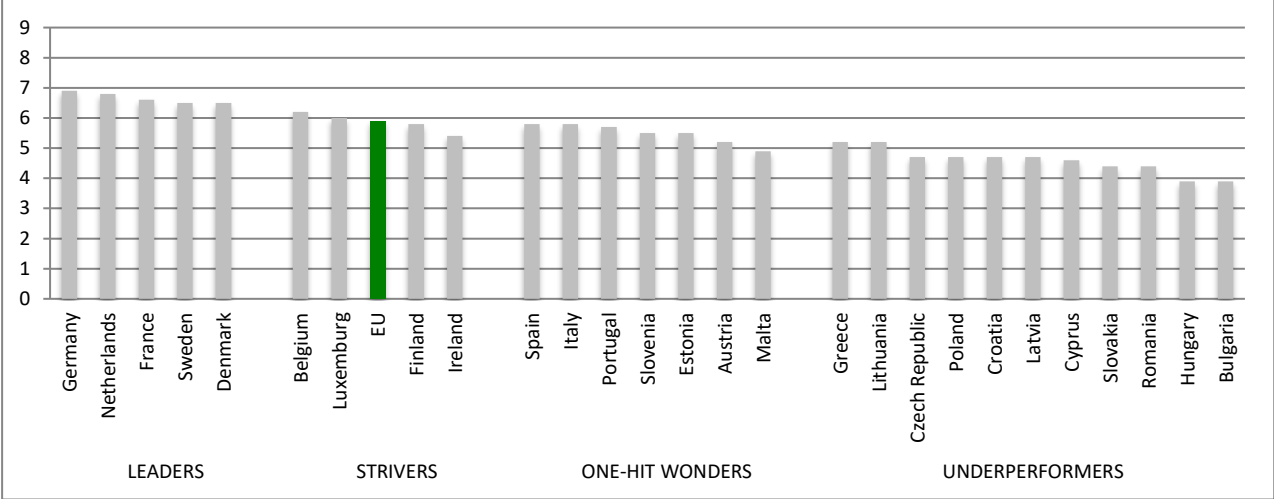


Source: EUSI (2022).

At a national level, the performance of countries in the aspects captured by the EUSI is heterogeneous. Figure 4 groups Member States into four categories: *leaders*, *strivers*, *one-hit wonders*, and *underperformers*. When looking at the specific areas of interest for this paper – climate and technology – the largest clusters have, respectively, satisfactory and poor performance (Figures 5 and 6), indicating a significant lack of resilience in areas key to continental growth and, at the same time, a clear opportunity for Union-wide policies to improve the situation.

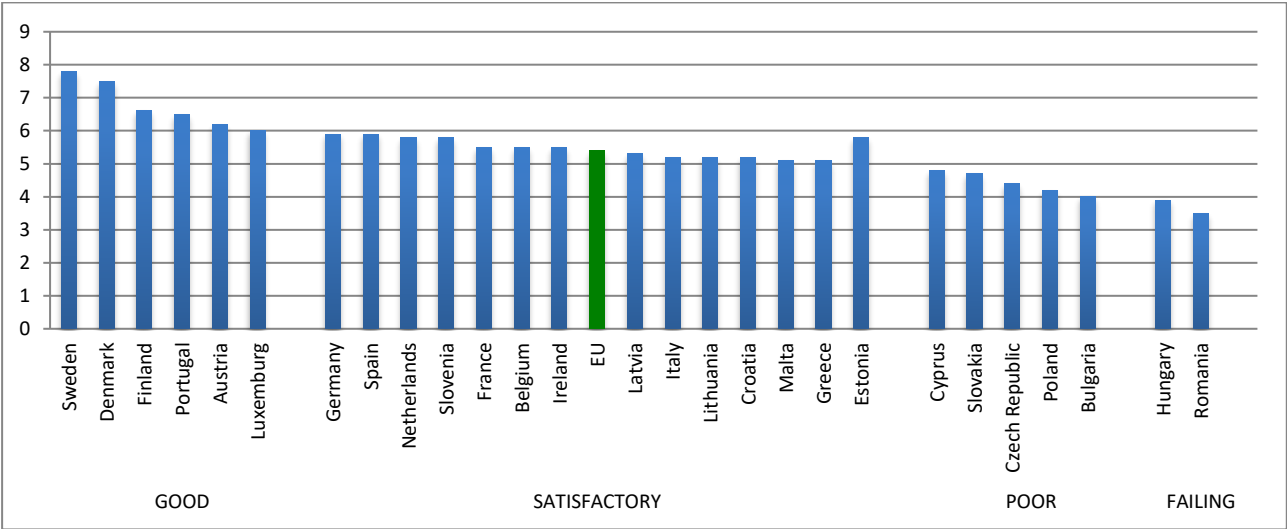
<sup>5</sup> <https://ecfr.eu/special/sovereignty-index/>

**Figure 4. Sovereignty index classification, by country**



Source: EUSI (2022).

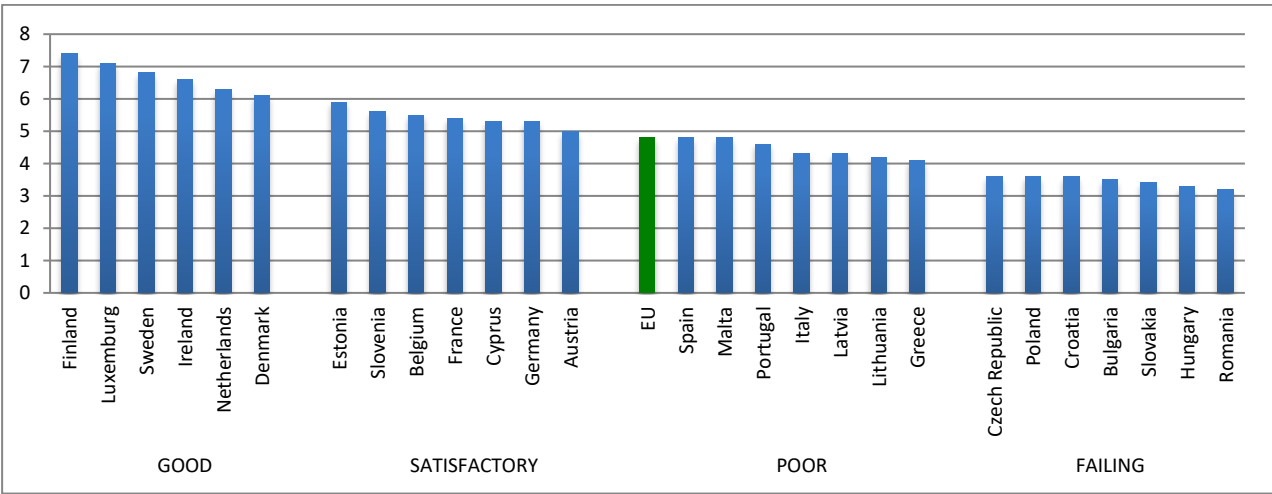
**Figure 5. Country performance in the climate terrain**



Source: EUSI (2022). Note: the index in this domain focuses on two areas: 1) how far countries have progressed in their green transition; 2) how much they contribute to EU leadership in the global green transition.



**Figure 6. Country performance in the technology terrain**



Source: EUSI (2022). Note: the index focuses on artificial intelligence, big data, cloud computing, semi-conductors, robotics, the internet of things, high-performance computing, advanced telecommunications, and cyber-security. The index measures Member States’ technological capabilities using indicators including their contributions to research, patents, and standards; number of technology firms and professionals; companies’ market share; venture capital investment in these technologies; and technology uptake.

The take home message from these assessments of dependencies and sovereignty is that, during the expanding phase of globalisation, Western economies including the EU did not pay much attention to the diversification of sources nor to the geopolitical bottlenecks of global value chains – semi-conductor fabrication, located mostly in disputed Taiwan – is a case in point. Now, emerging dependency and strategic rationales are motivating policies to ‘re-shore’, ‘on-shore’, or ‘friend-shore’ production. There is no evidence of de-globalisation, rather a re-structuring of global trade. Indeed, evidence is already accumulating of ‘de-fragmentation’ of global value chains.<sup>6</sup> In the US, a number of legislations including the Inflation Reduction Act<sup>7</sup> and the CHIPS and Science Act<sup>8</sup> have the explicit goal of boosting private commitments in advanced manufacturing through granting subsidies and introducing conditionalities in form of local-content requirements, with a clear directionality towards green and clean technology, re-shored jobs, and lowered costs through public investments in infrastructure.<sup>9</sup> Similar goals underpin the European Chips Act,<sup>10</sup> aimed at

<sup>6</sup> <https://www.linkedin.com/pulse/industrial-production-processes-defragmenting-portrait-baldwin-bcgle> (Last access: 31/01/2024)

<sup>7</sup> United States Congress Public Law No: 117-169: <https://www.congress.gov/bill/117th-congress/house-bill/5376> (last access: 31/01/2024).

<sup>8</sup> United States Congress Public Law No: 117-167: <https://www.congress.gov/bill/117th-congress/house-bill/4346> (last access: 31/01/2024).

<sup>9</sup> See <https://www.whitehouse.gov/invest/> for a breakdown of initiatives and their regional distribution by technology (last access: 31/01/2024).

<sup>10</sup> <https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733596/EPRS-Briefing-733596-EU-chips-act-V2-FINAL.pdf> (last access: 31/01/2024). The proposal of the European Chips Act contains important industrial policy measures, for instance the possibility for the European Commission to make shared purchases and prioritise orders in the event of supply crises.

building capacity to develop frontier semi-conductor fabrication capabilities on the continent, and the Green Deal Industrial Plan of the European Commission.<sup>11</sup>

The situation we have presented outlines conflicting incentives for economic actors. On the one hand, strategic initiatives generate a climate of rivalry at the international level; this strengthens the incentive to respond with further industrial policy actions, in a vicious circle. For example, the European Commission has granted exemption to Member States' limitations to engage in State Aid (as set out in European Treaties in order to protect the single market) in response to the adoption of the IRA in the US. In turn, the IRA provisions on local content requirements are in violation of the rules of the World Trade Organisation (WTO), signalling an aggressive attitude towards, and a shift away from, the 'old', multilateral, phase of globalisation (Kleimann et al. 2023). At the same time, the growing divide between allies and enemies on the global stage has created the conditions for some coordination mechanisms to emerge. A case in point is the US-EU Trade and Technology Council (TTC), launched in 2021 between the EU and the US. The Council serves as a platform to build consensus on both sides of the Atlantic on issues related to technology standards (particularly, artificial intelligence and future 6G connectivity), clean technology, data governance, and the resilience and security of supply chains. It also aims to facilitate cooperation between industry players in critical sectors (e.g. semiconductors) spurred by recent policy initiatives on both sides. The Council is an example of how an international industrial policy instrument can look like. The platform is a vehicle to address coordination failures through bilateral dialogue between two major macro-regions of the world, and is further evidence of the co-evolving regimes of competition and factionalised cooperation on the global stage.

Some final considerations for this Section concern the critical aspects of the new industrial policy. In the context of renewed pro-active State intervention, not all instruments are alike. Some authors underline the need to make explicit the different nature of ongoing industrial policy initiatives, since they reflect distinct ideological backgrounds. Gabor (2023) critically highlights the difference between public investments and subsidies – a more traditional form of State-substituting-markets direct action that underlies initiatives such as the CHIPS and Science Act, due to the geopolitical valence of semiconductors – and what she labels the 'derisking' State, which uses financial instruments to leverage private capital and, therefore, involves a logic less grounded on public powers as direct providers of public goods. Another key lesson reinforced by the results of the dependency assessment exercises is that industrial policy must focus not only on direct investments or subsidisation of frontier technologies. This could lead to a waste of public resources in rapidly evolving industries, such as semi-conductor. Legacy systems must not be forgotten in favour of hyped technologies at any given time – in fact, legacy semi-conductor devices are explicitly subsidised in the CHIPS and Science Act given their widespread use in the automotive industry. Likewise, policy attention should widen from technological products to bottlenecks in diffusion. Industrial development involves the percolation of technologies across user industries, and the provision of key inputs. As we have discussed, this is the case of critical raw materials, but also for the computing infrastructure that enables the growth of the digital economy and specific applications such as artificial intelligence.

---

<sup>11</sup> [https://commission.europa.eu/document/41514677-9598-4d89-a572-abe21cb037f4\\_en](https://commission.europa.eu/document/41514677-9598-4d89-a572-abe21cb037f4_en) (last access: 31/01/2024).

In summary, in addition to the planetary scope of the polycrisis and the permacrisis, the novel fact of industrial policy in the current global context is the momentum gained by the dependency and rivalry narratives. Vicard and Wibaux (2023, p.7) point out that “patterns underline that it is not the underlying structure of dependencies that has changed but the perceived risks associated with them because of the concentration of imports of dependent products from a source country, China, that is now considered less aligned geopolitically to the EU, and/or increasing risks of supply-chain disruption due to pandemics or natural disasters. The shift in the source of dependent products, however, occurred a decade ago, which reminds us that the renewed focus of the EU on its strategic vulnerabilities results from a shift in the perception of the consequences of trade relationships rather than the build-up of new dependencies”. Dependencies exist as a natural by-product of globalisation; their strategic nature has only now become a matter of concern, as the world turns into a more fractured place – still globalised, but with rising tensions. As Luo and Van Assche (2023, p.1) point out in their evaluation of the CHIPS and Science Act, what we are witnessing is a paradigm shift towards an “intervention-oriented techno-nationalism, heralding a new era of zero-sum thinking and geopolitical prioritization”. Signs of a worsening international climate can be seen in the evolution of communications relating to the strategic dependency of the European Commission, which have evolved from the assessment of trade dependencies and diversification of sources to security and defence considerations.<sup>12</sup> The emerging narrative is to avoid ‘technology leakage’ to other countries in critical areas such as advanced semi-conductors, artificial intelligence, quantum- and bio-technologies. The motivation for intervention shifts even further towards the logic of ‘national power’, with emphasis placed on the dual use of those technologies that can be developed for harmful purposes. A way to break the vicious circle between global challenges and techno-nationalistic interventionism in industry is to act on the ‘nationalistic’ element – building a supranational, federal industrial policy. We discuss how to achieve that in the next Sections.

#### 4. European industrial policy: general coordinates

The supranational experience of industrial policy in Europe has moved in tandem with successive prevailing styles and narratives of the field. In a very general sense, it evolved based on the relative (perceived) importance of internal versus external pressures. Pellegrin et al. (2015) outline five phases over the course of the integration process. A first phase coincided with the development of the European Coal and Steel Community (ECSC) in the 1950s. In a nutshell, this was a one-sector policy aimed at expanding the supply of what today would be called critical raw materials. A second phase began with the institutionalisation of the European Economic Community in 1957, and developed through the 1970s, allowing for sectoral planning that mirrored the ‘French’ industrial policy approach. The promotion of technologically advanced industries emerged as a priority, together with awareness of the ecological challenge, due largely to the profound impact of the Club of Rome’s *Limits to Growth* report (Meadows et al. 1972). This phase shows how a grand challenge becomes a motive for directed policy and can be considered a precursor of the situation we are now facing. A positive view on the selective role of public intervention in industry in this

---

<sup>12</sup> [https://defence-industry-space.ec.europa.eu/commission-recommendation-03-october-2023-critical-technology-areas-eus-economic-security-further\\_en](https://defence-industry-space.ec.europa.eu/commission-recommendation-03-october-2023-critical-technology-areas-eus-economic-security-further_en) (Last access: 31/01/2024).

period emerges during Altiero Spinelli's tenure as European Commissioner for European industrial policy. Spinelli (1972) argued the need to 'institutionalise' specific vehicles – European public enterprises – capable of providing risk capital to new ventures and high-tech sectors. Such European public enterprises could have been installed as initiatives of the European Bank of Investment and its national subsidiaries, in a networked approach to the public financing of projects of continental relevance that anticipates more recent proposals (Vannuccini 2015) and current instruments such as the IPCEI, which we will discuss later in the paper. A third phase of European approach to industrial policy began in 1990, with a shift away from vertical policies and a preference for the development of the internal market, with the emerging priority of guaranteeing a level playing field. However, at the same time, the Community began to consider the radical transformations set in motion by the diffusion of information and communication technologies (ICTs). At the turn of the 21<sup>st</sup> century, external dynamics – mainly globalisation and de-localisation – brought the industrial policy agenda back into the spotlight, setting the stage for an explicit return of strategies targeting manufacturing and re-industrialisation in a fifth phase starting in the mid-2010s, culminating in the idea of a European 'Industrial Renaissance' (Berglof 2016). In this iteration, industrial policy has explicitly ventured into the realm of regional policy, introducing the notion of *smart specialisation* as a vehicle for combining locally tailored innovation in key technological trajectories with a bottom-up approach that favours entrepreneurial discovery as a driver of experimentation and growth (Foray 2018).

Di Carlo and Schmitz (2023) unpack the factors shaping the form that European industrial policy is taking in the current phase, starting from the 2010s. Politically, the key push to implement industrial policy at the European level has been provided by the pivoting of Germany towards a more favourable stance on sectoral interventions (after experiencing the 'Kuka moment' of Chinese acquisition of Kuka, a major German robot equipment manufacturer). In doing so, Germany aligned itself with the more pro-active vision of France and helped to create a broader consensus around industrial policy. In this context, the authors highlight how the European Commission has acquired the role of a "developmental network state" in the domain, moving along different strategic axes by performing four different functions: i) *targeted resourcing*, mainly through the financing of technological innovation; ii) *brokering* European networks and alliances of private actors; iii) *facilitation* of national and private investments through the revision of State Aid regulation, as in the case of the IPCEI; and iv) *protecting* the single market by strengthening autonomy – for instance, by mapping strategic dependencies, as we reported in Section 3. These four functions are interdependent and integrated, and show different degrees of 'supranationality'. However, the financing of interventions still remains predominantly intergovernmental, and the Commission mainly acts as a fixer of coordination failures. In practice, the set of instruments and the budgetary lines used by the EU to influence industrialisation and the related challenges of technology, productivity, employment and regionalisation are rather invariant (Pianta et al. 2020). For instance, Mosconi (2006) reports a list of areas in which the Prodi Commission aimed to develop 'European champions' in the early 2000s: biotechnology, ICTs, renewables, aerospace and defence. These areas are precisely the same ones for which current assessments of strategic-ness and dependency recommend new industrial policy activism. What has changed over time is the weight assigned to different motives – and, consequently, instruments – both politically and financially through the

allocation of resources, and the degree of overlap and integration of the different policy schemes that have expanded incessantly and then streamlined.

From a legal point of view, Article 173(1) of the Treaty on the Functioning of the European Union (TFEU) mentions that the Union and Member States can take steps to speed up the adjustment of industry to structural change, support the establishment and growth of (and cooperation between) small and medium-sized undertakings, and exploiting the impacts of technology, science and innovation policies – namely, facilitating technology transfer. However, direct interventions in support of industry development fall under competition policy provisions, as exceptions to State Aid control rules (Article 107 TFEU). State Aid is defined as any advantage conferred by national public authorities on a selective basis (Piechucka et al. 2023). It is subject to compatibility assessment under Article 107 of the TFEU to avoid kickstarting subsidy races, that are incompatible with the development of the single market. The introduction of the General Block Exemption Regulation (GBER) has simplified the procedure by declaring *a priori* certain categories of aid compatible with the internal market.<sup>13</sup> However, the rationale for the current set up is summarised by Dullien and Hackenbroich (2022, p.5): “For decades, the EU has pursued an approach to industrial policy that focused on limiting Member States’ industrial policies. The idea was that a strong and well-functioning market would create the right framework for robust EU industries”. The provisions of Article 107 TFEU list exceptions for ‘natural disasters or exceptional occurrences’ and ‘serious disturbance in the economy of a Member State’ that have already been exploited to allow government interventions precisely in response to the challenges of the polycrisis and to develop the logic of responding to emerging rivalries: Covid-19 response; support to Ukraine for its defence against Russia; and reactions to the American IRA. Furthermore, in June 2023, the European Commission amended the GBER to support the green transition. In general, all exceptions to the State Aid rules are temporary. However, as we discussed, in the context of the permacrisis, a continuous succession of temporary exceptions becomes a quasi-permanent exception, justifying the creation of a stable, albeit turbulent, environment for vertical industrial policies.

The fundamental ambiguity of the current state of industrial policy in the EU is due to misalignment at the institutional level: competition policy is a truly federal competence of the Union, while industrial policy is pursued through the tortuous route of justifying cases of direct intervention at the national level – a *permanent* case, in the current context. This creates a layered tension: the trade-off is not just that between guaranteeing a fair functioning of the European market versus supporting European champions, but rather guaranteeing a fair European market versus allowing the support of national champions, who help reproduce within the border of the EU the logic of rivalry that is gaining momentum globally. An example of this dynamic has been the release of the ‘Franco-German Manifesto for a European industrial policy fit for the twenty-first Century’ in 2019,<sup>14</sup> after the European Commission’s ban on Siemens’ acquisition of Alstom, which explicitly attacks the Union’s merger guidelines. This case makes clear that European industrial policy initiatives motivated by external challenges are still predominantly a monopoly of nation-states. The fracture

---

<sup>13</sup> [https://competition-policy.ec.europa.eu/state-aid/legislation/regulations\\_en](https://competition-policy.ec.europa.eu/state-aid/legislation/regulations_en) (last access: 31/01/2024).

<sup>14</sup> [https://www.gouvernement.fr/sites/default/files/locale/piece-joynte/2019/02/1043\\_-\\_a\\_franco-german\\_manifesto\\_for\\_a\\_european\\_industrial\\_policy\\_fit\\_for\\_the\\_21st\\_century.pdf](https://www.gouvernement.fr/sites/default/files/locale/piece-joynte/2019/02/1043_-_a_franco-german_manifesto_for_a_european_industrial_policy_fit_for_the_21st_century.pdf) (last access: 31/01/2024).

between the generalised pressure imposed by the complex external landscape and the individual or bilateral reactions by EU members risk creating cracks in the Union's edifice. From this perspective, coordination actions at the level of EU institutions appear more as a patchwork than structural strategies. Analysing the proposal of a Net Zero Industry Act as European response to the American IRA, Kleimann et al. (2023) confirm this view: while priorities, instrument packages and resourcing across the Atlantic are rather comparable, the EU initiatives rely on Member States' contribution, while the European level is left to focus mainly on supervision and coordination tasks.

The possible risk of backward dynamics – discourses of European strategic autonomy can quickly collapse into discourses of national strategic autonomy and even security – constitutes a strong reason to start thinking in systemic (we say institutionalised) terms about a federal industrial policy. The case for a supranational industrial policy remains the same: providing European public goods, addressing externalities across industries, but at the continental level. Instead, recent initiatives – even when financed and delivered at the EU level – are severely underfinanced, and compensate for that by focusing on streamlining existing programmes, as in the case of the 'Strategic technologies for Europe platform' (STEP).<sup>15</sup> The reason for this, once again, is that industrial policy is eminently political, but Europe is not. There is room for action in reorganising existing budget appropriation lines and policy schemes (or for action in the area of Antitrust and competition policy, which is already European); there is much less room to expand funding at the Union level. This situation produces a disconcerting gulf between boastful announcements and realised initiatives: the necessary substantial public investments are replaced by public signalling. In other words, although we may want European industrial champions, we get 'European Sovereignty Seals' featured by STEP. It goes without saying that actions to reduce the fragmentation of existing industrial policy initiatives in the EU are a positive development. Indeed, the EU continues to underperform in demonstrating the ability to build a single flagship programme compared to the US. However, an honest discussion on European industrial policy should address the deeper question of whether industrial policy should be subordinated to a general societal policy, as argued by Spinelli (1972). Pragmatically, this means that the issue of the EU's own resources must be addressed: the other side of the coin of industrial policy in Europe is fiscal policy. Put differently, *there is no strategic autonomy without fiscal autonomy*.

Recent institutional innovations in the EU have partly addressed this fundamental problem. The NGEU package, launched in response to the Covid-19 shock, introduced important novelties in the financing of public interventions – the key one being the Recovery and Resilience Facility (RRF). However, the NGEU was conceived as a temporary measure; the problem of building a permanent fiscal capacity at the Union level remains. Nevertheless, the NGEU set a precedent on which more ambitious proposals can be built, which we discuss in Section 5.

Before moving to our proposals, we elaborate on a particular policy design that is increasingly under the spotlight, and which we believe to be a viable way to advance towards the 'institutionalisation' of a European industrial policy: the creation of agencies, authorities, or enterprises as goal-oriented, specialised institutional vehicles. These can be compared to the idea of European champions, however publicly governed. These types of organisations have been labelled European Public Enterprises, or European Enterprises of General Interest. Throughout its

---

<sup>15</sup> [https://www.europarl.europa.eu/thinktank/en/document/EPRS\\_BRI\(2023\)754547](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2023)754547) (last access: 31/01/2024).



history, the EU has used this tool to form publicly owned or participated consortia as ad hoc entities. Some examples of this policy instrument are: Euratom, Airbus, Galileo, or the European Space Agency, although each is characterised by different institutional, governance, and funding nuances. The idea of leveraging this industrial policy tool at the continental level is making its way into several proposals: for example, Renda and Balland<sup>16</sup> speak of the need for an ‘Airbus moment’ for the EU in the domain of artificial intelligence. Kleimann et al. (2023) share our concerns about the race to the bottom generated by global rivalries, and suggest the institution of an ARPA-EC (where EC stands for energy and climate) for the EU, modelled on the American experience of the Advanced Research Projects Agencies in defence (DARPA) and energy (ARPA-E). Even in this context, we are witnessing the emergence of ‘ARPAs’ at the national level (e.g. ARIA in the UK, Sprin-d in Germany), while the direction to be pursued should be the Europeanisation of these tools. The idea of European ARPAs is close to the aforementioned proposal put forward by Spinelli in the 1970s and elaborated by Velo (2006) with the concept of European Public Enterprise of General Interest, meant as pieces in the broader puzzle of the ‘project-based Europe’. Recently, the proposal was revamped by Archibugi and Mariella (2021), who argue for European public corporations – namely, public European champions – by comparing the similarities between the case of commercial aircraft technology in the 1960s, exemplified by the case of Concorde, and today’s digital technologies, the supply and control of which are dominated by American tech giants. The general case for establishing European Public Enterprises as a tool of a continental industrial policy is clear: these newly established corporations could exploit continental economies of scale in limited domains – for instance, technological innovation and transfer in critical and strategic fields – by allocating ‘patient’ risk capital by virtue of their public purpose.

In their fully public form, the creation of European Public Enterprises resembles the establishment of European State-Owned Enterprises (ESOs). The primary concern with this idea is the risk of government failure and capture. However, there is plenty of evidence of the ability of State-owned enterprises to internalise externalities (and, thus, to reduce market failures) and to nurture infant industries. Antonelli et al. (2014, p.47) show the positive impact of the *Istituto di Ricostruzione Industriale* (Industrial Reconstruction Institute, IRI) in the post-war Italian economy: “[o]rganized as a super-holding on top of the sectorial holdings, owing a sound capital base, entitled to issue long-term State-guaranteed bonds, IRI for a long phase– as a corporation wholly owned by the State but quite autonomous financially and in running business – was able to offer much needed fresh capital, to reorganize and run a large block of SOE – maintained joint-stock companies under private law – active in a variety of upstream industries ranging from the production of steel, ships, machinery and capital goods, motorcars, trains and airplanes”. Kline and Moretti (2014) estimate the impact of the best-known example of public enterprise, the Tennessee Valley Authority (TVA). The TVA was a key vehicle for implementing Roosevelt’s New Deal provisions, as it was tasked with managing infrastructure investments to industrialise the Tennessee Valley. Industrial policy, channelled through a specialised institutional vehicle, produced a lasting impact on manufacturing employment (but only a temporary one on agriculture, while the intervention lasted), as well as aggregate productivity gains for the entire US economy. Consequently, the gains resulting from the TVA exceeded the costs of the programme; in particular, the direct impact of infrastructure

---

<sup>16</sup> <https://www.ceps.eu/ceps-publications/forge-ahead-or-fall-behind/> (last access: 31/01/2024).

investments lasted even after the termination of the policy. The case of the TVA is usually read through the lens of ‘place-based policy’, given its focus on generating localised agglomeration economies to kickstart regional industrialisation processes. We believe that the best lens to look at it is the institutional one: a federal enterprise, equipped with adequate resources and with clearly defined tasks, can produce widespread and persistent positive effects on a large economy.

The ESOE, as well as other problem-oriented instruments, cannot exist in a vacuum; they must be housed within a broader institutional framework, since, despite their autonomy, they must be subject to a democratic process of resource appropriation or to an overarching mission. For this reason, Spinelli advocated for their inclusion within the network of European and national investment banks. In the current context, this corresponds to the temporary financing of the IPCEI by the RRF and, in our proposal, by a longer lasting new framework fund with a more federal distribution of resources between the European and national levels. Politically, IPCEIs could be seen as a form of general interest European enterprises (networks) financing high-risk, high-reward projects in strategic technology sectors linked to the green and digital transitions, thus representing the leverage for a broader fund modelled on the NGEU and the European Sovereignty Fund to pursue the mission of maintaining the EU on the global industrial frontier. We delve deeper into this aspect in the next Section.

## 5. Achieving a European industrial policy today

As already mentioned in Section 4, the exploitation of the ‘Aids granted by State’ provision in the TFEU (Art.107) is the current legal path through which the EU has enabled vertical industrial policies. According to this provision, aid intended to promote the implementation of an IPCEI or to remedy a serious disturbance in the economy of a Member State is to be considered compatible with the spirit of the European Single Market (Art.107 3(b)). State aid is allowed in this form as long as the supported projects: (i) contribute to the EU’s strategic objectives; (ii) involve several EU countries; (iii) involve private financing by the beneficiaries, (iv) generate positive spillover effects across the EU; and (v) are highly ambitious in terms of research and innovation (EC 2012). From the letter of the Treaty, the IPCEI seems to correspond perfectly to the infrastructure, cumulative and strategic dependency logics of intervention to produce or support key assets. And indeed, the IPCEI has increasingly come under the spotlight as a viable instrument to finance the early stages of industrial policy projects that are aligned with European priorities.<sup>17</sup>

IPCEIs represent a way of introducing some budgetary differentiation into an otherwise largely undifferentiated framework that was shaped by the longstanding principle of competition policy, which prioritises a level playing field in the single market (Eisl 2022a). Basically, differentiation procedures can be designed in two ways: a multi-speed integration, where a core group of willing Member States decides to proceed further in a certain policy with the underlying assumption that other Member States will follow later; or variable geometrical integration, where a permanent

---

<sup>17</sup> IPCEIs can underpin all policies and actions that seek to achieve common European objectives, in particular the European Green Deal, the Digital Strategy and the Digital Decade, the New Industrial Strategy for Europe and its update, the European Strategy for Data and Next Generation EU. They can also contribute to a sustainable recovery following serious economic disturbances such as those caused by the COVID-19 pandemic and support efforts to strengthen the EU social and economic resilience (EC 2021)



differentiated integration makes a distinction between more and less integrated Member States, with the latter choosing not to participate in specific policies (Stubb 1996). The IPCEI instrument follows the first approach, as it takes the form of a pooling of public resources provided by a group of willing countries that use these resources to finance common strategic projects. With the IPCEI, large-scale transnational public investments that would strengthen the competitiveness of the EU are enabled in six value chains considered critical in terms of dependencies: (i) connected, clean and autonomous vehicles, (ii) hydrogen technologies and systems, (iii) smart health, (iv) industrial internet of things, (v) low carbon industry, and (vi) cybersecurity.<sup>18</sup>

Three waves of IPCEIs have been launched or planned since 2018 (Eisl 2022b):

- the first wave projects concern microelectronics and batteries, in an experimentation phase in which participating states and European institutions started to develop procedures for initiating first projects. With €1.9 billion of national public investments, the participating states were expected to unlock an additional €6 billion from private investments;
- a second wave coincides with the launch of the RRF in the NGEU, which provides a fiscal stimulus for investments, particularly for the green and digital transitions. The 2021 revision of the IPCEI engagement rules, following its initial phase, made the procedure more transparent and inclusive, especially to encourage the participation of Central and Eastern Europe countries (EC, 2021). In this consolidation phase, the size and scope of projects increased, covering two new initiatives for the hydrogen sector and for microelectronics and Information and Communication technologies. Notably, the RRF made an important contribution to the European co-financing of second wave of IPCEIs (see Section 5.2);
- finally, a third wave of the IPCEIs is expected after the conclusion of the NGEU, in other strategic sectors, like solar photovoltaics, low carbon industries and healthcare.

From this brief assessment, it clearly emerges that since 2018 the IPCEIs have seen their role grow, with an increasing number of countries and companies receiving public financing of nearly €28 billion and are expected to mobilise a further €51.4 billion over the decade, thanks to a leverage effect of 2 (see Table 1). These projects have supported the creation of a set of tangible and intangible assets and have stimulated knowledge accumulation, the benefits of which will be shared on the basis of open access, therefore not limited to the participating companies. In summary, the IPCEI can be seen as a necessary lever to nurture problem-oriented, champion-like and specialised ecosystems on a continental scale – and thus appear as a preferential tool to be deepened and expanded in order to build a European industrial policy.

---

<sup>18</sup> See the Report of the Strategic Forum for IPCEI at <https://www.earto.eu/wp-content/uploads/Strategic-Forum-Strengthening-Strategic-Value-Chains-for-a-future-ready-EU-Industry.pdf>

**Table 1. Approved integrated IPCEIs: public and (expected) private financing (€billion, number of participating countries, companies and projects)**

	State aid approved	Expected private investment	Participating countries	Participating companies	Participating projects
<b>First wave IPCEIs</b>					
First IPCEI on microelectronics (2018-2022)	1.9	6.5	5	29	43
First IPCEI on batteries (2019-2031)	3.2	5	7	17	22
Second IPCEI on batteries (2021-2028)	2.9	9	12	42	46
<b>Second wave IPCEIs</b>					
First IPCEI on hydrogen	5.4	9	15	35	41
Second IPCEI on hydrogen	5.2	7	14	29	35
Second IPCEI on microelectronics and Communication Technologies	8.1	13.7	14	56	68
First IPCEI on cloud infrastructure and services	1.2	1.4	7	19	19
<b>Total</b>	<b>27.9</b>	<b>51.4</b>	<b>22</b>	<b>227</b>	<b>274</b>

Source: European Commission: [https://competition-policy.ec.europa.eu/state-aid/ipcei/approved-ipceis\\_en](https://competition-policy.ec.europa.eu/state-aid/ipcei/approved-ipceis_en) (last access: 31/01/2024).

### 5.1 A classification of European Public Goods

The rationale for a European industrial policy is the provision of public goods on a continental scale and scope. At this point, it is useful to introduce more nuance to this notion, as this will help to define the nature and perimeter of our proposals. According to Buti et al. (2023) the so-called twin transition – green and digital – fits well into the European public good scheme, since it is one of Europe’s priority areas that fully respects what are considered the three basic rationales – economic, political, institutional – justifying the provision of European public goods. The economic

rationale identifies European public goods on the basis of ‘classic’ features of non-rivalry and non-excludability, economies of scales and scope, and positive externalities. The green and digital transitions also fully respond to a political rationale, as these benefit the EU as a collective political entity and not just as the sum of its individual Member States, supporting the EU’s domestic and international strategic political priorities. Buti and Papacostantinou (2023) highlight a third relevant issue linked to the institutional dimension of public goods. They distinguish between two phases of the implementation of public goods, ‘delivery’ and ‘financing’. Both delivery and financing can take place at national or European levels (Table 2). Therefore, depending on their possible combination, we can have different types of European public goods:

- Pure European public goods are those provided and financed at the European level. Examples of *pure* European public goods are programmes such as the Innovation Fund and InvestEU (see Section 5.4), with centrally managed funds;
- Public goods financed by the EU but provided by Member States are European public goods *by aggregation*. In this case, although the implementation of projects relies on the decentralised management of Member States, the European Commission is responsible for monitoring, and as long as the projects are consistent with clearly defined European objectives, they can still be qualified as ‘European’, as they indirectly contribute to the common European interest. A case in point is the RRF, with European financing granted to beneficiary countries under conditions aligned to the European Green Deal, as at least 37% and 20% of the funds should be spent on the green and digital transitions, respectively;
- in the case of both national delivery and financing we are in presence of *pan-European* public goods, such as the first wave of IPCEIs, which allow State-aid support for revolutionary innovations that would otherwise not materialise, with national financing authorised by the European Commission;
- it is possible to have EU public goods delivered at the European level, even if the financing is national, through the ‘external assigned revenue’. Assigned revenues take the form of financial contributions by Member States or third countries, to finance specific items of expenditure, such as some research programmes and external aid projects, like the Facility for Refugees in Turkey.<sup>19</sup> Notably, the Buti and Papacostantinou (2023) classification does not explicitly consider, from a legal point of view, revenues arising from funds borrowed in the market to finance the NGEU as external assigned revenue. However, from a delivery point of view, the NGEU is mainly managed at the national level through the RRF, with European funds borrowed on the market.

With this framework, there are different paths to follow to create a European industrial policy that is green and aimed at achieving strategic autonomy. This could be implemented gradually, building on already existing instruments, but accompanied by important innovations, particularly linked to their financing.

---

<sup>19</sup> In 2019, assigned revenue amounted to 10.5% of the European budget (€17.5 billion), while in 2021, assigned revenue dramatically surged to €220 billion due to the decision to allow the Commission to issue bonds on the market on behalf of the EU (Mathis 2021).

**Table 2. Classification of European public goods by delivery and financing**

		DELIVERY	
		EU	NATIONAL
FINANCING	EU	<p><b>pure EU public good</b> CEF InvestEU</p>	<p><b>EU public goods by aggregation</b> RRF, SURE IPCEIs (second wave)</p>
	NATIONAL	<p><b>EU public goods by external assigned revenues</b> Facility for Refugees in Turkey</p>	<p><b>Pan-European public goods</b> IPCEIs (first wave)</p>

Source: Authors’ elaboration, based on Buti and Papacostantinou (2023)

In the classification of EU public goods depicted above, a two-tier structure emerges for financing a European industrial policy. First, the implementation of the second wave of IPCEIs at the national level could be further extended through increased co-financing from the European budget, providing more EU public goods by aggregation. Second, European delivery and financing – that is, pure EU public goods – could be explored through strengthening direct funding from the European budget, like InvestEU and the Innovation Fund. These two options are available with varying degrees of feasibility, considering their drawbacks from both a delivery and financing point of view. However, as we have already discussed, the question of an adequately resourced European fiscal capacity is a fundamental condition when designing a European industrial policy in the specific landscape we live in, regardless of whether the delivery is pursued at the European or the national level. In the following paragraphs, we explore the recent progress and critical issues of the tools envisioned to build a hybrid European industrial policy, beginning with the promising proposal of a European Sovereignty Fund.

**5.2 The ‘Europeanisation’ of IPCEIs: EU public goods by aggregation**

The third wave of IPCEIs announced for the post-NGEU period could face a double risk: first, financial support from the public sector could be scaled back due to the lack of available European resources, undermining the European industrial policy by aggregation; secondly, in the current framework in which the delivery is completely national, operational problems of the IPCEI procedures are relevant. The experience so far suggests at least three critical issues related to the IPCEI.

First, participating countries that wish to undertake an IPCEI must possess national fiscal, administrative, and technical capacities to do so (Eisl 2022a). As is clear from the EUSI (Section 3), there is a group of countries that contribute to European sovereignty in some way or another, thanks either to their excellent contribution overall (like France and Sweden), and in specific areas (like the Netherlands and Germany in the economy and healthcare sector), or to their useful contribution in one or two areas of European sovereignty (for example of Italy in the defence and healthcare sectors). Interestingly, France, Italy and their companies are involved in all IPCEIs,

despite their high level of public debt to GDP ratios. Most Central and Eastern EU countries are performing poorly in supporting EU sovereignty in multiple areas, due to insufficient resources and/or commitments, and are excluded from all (or almost all) the IPCEIs implemented so far. While the number of participating countries and companies has increased since 2018, participation remains uneven. Figure 7 shows that countries labelled as ‘underperformers’ and ‘one-hit wonders’ according to the EUSI are those less represented on average in the IPCEIs. This evidence suggests that the use of the IPCEIs could increase, rather than decrease, fragmentation within the single market.

The fragmentation of the IPCEIs undertaking is due not only to national fiscal constraints, but also to differences in the capabilities of businesses in those countries. This is linked to a second critical issue, namely that under the IPCEI, national governments directly support their domestic enterprises, which in some cases may lack technical capacity or encounter administrative difficulties to successfully complete a complex application procedure – an obstacle that applies in particular to small and medium-sized enterprises (SMEs). For example, low-carbon products tend to be ‘place-based’ local, and concentrated in certain European regions, such as Rhône-Alpes in France, Dresden and Stuttgart in Germany, and Lombardy in Italy (Bergamini and Zachmann 2020). The risk of an over-representation of certain countries in the IPCEIs is fundamentally due to fact that larger countries have national industrial champions capable of contributing to the needs of European strategic autonomy, while smaller countries tend to have a larger share of SMEs with fewer technological and administrative resources. In summary, several factors undermine the single market’s uniform integration framework, including low national fiscal capacity, poor administrative and technical capacity of companies, and lack of strong governance and transparency (Poitiers and Weil 2022). These factors can explain the uneven participation across countries.

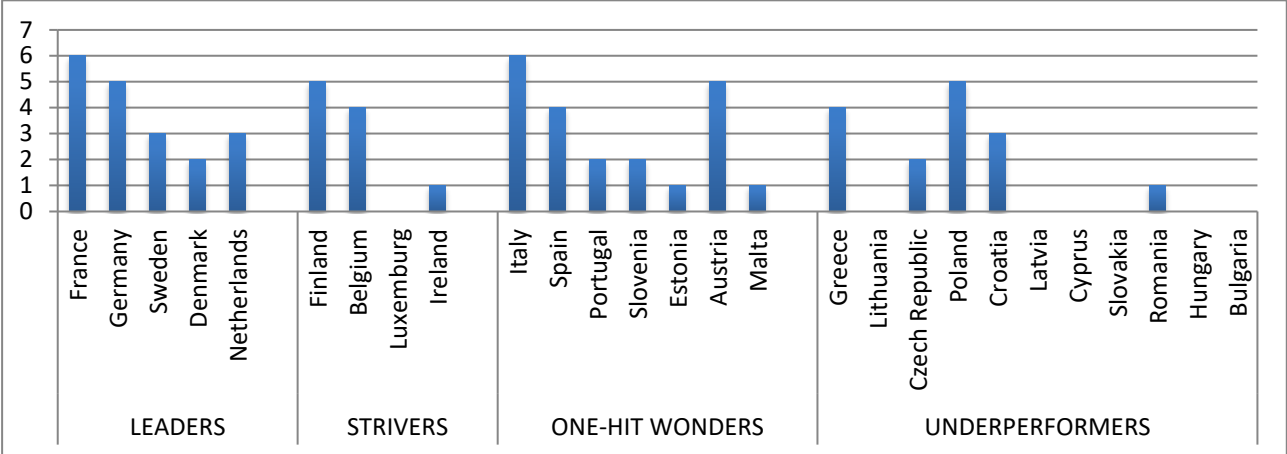
Third, the European Commission has a limited role in the IPCEIs. In essence, it provides the legal framework, defining the eligibility and compatibility criteria, in alignment with revised State-aid rules, while it has a minor role at the financial level for various reasons, including the political nature of direct supranational interventions, which provokes resistance from Member States.

The NGEU has opened up the possibility of EU co-financing of IPCEIs. The second wave of IPCEIs was also financed under the RRF through the National Recovery and Resilience Plans (NRRP) submitted by Member States to the Commission, amounting to roughly €10 billion, out of €18.6 billion of State-aid overall approved by the Commission on that occasion. This means that 55% of public spending for the second wave of the IPCEI comes from the European budget, through the NGEU, while the remainder comes from national budgets (Eisl 2022a). In this sense, the IPCEI instrument has started to become a European public good by aggregation, since the financing is partly national and partly European, while the delivery remains national. These figures suggest that an important change in the financing of the IPCEI has begun.

The First Pillar of NGEU is mainly the RRF component, covering a percentage of the total. The part of the RRF programme that is allocated to IPCEIs in the form of transfers to EU national governments is very low (1.3% of NGEU), while the Second Pillar with a spending programme more similar to pure European public good (such as InvestEU) is allocated an amount of nearly 0.7% of NGEU. Therefore, on the one hand, the NGEU has pushed for a greater provision of European public

good by aggregation through a European co-financing of IPCEIs, modifying the previous approach of national delivery and financing. However, on the other hand, the provision of pure European public goods has been neglected in favour of national projects under the umbrella of the RRF. It is important to remember that the Commission's original proposal for a 'Recovery Fund' in May 2020 envisaged an allocation of €30.3 billion in funds for pure European public goods, while the final agreement reached in July 2020 set an allocation of €5.6 billion. Notably, InvestEU was one of the most downsized programmes during negotiations between Member States.

**Figure 7. EU countries by number of IPCEIs**



Source: Authors' own elaboration

**5.3 The discarded proposal of a European Sovereignty Fund**

In the State of the Union Adress 2022, the European Commission President, Ursula von der Leyen, advocated for an assertive role for the EU in the field of industrial policy. On the one hand, she stated the intention to increase EU financial participation to IPCEIs; on the other hand, she introduced the idea of the ESF, without however providing further indications on its scope or financing. More details, although few, were provided by the Commissioner for Internal Markets, Thierry Breton, who echoed the proposal underlining the role of the ESF for a 'Made in Europe' industry. As Breton stated, "the future Sovereignty Fund must be granted with the right budgetary means to be credible. Its design should allow for direct, fast and flexible budgetary support to well identified projects of interest for EU sovereignty across any sector of our industrial spectrum. This Fund could be used to address critical dependencies and/or to top up specific industrial projects supported through IPCEIs to accelerate their implementation and improve European autonomy." (Breton, 2022). Consequently, secure financing is crucial to the Fund's credibility, as the method of support and the possibility of issuing new common debt, following the largest issuance of European common debt provided by the NGEU, will be significant. According to Breton, this centralised measure should compensate for the different margin of manoeuvre at the national level that prevents some Member States from supporting their economies with targeted interventions,

as Germany did in 2022 with a €200 billion relief package to help ease the energy crisis for industries and households.

Further details were provided in a joint statement by Commissioners Breton and Gentiloni, who called for a common tool at the European level to overcome the problem of different national fiscal capacities (Breton and Gentiloni, 2022). In particular, they identified the SURE (Support to mitigate Unemployment Risks in an Emergency) mechanism as a first step towards the provision of European public goods in the energy and security sectors. Unfortunately, later the common debt option was ruled out by Breton himself, who stated that “until all NGEU funds are mobilised, we better wait [before a next round of debt], it’s politically much more reasonable this way”.<sup>20</sup> Faced with political opposition from some Member States and the quantitative limits of the European budget, the idea of the ESF has been definitely scaled down by the European Commission’s proposal for a different arrangement – the Strategic Technologies for Europe Platform (STEP) – that is supposed to promote the EU’s long-term competitiveness in critical technologies such as digital and deep technology, clean technology and bio-technology. It will grant an additional €10 billion to four existing programmes: the Innovation Fund (5 billion), InvestEU (3 billion), the European Innovation Council (0.5 billion), the European Defence Fund (1.5 billion). Furthermore, all projects complying with the minimum quality requirements during the selection process for directly managed Union programmes will receive a ‘sovereignty seal’, certifying their contribution to the strategic objectives. This solution falls short of the previously announced ESF. STEP is primarily a rationalisation of existing instruments combined with an attempt to forge a single flagship industrial policy programme. While signalling is a legitimate industrial policy tool, its impact cannot be compared to the allocation of significant new financial resources to technological upgrading and diffusion.

#### **5.4 Centrally managed programmes for industrial policy: the case of InvestEU and the Innovation Fund**

Increasing the supply of pure European public goods would be the best solution to building a European industrial policy. This would require European delivery, including responsible framework institutions, as well as European financing, such as stable and adequate resources to finance technological development and diffusion in the sectors relevant for strategic autonomy and the green transition. Financing and delivering pure European public goods require new solutions that go beyond existing instruments. However, existing programmes can offer useful insights into the directions to take. Here we focus on two programmes: InvestEU and the Innovation Fund.

InvestEU builds on the European Fund for Strategic Investment (EFSI) launched in 2014 as the ‘Juncker Plan’ with task of closing the investment gap resulting from the financial and sovereign debt crisis in the Eurozone. InvestEU aims to mobilise more than €372 billion in investments through a €26.2 billion guarantee from the EU budget. The guarantee that is operationalised by the European Investment Bank (EIB) and other public financial institutions is divided between the four InvestEU policy windows as follows: 37% to sustainable infrastructure, 26% to SMEs, 25% to research, innovation and digitisation, 10% to social investments and skills. Notably, it is different from public

---

<sup>20</sup> <https://www.euractiv.com/section/economy-jobs/news/eus-breton-joint-debt-for-green-transition-no-longer-a-priority/>

finance and traditional lending, as it is mainly based on the leverage of a complex financial system, utilising a limited amount of public resources from the EU budget and avoiding liabilities that burden the EU budget. In a sense, it brought the ‘derisking’ paradigm closer to the public intervention we mentioned in Section 2. Basically, the EIB raises funds on capital markets (against the EU public guarantee) which are then used to mobilise private investors either through direct instruments, such as loans (back-to-back lending) or through indirect instruments, such as guarantees of loan portfolios or securitisations, sharing financial risks with private and public financial intermediaries, such as national promotional banks (Findeisen and Mack 2023). Importantly, the more the EIB relies on these indirect financial instruments, the greater the leverage it can achieve, as they blend the EIB resources with the capacities of public and private banks and private investments.

The positive aspects of InvestEU are several. First, the central monitoring role played by the European Commission. In fact, the contribution to achieving the climate objectives will be monitored through a climate tracking system developed by the Commission. Another positive outcome is the effort made to unify investment instruments for operations within the EU, bringing together thirteen previously separate and centrally managed financial instruments under InvestEU (European Court of Auditor 2023). However, based on an *ex post* assessment of the EFSI, a fundamental clarification is needed to understand its effectiveness to ‘deliver’ a European industrial policy. During a period of widening investment gap (2015-2020) in Europe relative to historic trends, the EFSI has proven to be an important tool to incentivise investment. In other words, the main success of the EFSI was in closing the *cyclical* investment gap, that is, in bringing the level of actual investment back to historic trends. Unfortunately, the EFSI has not proven successful in closing the *structural* investment gaps, which still persist in key areas such as the transition to net-zero emissions, digitalisation, and social infrastructure (Wilkinson et al. 2022). This means that the investments needed to achieve policy objectives and address societal needs have not fully materialised under the EFSI. Finally, tools such as InvestEU must address the changed geopolitical and macro-economic contexts we outlined, characterised by tensions and uncertainties, as well as by an environment of high interest rates and growing public debt of Member States. These pressures make strategic investments for strategic autonomy more urgent, but at the same time impose financial and fiscal constraints on them.

Another existing centrally managed fund is the Innovation Fund, established under the EU carbon pricing market (Emission Trading System) for the period 2021-2030, with the aim of supporting commercial demonstration of low-carbon technologies. However, the Innovation Fund will make available an estimated amount of €40 billion in the period 2020-2030, depending on the price of carbon on the market. Substantial additional funding would be necessary for the EU to achieve its climate and energy goals. An interim assessment of the Innovation Fund indicates that both the first call for large-scale and small-scale projects (with capital expenditure above and below €750 million, respectively) attracted an impressive number of applications, from a broad sectoral and geographical spectrum. However, 41 out of 70 eligible proposals for large-scale projects could not be financed due to insufficient funds, even though they were high-scoring projects. As the report states “the very high number of applications and the significant oversubscription of the budget predicted strong competition for funding and therefore only few projects were awarded grants,



while many projects passing all thresholds did not receive support, especially in the large-scale call.” (European Commission, 2022, p. 9)

It is very difficult to estimate the financial needs for achieving strategic autonomy. A starting point would be to identify the investment gap that needs to be addressed structurally, to pursue a green-oriented European industrial policy for strategic autonomy that is aligned with the Paris agreement. According to the European Commission, investments of €500 billion per year (at 2022 prices) will be needed compared to the 2011-2020 baseline amount (€765 billion), and the impact of rising inflation following the energy crisis would also have to be considered (Abraham et al., 2023). In total, the investment gap until 2030 for climate and energy security is €1.25 trillion, including both public and private investments. Public investments play a crucial role in bridging the investment gap. Based on the National Energy and Climate Plan for 2021-2030 presented by Member States, the GDP-weighted share of public investment for the transition amounts to around 25% of total additional investment needs in the EU (Delgado Téllez et al. 2022).

In summary, the landscape of European industrial policy tools has evolved in recent years, especially thanks to the innovations launched by the NGEU. While its temporary nature might not have created the conditions to permanently institutionalise some of these innovations, it shows directions to pursue and exploit, despite the current scaling back of the ambitions of proposals such as the ESF. The IPCEI instrument is the clearest example: although it is still a European public good by aggregation, it already presents some of the desired elements of the long-existing but mostly inactive ideas of European public enterprise and European champions. The other examples are InvestEU and the Innovation Fund, pure European public goods; however, both have limited resources and pay little attention to emerging industrial policy priorities. Both cases – the first more focused on public investments, and the second on incentivising private ones – illustrate that the path towards a European industrial policy is through a shift to (or the expansion of) pure European public goods.

### 5.5 The NGEU as a model for a framework ‘fund’

The framework institution that can manage initiatives such a European IPCEI or a strengthened supranational InvestEU remains to be discussed. Ideas such as agency-style bodies inspired by the ARPA model are gaining ground (Kleimann et al. 2023), but appear as too narrow vehicles to manage a European industrial policy. A generalist fund incorporating several missions, such as those outlined in the RRF and the ESF proposals could offer a more systemic approach to European industrial policy. As we have seen, the latter faced financial and political downsizing with the birth of the STEP initiative. Despite this, the idea of an autonomous fund as a vehicle for conducting industrial policy and, possibly, as the sole coordinator of initiatives such as new waves of IPCEIs remains a very attractive idea and, therefore, continues to re-emerge. Creating such a tool from the ground-up seems far-fetched in the current context. Instead, improving existing instruments following an incremental approach seems like a viable solution.

A fruitful place to start is the NGEU, as it is already contributing to the financing needs of the twin transition. However, the NGEU has limited scope compared to the horizon of industrial policy objectives. Green investments financed through the NGEU represent around 5% of the total green investments estimated necessary to meet the EU’s 2030 climate target (Delgado Téllez et al. 2022),

part of which is through the IPCEI (the second wave). The NGEU focuses on spending for the twin transition and social inclusion, but is not a specific financial programme for the EU Green Deal. Another limitation of the NGEU is its temporary nature, as it is a six-year programme expiring in 2026. Nevertheless, some characteristics of the NGEU could be exploited, in particular its legal basis and its operational design to create a framework fund for industrial policy.

Regarding the legal foundation of the NGEU, it should be noted that the NGEU has proved to be a useful tool for combining a timely response to a crisis – without Treaty changes and without resorting to intergovernmental arrangements – with a strengthening of the European fiscal capacity. It has introduced important elements: on the one hand, it provided further support to the Multiannual Financial Framework 2021-2027 as the pandemic unfolded, thanks to Art.122, the ‘solidarity clause’ of the TFEU; on the other hand, it allowed the European Commission to issue EU bonds on the market on behalf of the EU, to provide financial support in times of crisis. The first innovative element concerns the NGEU legal provision, Art. 122 TFEU. It states that the Council, on a proposal from the Commission, may decide, in a spirit of solidarity between Member States, upon the measures appropriate to the economic situation, in particular if serious difficulties arise in the supply of certain products, notably in the area of energy (Art. 122(a)TFEU). Furthermore, it added that where a Member State finds itself in difficulty or is seriously threatened by problems caused by natural disasters or exceptional events beyond its control, the Council, on a proposal from the Commission, may grant, under certain conditions, financial assistance from the Union to the Member State concerned (Art. 122(2) TFEU). These provisions give the EU the right to take emergency measures in favour of Member States, but it can only provide emergency, exceptional and one-off (limited) financial support. Therefore, the idea of making the NGEU a permanent tool beyond 2026 does not seem like a viable solution.<sup>21</sup> Nevertheless, a possible avenue to explore is to establish a new emergency tool on a similar premise, that is, still temporary, but with an extended operational period (e.g. longer term). The creation of such a tool should once again be based on crisis elements; in this context, the consensus around the polycrisis-permacrisis scenario could justify a new institutional innovation.

The second innovative feature of the NGEU is the possibility of using the funds raised on the market through the issuing of EU bonds, but mainly to provide grants to Member States, in addition to loans. Indeed, while borrowing–lending operations (back-to-back operations) are well established financial procedures in the EU, the real novelty of the NGEU is to empower the European Commission to borrow on the market for the purpose of providing grants. In order to guarantee compliance with Art. 310 TFEU, ensuring the principle of budgetary balance, the proceeds of EU borrowing used to provide grants to Member States were categorised as ‘external assigned revenues’ (€390 billion allocated to finance part of the RRF and the remaining for expenditures of the NGEU). This budgetary technique ensures that the borrowing-grants operation respects the budgetary balance principle (Council Legal Service 2020). Furthermore, the provision of an

---

<sup>21</sup> The transformation of the NGEU into a permanent tool is limited not only by the legal constraint, but also by a financial constraint as any new financial support from the NGEU is not possible until all or part of the previous borrowing is repaid (Allemand et al. 2023).

adequate safeguard needed to repay these assigned revenues provided another guarantee for grant operations.<sup>22</sup>

According to a legal assessment of the NGEU by Abraham et al. (2023), it would be legally feasible to establish, for example, a ‘*Climate Sovereignty Fund*’ that mimics the NGEU. What would be legally necessary is that: (i) new own resources are available as collateral for EU borrowing on the market to provide grants to support investment; (ii) a regulation is adopted in accordance with Art. 122 TFEU which would designate EU borrowing and new own resources flowing into the Fund as ‘external assigned revenue’; (iii) funding is channeled into spending programmes in the area of climate policy. In other words, once future contributions (preferably new own resources) to the EU budget have been decided *a priori*, the Fund could be established on the basis that it will be used for emergency and temporary (but medium to long term) support to green and strategic technologies. Therefore, a necessary condition would be the introduction of new own resources to increase the EU budget and shape a stable European fiscal capacity. The European Commission has proposed resources based on the environmental and profit sectors to cover the cost of the NGEU borrowing. However, additional resources to address other European strategic priorities could be found, for example in the gambling, tobacco and financial sectors (Fontana 2024). This type of new resources would allow national contributions to be replaced with genuine own resources not coming from national coffers.

The second relevant aspect concerns the operational design of the NGEU, in particular the RRF. The RRF is based on the decentralised selection of projects with a bottom-up process, therefore member countries retain their role of proposing projects for financing, as in the case of the IPCEIs. Replicating this approach for the specific purpose of a European industrial policy would require a robust methodology to identify investment projects aligned with the strategic autonomy and green agenda, as well as detailed disbursement conditions. Furthermore, it would be necessary to identify from an administrative perspective, how such investments should be implemented, the share of European and national competences in managing the funding.

As regards the criteria for allocating funds, an appropriate distribution key should be envisioned. For example, Heimberger and Lichtenberger (2023) propose to adopt the current RRF disbursement rule to the climate situation within the EU. They suggest that the share of a climate specific ESF that should be allocated to Member States should be proportional to each country’s greenhouse gas emissions per capita, population size and relative economic wealth (reflected by the inverse of GDP per capita). From our perspective of strategic autonomy, an allocation rule could also consider the actual capabilities of each country to contribute to European Sovereignty in each area. Indicators such as the EUSI presented in Section 3 could provide guidance to pay particular attention to those countries with less capabilities but with high commitment to deliver in strategic sectors.

In summary, the NGEU model could provide the legal framework to introduce a still temporary, but this time long-term framework focusing on strategic industrial sectors – particularly green technologies – based on a two-tier structure. A first tier could be based on the IPCEIs, now public

---

<sup>22</sup> This was possible by amending the Own Resources Decision, through an interinstitutional agreement between the EU Commission, the EP and the Council on creating new own resources to repay the grant component of the NGEU.

goods by aggregation, in prospect evolving towards pure public goods. They should continue to receive funding from the EU budget, in higher proportion than national funds, with resources allocated as grants according to the specific criteria of environmental and strategic autonomy. A second level could be formed by centrally managed programmes (pure public goods), whether already existing or new tools, designed to overcome the shortcomings of InvestEU and the Innovation Fund. They should therefore focus more on structural investments that respond to societal needs and have a larger financial allocation. STEP is a good starting point in this direction as it strengthens precisely these expense items. However, it should be more focused on programmes supporting structural investments that respond to societal needs and have a larger financial allocation.

## 6. Conclusion

Global challenges, and especially shifts in patterns of globalisation and the climate emergency have provided States (and the EU) with new reasons to engage in industrial policy: fostering the green transition while striving for strategic autonomy. The positive side of this transformation is a renewed acceptance of state intervention in the economy in critical areas, especially those related to key technologies (e.g. batteries, semi-conductors), emerging technologies (e.g. artificial intelligence, quantum technologies) and, perhaps more importantly, those related to energy and green technologies. Initiatives such as the IRA in the US are symbolic of this new wave of industrial policy. On the negative side, the arms race and blows to the international multilateral system that new industrial policy interventions tend to induce can reinforce nationalistic tendencies and rivalries. This also applies within the EU, where European competition policy to protect the single market and State-aid exemptions are increasingly in tension. For the EU, one way out of the race to the bottom is to devote efforts to creating industrial policy instruments conceived as ‘pure’ European public goods – those financed and delivered by the Union. For example, it should be possible to resort to vertical policies aimed at creating industrial champions, but only if these are European champions.

To truly achieve strategic autonomy, the EU must achieve fiscal autonomy – the issue of the Union’s own resources cannot be avoided when designing industrial policy. Current compromises like STEP may be a good way to establish a European flagship approach to industrial policy (as the EU still trails the US in this respect), but they are not sufficient, as they address coordination issues, rather than dedicating substantial financing to pure European public goods. Therefore, in this paper, we have outlined some ideas on how a truly European industrial policy could be designed. Rather than re-inventing the wheel, we suggest that the key direction to follow is to build on the institutional innovations introduced by the NGEU. These can be amended, transformed, and ‘Europeanised’ further, with the fundamental aim of making the proposal permanent in the long run, rather than temporary. We connect our proposals to ideas on European industrial policy that have formed throughout the history of the integration process, and which continue to re-emerge at specific historical intervals characterised by profound changes in the landscape surrounding the European community; for example, we bring Spinelli’s 1970s proposals on European public enterprises to new attention, and show how similar proposals are currently gaining traction.

In a nutshell, our proposal is to establish a broad institutional platform, that is, a framework fund for a European industrial policy, building on the NGEU experience and the ESF idea. The fund can be established as a non-permanent vehicle, but with a longer time-frame, and financed through external assigned revenues. The rationale for its establishment could be based on the emergency provisions of Art. 122 TFEU, possibly resorting to consensus on the emergency unfolding in the context of the permacrisis, and on the principle of fairness in the distribution of support across Europe. This will likely enhance the acceptability of the proposal and place it within the remit of the Treaties. We leave the naming of the fund open – to avoid resistance that the European Sovereignty Fund proposal had faced – but we suggest framing the new fund along the lines of a Climate and Strategic Investments Fund. The fund will centrally manage ‘upgraded’ existing programmes, with larger, supranational financing and a clear definition of objectives aligned with the priorities of the green transition and strategic autonomy. This will make industrial policy instruments truly European (federal) in nature. In particular, we suggest that the IPCEI instrument evolves into a pure European public good, increasing the share of contributions from the EU budget. Following this avenue, the idea of European public enterprises and European project-dedicated agencies could finally find a pragmatic and feasible realisation.

## References

- Abraham, L., O'Connell, M. & Arruga Oleaga, I. (2023). The legal and institutional feasibility of an EU Climate and Energy Security Fund. *ECB Occasional Paper*, (2023/313).
- Allemand, F., Creel, J., Saraceno, F., Levasseur, S., & Leron, N. (2023). Making Next Generation EU a permanent tool. FEPS.
- Andreoni, A. (2016). Varieties of industrial policy: models, packages, and transformation cycles. In *Efficiency, finance, and varieties of industrial policy: guiding resources, learning, and technology for sustained growth* (pp. 245-305). Columbia university press.
- Andreoni, A., & Chang, H. J. (2019). The political economy of industrial policy: Structural interdependencies, policy alignment and conflict management. *Structural change and economic dynamics*, 48, 136-150.
- Antonelli, C., Amidei, F. B., & Fassio, C. (2014). The mechanisms of knowledge governance: State owned enterprises and Italian economic growth, 1950–1994. *Structural Change and Economic Dynamics*, 31, 43-63.
- Archibugi, D., & Mariella, V. (2021). Is a European recovery possible without high-tech public corporations?, *Intereconomics*, 56(3), 160-166.
- Arnold, N., Balakrishnan, R., Barkbu, B., Davoodi, H., Lagerborg, A., Lam, W., Medas, P., Otten, J., Rabier, L., Roehler, C., Shahmoradi, A., Spector, M., Weber, S., & Zettelmeyer, J. (2022). “The EU Fiscal Framework: Strengthening the Fiscal Rules and Institutions”, IMF Departmental Paper, 5 September.
- Arrighi, G. (1994). *The long twentieth century: Money, power, and the origins of our times*. verso.
- Arjona, R, W Connell & Herghelegiu, C. (2023). “An enhanced methodology to monitor the EU’s strategic dependencies and vulnerabilities”, Single Market Economy Papers WP2023/14, Publications Office of the European Union.
- Bartelme, D. G., Costinot, A., Donaldson, D., & Rodriguez-Clare, A. (2019). *The textbook case for industrial policy: Theory meets data* (No. w26193). National Bureau of Economic Research.
- Bassanini, F., Napolitano, G., & Torchia, L. (Eds.). (2021). *Lo Stato promotore: come cambia l'intervento pubblico nell'economia*. Il mulino.
- Bergamini, E. & Zachmann, G. (2020). ‘Understanding the European Union’s regional potential in low-carbon technologies, Working Paper 07/2020, Bruegel
- Berglof, E. (2016). European industrial policy—tapping the full growth potential of the EU. *Intereconomics*, 51(6), 335-340.
- Bistline, J., Blanford, G., Brown, M., Burtraw, D., Domeshek, M., Farbes, J., ... & Zhao, A. (2023). Emissions and energy impacts of the Inflation Reduction Act. *Science*, 380(6652), 1324-1327.
- Breton, T. (2022). A European Sovereignty Fund for an industry “Made in Europe”. Blog of Commissioner Thierry Breton Brussels, Statement, 15 September 2022

- Breton, T. & Gentiloni, P. (2022). Germany's latest response to energy crisis raises questions, *The Irish Times*, <https://www.irishtimes.com/opinion/2022/10/03/germanys-latest-response-to-energy-crisis-raises-questions>
- Buchholz, W., & Sandler, T. (2021). Global public goods: a survey. *Journal of Economic Literature*, 59(2), 488-545.
- Buti, M. & Papaconstantinou, G. (2022). European Public Goods: How can we supply more?, *Luis School of European Political Economy, Policy Brief*, 3, 2022.
- Buti, M., Coloccia, A. & Messori, M. (2023). European public goods, in "Financing investment in times of high public debt", edited by Cerniglia F., Saraceno F. and Watt A.
- Cantner, U., & Vannuccini, S. (2018). Elements of a Schumpeterian catalytic research and innovation policy. *Industrial and Corporate Change*, 27(5), 833-850.
- Caravella, S., Crespi, F., Cucignatto, G., & Guarascio, D. (2024). Technological sovereignty and strategic dependencies: The case of the photovoltaic supply chain. *Journal of Cleaner Production*, 434, 140222.
- Carlaw, K. I., & Lipsey, R. G. (2022). *Industrial Policy: The Coevolution of Public and Private Sources of Finance for Important Emerging and Evolving Technologies*. Cambridge University Press.
- Carrara, S., Bobba, S., Blagoeva, D., Dias, P. A., Cavalli, A., Georgitzikis, K., ... & Christou, M. (2023). *Supply Chain Analysis and Material Demand Forecast in Strategic Technologies and Sectors in the EU: A Foresight Study*. Publications Office of the European Union.
- Castillo, J. C., Ahuja, A., Athey, S., Baker, A., Budish, E., Chipty, T., ... & Więcek, W. (2021). Market design to accelerate COVID-19 vaccine supply. *Science*, 371(6534), 1107-1109.
- Cherif, R., & Hasanov, F. (2019). Principles of true industrial policy. *Journal of Globalization and Development*, 10(1), 20190034.
- Council Legal Services (2020). Opinion of the Legal Services on the proposals on Next Generation EU, Brussels.
- Crespi, F., Caravella, S., Menghini, M., & Salvatori, C. (2021). European technological sovereignty: an emerging framework for policy strategy. *Intereconomics*, 56(6), 348-354.
- Criscuolo, C., et al. (2022a), "An industrial policy framework for OECD countries: Old debates, new perspectives", *OECD Science, Technology and Industry Policy Papers*, No. 127, OECD Publishing, Paris, <https://doi.org/10.1787/0002217c-en>.
- Criscuolo, C., et al. (2022b), "Are industrial policy instruments effective?: A review of the evidence in OECD countries", *OECD Science, Technology and Industry Policy Papers*, No. 128, OECD Publishing, Paris, <https://doi.org/10.1787/57b3dae2-en>.
- Delgado-Téllez, M., Ferdinandusse, M., & Nerlich, C. (2022). Fiscal policies to mitigate climate change in the euro area, *ECB Economic Bulletin*, Issue 6/2022.
- Di Carlo, D., & Schmitz, L. (2023). Europe first? The rise of EU industrial policy promoting and protecting the single market. *Journal of European Public Policy*, 1-34.



- Ding, J., & Dafoe, A. (2021). The logic of strategic assets: From oil to AI. *Security Studies*, 30(2), 182-212.
- Dullien, S., & Hackenbroich, J. (2022). *European industrial policy: A crucial element of strategic autonomy* (No. 130). IMK Policy Brief.
- Edler, J., Blind, K., Kroll, H., & Schubert, T. (2023). Technology sovereignty as an emerging frame for innovation policy. Defining rationales, ends and means. *Research Policy*, 52(6), 104765.
- Eisl, A. (2022a). Important Projects of Common European Interest (IPCEIs) as a New Form of Differentiation: An Analysis of Their Challenges for the European Single Market, Policy papers n. 18, EUIDEA
- Eisl, A. (2022b). EU Industrial Policy in the Making. Notre Europe Jacques Delors Institute. Economy & Finance, Policy Paper, n° 286.
- European Commission (2012). EU State Aid Modernization, COM(2012) 209 final
- European Commission (2021a). Strategic dependencies and capacities, Staff Working Document 352.
- European Commission (2021b). A competition policy fit for new challenges, COM(2021) 713 final
- European Commission (2022). Innovation Fund. Progress report
- European Commission, Joint Research Centre, Kroll, H. (2024). *Assessing open strategic autonomy*, Publications Office of the European Union. <https://data.europa.eu/doi/10.2760/767279>
- European Court of Auditors (2023). The EU's financial landscape. A patchwork construction requiring further simplification and accountability, Special report
- Evenett, S., Jakubik, A., Martín, F., & Ruta, M. (2024). The Return of Industrial Policy in Data. *IMF Working Papers*, 2024(001).
- Findeisen, F., & Mack, S. (2023). Do more with more. How the EU can improve funding for the European Green Deal, Hertie School Jacques Delors Centre.
- Fontana O. (2024). New own resources for the EU budget, MIMEO
- Foray, D. (2018). Smart specialization strategies as a case of mission-oriented policy—a case study on the emergence of new policy practices. *Industrial and Corporate Change*, 27(5), 817-832.
- Gabor, D. (2023). *The (European) Derisking State* (No. hpbj2). Center for Open Science.
- Garicano, L. (2022). Combining environmental and fiscal sustainability: A new climate facility, an expenditure rule, and an independent fiscal agency, VoxEU Column, 14 January.
- Hamilton, A. (1913). Report on manufactures (1791). *Reprinted in US Senate Documents*, 22(172).
- Hausmann, R., & Rodrik, D. (2006). Doomed to choose: industrial policy as predicament. *John F. Kennedy School of Government, Harvard University*, 9.



Heimberger, P., & Lichtenberger, A. (2023). Options for a Permanent EU Sovereign Fund: Meeting the Climate-Investment Challenge and Promoting Macroeconomic Stability, in “Financing investment in times of high public debt”, edited by Cerniglia F., Saraceno F. and Watt A.

Hirschman, A. O. (1980). *National power and the structure of foreign trade* (Vol. 105). Univ of California Press.

Irwin, D. A. (1996). The US-Japan semiconductor trade conflict. In *The Political Economy of Trade Protection* (pp. 5-14). University of Chicago Press.

Jowett, P., & Rothwell, M. (1986). *The economics of information technology*. Springer.

Juhász, R., Lane, N. J., & Rodrik, D. (2023). *The new economics of industrial policy* (No. w31538). National Bureau of Economic Research.

Juhász, R., & Steinwender, C. (2023). *Industrial policy and the great divergence* (No. w31736). National Bureau of Economic Research.

Kantor, S., & Whalley, A. T. (2023). *Moonshot: Public R&D and growth* (No. w31471). National Bureau of Economic Research.

Kleimann, D., Poitiers, N., Sapir, A., Tagliapietra, S., Véron, N., Veugelers, R., & Zettelmeyer, J. (2023). Green tech race? The US Inflation Reduction Act and the EU Net Zero Industry Act. *The World Economy*, 46(12), 3420-3434.

Kline, P., & Moretti, E. (2014). Local economic development, agglomeration economies, and the big push: 100 years of evidence from the Tennessee Valley Authority. *The Quarterly journal of economics*, 129(1), 275-331.

Kowalski, P., & Legendre, C. (2023). "Raw materials critical for the green transition: Production, international trade and export restrictions", *OECD Trade Policy Papers*, No. 269, OECD Publishing, Paris, <https://doi.org/10.1787/c6bb598b-en>.

Lane, N. (2020). The new empirics of industrial policy. *Journal of Industry, Competition and Trade*, 20, 209-234.

Lashkaripour, A., & Lugovskyy, V. (2023). Profits, scale economies, and the gains from trade and industrial policy. *American Economic Review*, 113(10), 2759-2808.

Liu, E. (2019). Industrial policies in production networks. *The Quarterly Journal of Economics*, 134(4), 1883-1948.

Lombardi, M., & Vannuccini, S. (2022). Understanding emerging patterns and dynamics through the lenses of the cyber-physical universe. *Patterns*, 3(11).

Luo, Y., & Van Assche, A. (2023). The rise of techno-geopolitical uncertainty: Implications of the United States CHIPS and Science Act. *Journal of international business studies*, 1-18.

Mathis, A. (2021). Next Generation EU. Where are assigned revenue? Which impact in 2021?, Briefing, Policy Department for Budgetary Affairs

Mazzucato, M. (2023). Governing the economics of the common good: from correcting market failures to shaping collective goals. *Journal of Economic Policy Reform*, 1-24.

- Mazzucato, M. (2021). *Mission economy: A moonshot guide to changing capitalism*. Penguin UK.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972). The limits to growth-club of rome.
- Mosconi, F. (2006). The Age of European Champions-A new Chance for EU Industrial Policy. *The European Union Review*, 11, 29-59.
- Naudé, W. (2010). *Industrial policy: Old and new issues* (No. 2010/106). WIDER Working Paper.
- O'Connell, M., Abraham, L., & Arruga Oleaga, I. (2023). The legal and institutional feasibility of an EU Climate and Energy Security Fund. *ECB Occasional Paper*, (2023/313).
- Pellegrin, J., Giorgetti, M. L., Jensen, C., & Bolognini, A. (2015). EU industrial policy: Assessment of recent developments and recommendations for future policies.
- Perez, C. (2010). Technological revolutions and techno-economic paradigms. *Cambridge journal of economics*, 34(1), 185-202.
- Pianta, M. (2015). What is to be produced? The case for industrial policy. *Intereconomics*, 50(3), 140-146.
- Pianta, M., Lucchese, M., & Nascia, L. (2020). The policy space for a novel industrial policy in Europe. *Industrial and Corporate Change*, 29(3), 779-795.
- Piechucka, J., Saurí-Romero, L., & Smulders, B. (2023). Industrial Policies, Competition, and Efficiency: The Need for State Aid Control. *Journal of Competition Law & Economics*, 19(4), 503-526.
- Pinker, S. (2011). *The better angels of our nature: The decline of violence in history and its causes*. Penguin uk.
- Reinert, Erik S., 'Industrial Policy: A Long-term Perspective and Overview of Theoretical Arguments', in Arkebe Oqubay, and others (eds), *The Oxford Handbook of Industrial Policy*, Oxford Handbooks (2020; online edn, Oxford Academic, 10 Nov. 2020), <https://doi.org/10.1093/oxfordhb/9780198862420.013.20>.
- Schinkel, M. P., & Treuren, L. (2021). Green Antitrust:(More) Friendly Fire in the Fight against Climate Change. *This is an updated and extended version of the paper published in: Holmes, S., D. Middelschulte and M. Snoep (eds.), Competition Law, Climate Change & Environmental Sustainability, Concurrences*, 2020-72.
- Soete, L., & Stierna, J. (2023). Revisiting Schumpeter in Europe: Place-based innovation and transformative industrial policy. UNU-MERIT Working Paper #2023-022.
- Spinelli, A. (1972). Una sfida per l'Europa: lo sviluppo industriale e il problema ecologico. *il Mulino*, 21(3), 397-406.
- Steinmueller, W. E. (2010). Economics of technology policy. In *Handbook of the Economics of Innovation* (Vol. 2, pp. 1181-1218). North-Holland.
- Stubb, A. C. G. (1996). A categorization of differentiated integration. *JCMS: Journal of Common Market Studies*, 34(2), 283-295.
- Tooze A. (2022). Welcome to the world of the polycrisis, *Financial Times*, 28 October 2022.

Tyson, L., Zysman, J., & Judge, B. The New Logic of Globalization: Uncertainty, Volatility, and the Digital Economy. BRIE Working Paper 2023-4.

Vannuccini, S. (2015). The rate, direction and timing of European industrial policy: a few proposals. *Research Paper, Centre for Studies on Federalism, Turin.*

Velo, D. (2006). Dall'Europa dei progetti all'unione economica. Lo sviluppo della grande impresa europea di interesse generale. *Impresa Progetto-Electronic Journal of Management*, (2).

Vicard, V., & Wibaux, P. *EU Strategic Dependencies: A Long View* (No. 2023-41). CEPII research center.

Warwick, K. (2013), "Beyond Industrial Policy: Emerging Issues and New Trends", *OECD Science, Technology and Industry Policy Papers*, No. 2, OECD Publishing, Paris, <https://doi.org/10.1787/5k4869clwoxp-en>.

Wilkinson C., Mathis J., Mori D., Herrera F., Jugnauth A., Kollatz M. (2022), Study supporting the ex-post Evaluation of the European Fund for Strategic Investments, following Regulation 2017/2396 (EFSI 2.0), Final report.

---

**CENTRO STUDI SUL FEDERALISMO**

Piazza Arbarello 8  
10122 Torino - Italy  
Tel. +39 011 15630 890  
[info@csfederalismo.it](mailto:info@csfederalismo.it)  
[www.csfederalismo.it](http://www.csfederalismo.it)