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Scientific Report - For an Innovative, Sustainable and Fair Economy in Europe

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Abstract

This scientific report builds on fifteen science for policy concept papers elaborated for the JRC by nineteen independent individual expert within a pool named “Implementing a fair and sustainable economy”. In light of the findings in the Draghi report and the emerging new EU policy agenda, this report analyses synergies and common lines of reflection shared by several experts. Based on their science for policy outcomes, three cross-cutting themes are identified: the new EU industrial policy, the implementation gap of the EU, and different angles to increased security in the EU. The experts stress the importance of understanding and addressing trade-offs between the EU policy goals of competitiveness, sustainability, fairness and security. They reflect on new requirements of science for policy in times of deep transformation; they elaborate on the structural pillars for a new industrial policy; they reflect on the conditions for disruptive innovation and systemic transitions; and they analyse spill-overs from a comprehensive approach to EU’s new search for security. In all these areas, the experts explore openings for a territorial articulation of the EU-level initiatives in Member States, regions and with citizens.

Authors

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Executive summary

This report builds on fifteen concept papers written by independent experts. It analyses synergies and common lines of reflection shared by several experts. It also emphasizes the importance of understanding the main trade-offs between the current EU policy goals of competitiveness, sustainability, fairness and security.

In its ambition to complement the Draghi report, the report analyses three structural challenges facing the EU policy today: the "innovation gap", the "implementation gap" and the "fairness/security gap".

1. The *innovation gap* is highlighted in the Draghi report as central to the EU's growing competitiveness gap with the US and China. In their analysis, the experts analyse the EU's innovation system from two fundamental premises.

    (a) First, innovation is most powerful when it has a direction of multiple goals. Today the race is about reaping the benefits from the ongoing and interlinked deep transformations in the energy, digital and security systems. This requires a policy mix to address transformative challenges. It is the only way to break the "middle-tech trap" which the EU's industry finds itself in and incentivize innovation in large incumbent European firms in energy-intensive industries. They open the reflection for an "institutionalisation" of European industrial policy, e.g. in Artificial Intelligence or in a European ARPA for energy and climate, building on the learnings from CERN, Airbus, Galileo or the European Space Agency. The experts also outline potential synergies between the European Research/Innovation Area and the emerging need for security and defence investment.

    (b) Second, innovation is forcefully embedded in places - as a difference to research, which has clear EU-level economies of scale. The new EU industrial policy must connect, from its very design, the scale and top-down initiatives with local areas, hubs and bottom-up specialisation mapping. This is particularly relevant for new Important Projects of Common European Interest, but also to develop AI in different "smart specialisation" locations in Europe. Moreover, compared to the US and China, the EU is characterized by a linguistic and cultural diversity, which it has failed so far to translate in diversified supply chains and value creation in prototyping and customised solutions. Innovation policy is about matching supply and demand, and the latter is shaped at national and regional level through public procurement including culturally bound purchasing preferences.

2. The experts also highlight that the EU's has an "*implementation gap*". Since the Lisbon strategy in 2000, the EU developed medium-term policy frameworks, often covering 10-years horizon. This offered stability to the European construction, cutting across shorter-term electoral periods in Member States of 4 to 5 years.

(a) With hindsight, the Lisbon strategy set the right policy goals. However, the implementation was left open (the "open method of coordination"), and as a result never fully implemented at the EU level. The EU subsequently missed the historical shift to the market of digitalisation and the emergence of platform firms, which paradoxically benefitted optimally from the European single market harmonisation. In response, the outgoing European Commission focused on the transposition of game-changing EU legislation in pursuing the EU's twin strategy of a "green deal" and the "digital agenda". However, the implementation challenge remained how to fully implement the EU's continent-wide 'smart specialisation' in the articulation of the green and digital transitions, linking first-mover innovative firms to market creation driven by game-changing EU legislation.

(b) To strengthen the EU's implementation capacity, the experts stress the importance of an upfront performance-based monitoring system. An optimal impact of EU policy requires an agile and continuous science for policy learning system, whereby policy makers at all levels of the governance system receive feedback and launch corrective measures to re-adjust or tilt investment and reforms continuously. In times of transitions, such as the current systemic transition of the energy system, the accelerating digitalisation, the climate adaptation or the social transition in view of security, a comprehensive monitoring of the policy initiatives is more important than ever. Policy makers actually need information on four dynamics of change: direction, speed, contestation and experimentation. This should engage all levels of governance to avoid being "space-blind".

3. Last but not least, the experts analyse what could be described as a *"fairness gap"*. It builds on the increasing discontent of citizens across the EU, in particular in economically weaker regions, which in many cases are those most exposed to risks and uncertainties associated with the current transitions in energy and digital systems. However, the feelings and perceptions of fairness are more complex and broader.

    (a) Over the last decade, economic growth has been associated with increasing income and wealth inequality in Europe and a growing feeling of "economic insecurity". This trend is partly linked to the intrinsic economic structure of the digital platform economy, but it also has a territorial impact, with regional misalignment and increasing economic inequalities among EU's regions. Finally, perceptions of fairness focus on the distributions of benefits and costs of the ongoing transformations. Increasingly, this discontent is directed today towards the European construction itself, since the policies tilting the deep transitions, inducing change, have gradually been transferred from national to EU-level.

(b) The “fairness gap” is, however, also closely related to the new challenge of “security”, in a broad sense, embracing the uncertainty and risks stemming from the deep transformations. The implicit social contract ensuring basic security for EU’s citizens is at risk. The experts stress the urgency of this policy challenge. EU policy goals cannot afford a sequencing, where the priority to economic growth would be sufficient in itself, relying on a subsequent uncertain redistribution of wealth. Closing the fairness gap requires a shift in the understanding of growth and competitiveness, with an EU policy framed within the goals of wellbeing. In this sense, the experts propose new indicators for planetary boundaries, resilience, intergenerational fairness and inclusiveness.

1 Introduction

This scientific report, written at the start of a new European Commission, provides a framework for science-based advice to policy making with the purpose of assisting JRC and by extension the new Commission in its elaboration of the new EU policy framework for the remainder of this decade. It has been enriched and inspired by the input from a pool of independent senior experts with very different backgrounds who, between April and September 2024, wrote a collection of concept papers in close collaboration with researchers at the JRC, published as Working Papers of a new JRC series called 'For a Fair, Innovative and Sustainable Economy'.

The approach taken in this report seeks to complement the recent policy reports requested by the European Commission on the future of the single market, the so-called Letta report[1] and on the future of competitiveness, the so-called Draghi report[2]. We argue that those reports, while radical in highlighting the need for an urgent transformation of the structure of the European economy, follow a more conventional conceptual approach. They make an important contribution to the European policy discussion by astutely describing and assessing the critical situation the EU finds itself in compared to the US and China, using conventional metrics. They propose many policy recommendations targeting a wide spectrum of different areas such as productivity and competitiveness, research and innovation, state aid and industrial policy, competition policy and regulation, security, administrative burdens, etc.

Complementing their work, this collection of papers presents science for policy, which goes a step further, focusing on the need for more systemic policy-driven transformation and even questioning whether the current forms of science advice for policy are still appropriate. As Slavo Radosevic and Sylvia Schwaag Serger put it in their contribution[3]: "the transformative policy context necessitates a shift from the conventional "Science for Policy" model to a more inclusive, dynamic, and integrated "Knowledge for Policy" approach. This requires embracing diverse knowledge sources, participatory governance, and a strategic mix of policy instruments that can adapt to the rapid, complex changes characteristic of transformative challenges, such as climate change, digital transformation and societal innovation."

This approach allows us to highlight the granular impact of the mix of such "systemic" transformation policies on the EU's long-term future competitiveness, its sustainability and fairness. At the same time, it enables us to draw the attention to numerous "trade-offs" and "contestations" which might emerge, and which will also become subject of science for policy advice.

We start off, however, with a closer look at the nature of the wake-up call, which currently dominates the European policy debate.

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1 Letta, E. (2024), Much more than a market – Speed, Security, Solidarity. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens, April 2024, https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf

2 Draghi, M. (2024), The future of European competitiveness – A competitiveness strategy for Europe, September 2024.

3 Slavo Radosevic and Sylvia Schwaag Serger (2024), Science for policy in a transformative policy context. JRC Working paper, series: For a Fair and Sustainable Economy.

Uncertainty over Europe's future prosperity

As shown in the Draghi report and acknowledged in the Political guidelines for the next European Commission 2024-2029 presented by its President Ursula von der Leyen, there is growing uncertainty over the EU's future prosperity. To quote Mario Draghi in his foreword to his report: "Europe's fundamental values are prosperity, equity, freedom, peace and democracy in a sustainable environment. The EU exists to ensure that Europeans can always benefit from these fundamental rights. If Europe can no longer provide them to its people – or has to trade off one against the other – it will have lost its reason for being."

Major changes in the global geopolitical context partially explain the rapidly growing concern with European competitiveness. The wave of socio-economic, technological and geopolitical disruptions may indeed, as Draghi highlighted, be shaking the foundations of the EU itself. For an institution that received the Nobel Peace Prize only twelve years ago for demonstrating how openness in trade and economic integration amongst individual nations would not just bring economic growth and welfare but also peace. The transformative changes, which have dominated the world over the last ten years, are perhaps particularly difficult to grasp and digest. In his 2012 Nobel Peace Prize acceptance speech, José Manuel Durão Barroso, then the president of the European Commission, praised the principles of openness on which the EU was built: "As a successful example of peaceful reconciliation based on economic integration, we contribute to developing new forms of cooperation built on exchange of ideas, innovation and research. Science and culture are at the very core of the European openness: they enrich us as individuals, and they create bonds beyond borders."[4]

These principles reflected the implicit primacy of economics in international relations, both internally within the EU and externally in its relationships with the outside world. Internally, in the gradual expansion of single market principles with openness, not just in the trade of goods but also of services, of capital, of labour and – as highlighted by Barroso – of knowledge[5]. Externally, with openness becoming an intrinsic part of European values of democracy and transparency towards the outside world. The focus on openness was aligned with an international, multilateral liberal order in which Europe was at the forefront of setting up international exchange standards through its own free trade agreements. These represented typical "soft power" instruments that could be expanded to include broader, global welfare principles such as human rights and, in more recent times, sustainability, which became an integral part of trade policy and, as a result, a unique competence of the EU.

Behind the priority given to openness was the central assumption that the EU's internal and external economic relationships could in a certain way be ringfenced from the interference of geopolitics. Such an assumption appeared logical given the success of the European economic integration project with the inclusion of many East-European countries following the collapse of the Soviet Union. With hindsight, it can be argued as Kattel and Soete[6] claim in their contribution: "that the

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4 The text of his speech is available here: https://www.nobelprize.org/prizes/peace/2012/eu/lecture/

5 Particularly the recent Letta report Much more than a market – Speed, Security, Solidarity. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens, April 2024, highlights the opportunities in further exploiting such single market opportunities.

6 Rainer Kattel and Luc Soete (2024), European security in a changing geo-political context: From the European Research Area to the European Defence Research and Innovation Area and from Cohesion to European territorial security policy, JRC Working paper, series: For a Fair and Sustainable Economy.

EU's enlargement in the 21st century has primarily been a political and security project that has been carried out predominantly through economic policy."

The earlier integration period following the second world-war, had been characterized in both Europe and more broadly the OECD world, by rapid catching-up growth – the so-called "trentes glorieuses": effectively a convergence in production, distribution and consumption patterns to US levels – reflected in high GDP and productivity growth rates. But, insufficiently reflected in those figures, it was also a period of massive social, cultural and economic change in Europe. It led to many welfare benefits such as paid vacation, pensions and social security: effectively the building of a European welfare system with national diversities and accents (with the Rhineland vs Anglo-Saxon models competing for policy dominance). The European integration project with its focus on reaping scale economies through an economically driven "single market" process controlled by a strong European competition policy framework, challenged some of those social benefits and led to various debates on social "race to the bottom" fears. Overall though the integration process ushered in a period of substantial growth in welfare in Europe in the 20th Century leading to the formulation of a strategy discussed in Lisbon at the start of a new millennium which was illustrative of the EU's hope and belief in its ability to become the world's most knowledge intensive and socially inclusive region in the world, a vision expanded upon to include sustainability a year later.

So, what when wrong in the 21st Century? How did Europe become a "continent of fear"?[7]

As the Draghi report highlights, the period since 2000 has been characterized by a widening gap in productivity growth with both the US and China with direct consequences for European citizens' income: "on a per capita basis, real disposable income has grown almost twice as much in the US as in the EU since 2000". In both regions, business corporations invest substantially more in research and innovation than in Europe, resulting in significantly higher productivity growth, start-up rates and new business activities. Zooming-in on the data in the Draghi report, EU labour productivity was catching-up with the US economy over the period 1950-1995; it lost ground 1995-2010, followed by a period in which it largely evolved on par with the productivity growth in the US (at a lower level). From a perspective of long-term, structural transformation, the period 1995-2010 was characterised by structural change in the economy, mainly in the US, specifically the emergence of the digital economy with large platform companies and the roll-out of digital technologies. Clearly, Europe lost-out on the first (and the second) stage of digitalisation.

The nearly a quarter century old "Lisbon strategy" seeking to make Europe "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" failed because of poor implementation.

Later, the COVID-19 pandemic and the outbreak of war on Europe's borders, brought Europe's foreign "dependency" to the fore: in strategic (raw) materials and equipment, in fossil fuels, in technological components such as microchips and batteries, in digital platform technologies such as artificial intelligence, even in military equipment. Europe's old linear view of openness in which the concept has both a democratic (for example, basic freedoms) and economic value (for example, trade and market integration) leading to better societal outcomes, appears suddenly particularly naive.

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[7] See in particular Dominique Moïsi's *The Geopolitics of Emotion. How Cultures of Fear, Humiliation and Hope are Reshaping the World,* Penguin Random House, 2009.

The new dependency and vulnerability questions this linear logic, and various initiatives and debates around "technological sovereignty"[8], now even reflected in the so called 'mission letter' of the new EC's Executive Vice-President Henna Virkkunen, Commissioner for Tech Sovereignty, Security and Democracy, capture well these emerging political and policy tensions. However, as already noted by Jean Pisani-Ferri and Guntram Wolff in their 2019 "Memo to the High Representative of the Union for Foreign Affairs and Security Policy" at the start of the first von der Leyen Commission, the changing geopolitical landscape within which the EU would operate in the 2020s stemmed from the fact that countries such as China or the United States no longer adhered to the principle of separating economics from geopolitics in their industrial, research and STI policies. In their words: "sovereignty for the EU as a whole was and remains first and foremost economic sovereignty. The collective capacity of the EU and its member countries working together to preserve their economic independence underpins the bloc's value to Europe's citizens. That argument is bolstered by the EU's ability to participate in defining the rules of the game for the global economy… In this context, the EU's international economic policy was reasonably insulated from geopolitical concerns." However, they continued, "the EU has been lucky so far. Perhaps the EU's apparent economic independence in the global context was always the result of a lack of geopolitical interference. It is becoming ever clearer that neither the US nor China separate economics from geopolitics."

How to preserve in this new geopolitical world, an EU built on principles of innovation, sustainability and fairness within a secure and resilient society?

In a first chapter, we address the new EU challenge of industrialisation in the context of economic, technological and industrial sovereignty. How to develop a new industrial policy in a region of the world which was built on principles of openness, international exchange and collaboration, and now has to start thinking as a geopolitical power, define its goals and act strategically. In Jakob Edler's words, create "a virtuous circle of openness on the one hand, and economic as well as political power and autonomy on the other. The stronger the EU is technologically and economically, the more powerful it is in international negotiations and trade relations; and the more open it is to those international cooperations and relations, the more economically powerful and autonomous it can become" (Edler 2024).

In a second chapter, we reflect on the challenge of policy implementation, i.e. what it takes for EU policy to be efficient and have an impact in the long and bumpy road from policy design to structural transformation. As we have seen, this is somewhat the 'Achilles heel' in EU policy making, from the Lisbon agenda to the current challenges in the implementation of the European Green Deal. Implementation failure is even more challenging in times of deep transformations and requires a revisiting of the form and use of 'science for policy' to fully accompany the policy to the ground.

We conclude with a summary of the main messages, based on solid science for policy concepts, within the space between competitiveness, fairness, environmental sustainability and security. It is an open-ended reflection on some of the ideas that emerged in the various expert papers with a relevance for a new European policy agenda, including how science for policy can contribute to balance continuity and renewal.

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[8] See, amongst others, Edler et al. 2023.

2 A new European industrial policy in an era of geopolitical tensions

2.1 Europe in search of sustainable competitiveness

The renewed focus on "competitiveness" as core element in maintaining Europe's long term prosperity in both von der Leyen's Political Guidelines for the next European Commission 2024-2029 and the Draghi report with a renewed emphasis on business and regulatory simplification; decarbonisation and innovation; and a new emphasis on defence and security, is to some extent illustrative of the growing tension between the relative political success of the European Commission in having introduced new legal policy frameworks such as the European Green Deal; or financial recovery plans such as NextGenerationEU following the COVID-19 outbreak; or even the Pact on Migration and Asylum and the European Defence Fund; and the perceived failures in the practical implementation of such policies in individual Member States and regions. In this sense, "competitiveness", as measured e.g. by the evolution of labour productivity growth compared to the EU's main trading partners, takes on the form of an aggregate economic performance variable considered essential to maintain the welfare of an ageing European population (as highlighted in the Draghi report).

However, competitiveness can be interpreted in different ways. In the Draghi report, the focus is on the economic and income implications for European business and citizens' welfare. But competitiveness can also be examined from a perspective that recognizes more explicitly planetary boundaries[9]and internalises all relevant costs[10]. In a recent ESIR report, reference is made e.g. on how the "Circular Single Market" could indirectly contribute to European competitiveness: "the circular economy perspective calls for adapting the typical productivity-oriented perspective of competitiveness... The traditional perspective measures competitiveness with regard to the development of, in particular, labour productivity. It is now also increasingly necessary to consider the development of resource productivity as another important indicator of competitiveness."[11]

In Arnold Tukker and José M. Rueda Cantuche's contribution[12] a first overview is presented on the modelling those circular economy features in more traditional forward-looking models such as (Computable) General Equilibrium (GE) models. As Tukker and Cantuche point out: "such top-down, usually economy-wide models have limited sector resolution. They cannot assess highly product specific circular economy (CE) strategies such as component re-use, refurbishment, or high quality material recycling."

The proposed hybrid approach by Tukker and Cantuche illustrates that the traditional way in which the CE is presented as a win-win-win strategy reducing material use and emissions while providing more jobs and growth, ignores, as they put it: "a number of inconvenient truths. First... CE can lead

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9 It remains striking to observe how environmental sustainability is reduced in the Draghi report to the issue of climate change and the need for the decarbonization of industry, whereas the much broader issue of biodiversity raises many more challenges and trade-offs, as highlighted by Partha Dasgupta and Simon Levin (2023), Economic factors underlying biodiversity loss, Philosophical Transactions of the Royal Society B: Biological Sciences, Volume 378, Issue 1881 Published:29 May 2023 https://doi.org/10.1098/rstb.2022.0197.

10 See https://www.euractiv.com/section/economy-jobs/opinion/a-competitive-and-resilient-europe-requires-transitioning-from-sectoral-to-systemic-thinking/

11 ESIR group of expert to DG Research and Innovation, 2024

12 Arnold Tukker and José M. Rueda Cantuche (2024), Modelling circular economy impacts in the context of a transition to a fair and sustainable economy. JRC Working paper, series: For a Fair and Sustainable Economy.

to loss of GDP. Each doubling of product lifetimes will halve the related industrial production, while the required design changes may cost little. Second, the same mechanism can create losses of production jobs. This may not be compensated by extra maintenance, repair or refurbishing activities. Finally, 'Product-as-a-Service' business models supported by platform technologies are crucial for a CE transition… But some fear this may lead to a concentration of power and value with providers, dramatically affecting the distribution of wealth." Those concerns about the impact on the international distribution of wealth is also what is behind the current uncertainties about European competitiveness.

How can Europe achieve such forms of competitive sustainability if other, and in particular the EU's main trading partners, pursue a more narrow notion of competitiveness, which does not take economic and environmental sustainability and planetary boundaries into account. One of the most direct competitive threats to European industry such as much higher energy prices are illustrative of this growing tension. As highlighted in Luke Georgiou's contribution[13] quoting amongst others the recent open letter of Sir Jim Ratcliffe, Chairman and Founder of INEOS, to Ursula von der Leyen: "Europe is sleepwalking towards offshoring its industry, jobs, investments, and emissions."[14]

While the higher energy prices could be seen as an incentive for a more rapid transition in Europe towards renewables, they represent at the same time a major cost disadvantage undermining European industry's internal capacity to invest in decarbonisation. They are also currently causing a major pushback or backlash against the green transition, leading some actors to view and portray sustainability (or decarbonisation) and competitiveness as mutually exclusive, even diametrically opposed forces.

2.2 Old and new approaches to industrial policy

From what was already discussed in the Introduction, it will be clear that the new European industrial policy will have to be rather different from the old industrial policies pursued in the EU in the previous Century.

First, in its overall aim. There is now an urgent need to bring about a fundamental transformative shift in the purpose of industrial production. The expansionary and rather linear growth and development framework assumed to govern business and industrial growth is being questioned. Over the last 75 years or so, Europe became internationally specialized in energy intensive industrial production processes[15] from the production of iron and steel to the manufacture of motor cars and machine equipment. The enlargement of the EU in the 90's further "widened" these European industrial value chains across the EU towards both the Southern and Eastern parts of

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13 Luke Georghiou (2024), Corporate Transition pathways from a Policy Mix Perspective. JRC Working paper, series: For a Fair and Sustainable Economy.

14 As Luke Georgiou points out: "This echoed an earlier such letter in 2014 from Radcliffe to President Barroso expressing fears for the future of the European chemical industry. The recent letter raises the possibility (or threat) of relocation to what they see as more favorable regimes in terms of regulation (notably carbon taxes) and incentives (the investment incentives for clean technologies in the US Act), or simply displacement of their business to rivals from those countries, with net negative effects on sustainability. This presents the issue as a dilemma between an innovation-based approach and a regulatory approach demanding compliance with low-to-zero emission technologies."

15 It is worthwhile remembering that the origins of the European Union go back to the European Coal and Steel Community founded in 1951.

Europe and was extended sector-wise from the agro-industrial sector to chemicals, mechanical and electrical engineering.

As a result, the industrial transformation towards green energy-based sectors raises major structural change challenges, particularly in Europe. This involves not just systemic transformations of industrial production and supply chains with heavy investments in new, green[16] energy production sites and new, renewable energy grids but also as highlighted in Soete and Stierna (2023), a possible relocation of industries near more easily accessible renewable green energy sources.[17]

At the same time, the (re-)use of existing materials might also become reflected in more revolutionary than incremental applications of circular economy principles with, as a result, more radical shifts in the reliance on local suppliers as opposed to the well-established global value chains. A similar transformation is likely to take place in the agricultural sector.

It brings us to the need for a more integrated policy circle setting, in Andrea Renda's words[18]: "a broad set of long-term goals aligned with people, planet and prosperity." The extensive table in Andrea Renda's paper summarizes well the wide spectrum of differences and necessary policy reforms between "old" and "new" approaches to industrial policy in the EU. As illustrated in Table 1 of Renda's contribution, the new approach to industrial policy includes a more goal based, mission[19] driven approach to industrial policy as opposed to the old, growth based, prescriptive approach; a more foresight-based rather than purely evidence-based approach; a poly-centric as opposed to a subsidiarity-inspired approach to smart specialization; a 'whole of government' as opposed to a siloed approach and finally a more experimental/agile approach as opposed to the old linear/waterfall approach in industrial policy.

The required policy reforms are in other words substantial. In chapter 3 we discuss in more detail how implementing these reforms might raise trade-offs and what could be the impact of such new EU policies.

2.3 Dealing with systemic transformative change

Paula Kivimaa and Karoline Rogge in their contribution[20] elaborate this further into a detailed description of the comprehensive policy mixes, which will be needed when dealing with systemic transformative change. For Kivimaa and Rogge, referring to the EU's Recovery and Resilience Facility (RRF) as moving in this direction: "the acceleration of sustainability transitions calls for harnessing the forces of creative destruction in policy mixes by supporting novel solutions and making room for their wider diffusion by destabilising the unsustainable regime". However, as they point out: "more typically 'real-world' policy mixes suffer from incoherent policies and political difficulties in adopting phase-out policies. In effect, the adoption of such transformative policy

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16 The argument can be enlarged so as to consider "green" here as including also water and land use and isn't limited just to climate change.

17 This structural challenge is also raised and analysed briefly in the Draghi report, (Part B, p. 14-15).

18 Andrea Renda (2024), Europe's industrial policy challenge: combining place-based industrial transformation with centrally coordinated industrial policy in the EU. *JRC Working paper*, series: For a Fair and Sustainable Economy.

19 The notion of "missions" is only mentioned once in the Draghi report in a footnote listing the EU Missions, page 238.

20 Paula Kivimaa and Karoline Rogge (2024), Pursuing sustainability transitions and open strategic autonomy: a policy mix perspective on synergies and tradeoffs. JRC Working paper, series: For a Fair and Sustainable Economy.

mixes is often hindered by opposition from vested interests. Opponents to more ambitious climate action employ various discourses of climate delay to slow down progress, such as by redirecting responsibility, pushing non-transformative solutions and emphasising the downsides."

For Kivimaa and Rogge, the lack of the required policy mix will confront "new" industrial policies – such as the IPCEI Batteries or the RePowerEU package – attempting to combine "Open Strategic Autonomy" (OSA) and "Sustainability Transition" (ST) with new trade-offs. In the case of batteries, the ultimate aim was "to build an integrated European battery ecosystem, reducing reliance on imports from China and doing so securing the future competitiveness of the European automotive industry.[21] However, the effectiveness of policy efforts could be strengthened beyond such singular innovation policy measures, for example by annually increasing the stringency of net-zero emission vehicle sales targets and by phasing-out tax benefits and/or subsidies for GHG emitting vehicles." Similarly, the RePowerEU package "included contrary goals to sustainability transitions, such as improved liquified natural gas (LNG) investments and infrastructure… some EU Member States (e.g., Estonia) and Norway even changed policy to strengthen support for domestic fossil fuel production – that is, some countries have opted for the recontinuation or restabilisation of fossil fuel production which supports OSA but not ST." As Kivimaa and Rogge describe in much more detail in their contribution, it will be crucial to identify potential synergies and trade-offs between ST and OSA pursuits, and how to create alignment between these two policy objectives.

In the next sections we discuss issues that arise with the increasing focus on "open strategic autonomy" and technological sovereignty. The choice of issues is far from exhaustive but based on contributions made by different experts: Daniel Gros on the particular role of chips in manufacturing: globally and in Europe[22] ; Daria Golebiowska-Tataj on artificial intelligence[23] ; Dominique Foray on the funding of research and innovation[24]; and Rainer Kattel and Luc Soete[25] on defence and security as the new "kid on the bloc" of European industrial policy as also highlighted in both the Letta and Draghi reports. Earlier work for the JRC, summarized in Trippl et al. (2024)[26] , addressed other areas such as critical raw materials and the energy transition part of the European Green Deal.

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21 In this context, the EU should assess and learn from recent concrete corporate initiatives on battery production in the EU and how they can be better supported.

22 Daniel Gros, (2024) The (global) supply chain of Chips: Chips in the European supply chain. JRC Working paper, series: For a Fair and Sustainable Economy.

23 Daria Golebiowska-Tataj, (2024), Enhancing European Competitiveness with Fairness, Sustainability, and Open Strategic Autonomy. JRC Working paper, series: For a Fair and Sustainable Economy.

24 Domnique Foray (2024), New ideas for funding scientific research in areas of societal relevance – analyzing the co-evolution of research methods and financial tools. JRC Working paper, series: For a Fair and Sustainable Economy

25 Rainer Kattel and Luc Soete (2024), European security in a changing geo-political context: From the European Research Area to the European Defence Research and Innovation Area and from Cohesion to European territorial security policy. JRC Working paper, series: For a Fair and Sustainable Economy.

26 European Commission, Joint Research Centre, Trippl, M., Soete, Kivimaa, P., L., Schwaag Serger, S., Koundouri, P. and Pontikakis, D., Addressing the regional dimension of open strategic autonomy and European green industrial policy, Publications Office of the European Union, Luxembourg, 2024, https://data.europa.eu/doi/10.2760/141776 , JRC13642

2.4 Strategic value chains for European autonomy

Throughout its history, the chips industry has generally been considered of strategic importance, particularly to countries' so-called "technological competitiveness". Today the situation has undoubtedly been exacerbated by the link made most explicitly between advanced chips production and national security. As Daniel Gros put it in his contribution[27] : "A chips war has already started between the US and China as the US administration is increasing its efforts to deny Chinese industry access to advanced chips and the technologies deemed critical to produce such chips. The explicit geopolitical aim is to enhance US national security by ensuring that China does not have access to this critical technology. This represents an important shift since in the past the US had been content to maintain an advance of one or two generations of technology."

From this perspective, the EU at first sight does not have a particular strong geopolitical nor technological position to defend even though it has developed some strong technological positions, particularly in The Netherlands in wafer-processing technologies, including lithography, deposition, ion implantation, single-wafer epitaxy, and in recent years atomic layer deposition with ASML, ASMI and Besi[28].

As Daniel Gros points out: "The 'national' security concerns of the EU are more linked to the economy, namely to derisk European industry… domestic production of advanced chips provides protection against a potential supply disruption from Taiwan…The key trend over the last decades has been the rising importance of design and software as producers have packed ever more elements on a single chip… most production takes place in Asia while the design and software come from the US. European Fabs produce mostly mature node chips needed in manufacturing, mainly the automotive sector. This constellation confirms the more general finding of Europe being stuck in a 'middle tech' trap (Fuest et al 2024)."

From this perspective, "concentrating funding on the end of the supply chain (i.e. fabs) in the hope that the other elements will then follow" does not appear to be a particularly clever strategic industrial policy. Rather, as Daniel Gros put it "strengthening the EU presence in the chip 'ecosystem' requires addressing this fundamental weakness with support for software development and R&D in the critical elements of the supply chain… For the 'national' security of the EU China is not the key problem in the chips sector. The dominance of Taiwan in advanced chips is a global issue, but which affects the EU relatively more than others. Moreover, the increasing importance of software gives the US an additional lever to constrain EU exports towards China. Strengthening the EU's position in the supply chain, both in the physical and the software part seems more promising than subsidizing a small number of fabs."

What Daniel Gros highlights in his detailed analysis of the global supply chain of chips, is that there is only limited value for Europe in linking strongly chips production to strategic autonomy. Given Europe's structural weakness in software, there are today major benefits for Europe in keeping value chains global. Worse, one could add Europe seems today to have become "sucked in" a US-China chips war, which is not in its interest, being now forced by the US to limit its exports to China

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[27] Daniel Gros (2024), The (global) supply chain of Chips. Chips in the European supply chain. JRC Working paper, series: For a Fair and Sustainable Economy.

[28] These were all former divisions of ASM, the company set up by Arthur del Prado (1931-2016) as 'Advanced Semiconductor Materials' in 1964.

of sophisticated chips producing machines using extreme ultraviolet (EUV) lithography systems; the only area in which it has a significant technological advantage.

So even in a case in which there appears to be broad consensus amongst policy makers about its strategic autonomy importance: i.e. chips, the discussion is wide open.

2.5 AI and European competitiveness: a case of destructive innovation?

Artificial Intelligence (AI) is another area of strategic importance for European competitiveness. The Draghi report discusses extensively the role of AI and proposes to link the new AI centres to where supercomputers are located. Along similar lines, the pooling of human resources in such centres will allow one to offer salaries competitive with those of the big platform firms. In her contribution[29], Daria Golewioska-Tataj also emphasises the human resources side of the "AI Vertical Priorities Plan" as proposed in the Draghi report. “As AI reshapes industries, policies must ensure that workers are empowered with new skills and secure employment. Von der Leyen’s call for a Quality Jobs Roadmap reflects the commitment to providing fair wages, safe working conditions, and equitable transitions into AI-enhanced roles.” Interestingly, Daron Acemoglu, the recent Nobel laureate, expressed similar concerns with respect to AI and the potential for massive automation leading to the erosion of workers’ rights.

Next to such industrial policy inspired measures to strengthen and pool the scientific and technological capacity of AI in different European “smart specialisation” locations[30], the competitiveness impact of the widespread use of AI applications will be of particular relevance to European society with its cultural, administrative and regulatory “variety”. From this perspective it is remarkable that companies in the EU have so far failed to exploit some of those “natural” advantages – one may think of the large number of different languages spoken – to grow and become global players. As the Draghi report notices, it is primarily US firms which today dominate the global digital platform market, exploiting fully the EU’s single market scale advantages.

In this vein, as Daria Golewioska-Tataj notes: “Europe’s ability to innovate in AI hinges on fostering creativity and entrepreneurship… To remain competitive, small firms must embrace AI, while larger firms must adapt or risk obsolescence. The Commission should support AI adoption and create environments conducive to innovation through private and public-private partnerships. Skilling and reskilling are key, and innovation with platform and network-based business models builds ecosystem-based advantages. Europe’s competitiveness depends on supporting agile SMEs, while enabling larger incumbents to adapt to technological shifts”.

A complementary vision on the future of AI and its role in corporate productivity highlights the demand-side, the potential in adapting and using AI in European firms. In this sense, we do not need to be the best or first to discover or invent AI but the best at putting it to good use. Larger established firms, collaborating with tech entrepreneurs, can work with AI and together on AI.

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[29] Daria Golewioska-Tataj (2024), Enhancing European Competitiveness with Fairness, Sustainability, and Open Strategic Autonomy. *JRC Working paper*, series: For a Fair and Sustainable Economy.

[30] As also argued by Pierre-Alex Baland and Andrea Renda in Forge ahead or fall behind. Why we need a United Europe of Artificial Intelligence. CEPS, November 15th 2023, https://www.ceps.eu/ceps-publications/forge-ahead-or-fall-behind/

In short, the existence of the large single market is insufficient to induce Europe's large incumbents to enter new radical technological areas such as AI. On the contrary, the large single market seems to have operated as honeypot to foreign agile unicorns rather than catalyst forthe internal development of agile and competitive SMEs.

2.6 Alternative sources for funding research and innovation

The Draghi report highlighted the fact that there is very little European as opposed to national public funding for research and innovation, certainly compared to the US. However, it is private R&D funding and in particular R&D carried out in the Business enterprise sector where Europe has been lagging behind both the US and China. The private funding of research and innovation raises particular issues in Europe which warrant a more careful analysis of risks and rewards in the fields of both fundamental research and digital innovation.

As Dominique Foray in his contribution[31] analyses, there are in principle various financial engineering tools and methods to activate private investment in research: "The classical funding mechanism used by most national science foundations is the allocation of research grants, and it is true that such a mechanism pays for the inputs of research, not for the outputs. As a result, the risk of failure is indeed fully supported by public agencies: in case of success, the problem is solved and the government has funded the advance of knowledge involving perhaps huge social benefits; in case of failure, the public has paid for "nothing", and this does not seem to be a very smart use of public money."

As Foray notices: "the finance industry is highly innovative (Lerner et al., 2023), and one can see a proliferation of financial engineering (FE) tools to solve such difficult funding problems – where projects are highly desirable from a societal point of view but uncertain, risky, and extremely expensive. The interest in using such tools is to attract a new source of financing to finance projects that might not otherwise receive funding, or to improve the conditions at which this financing is realized, notably by leveraging financial markets' ability to share risk."

Foray discusses in his contribution the limits and opportunities for particular research projects of the use of so-called research impact bonds (RIB). "Researchers can credibly commit ex ante to a precise methodology, milestones and deliverables – solving thereby the problem of unhedged uncertainty". They can also use a mega-fund mechanism "when risks are diversifiable, and a very large number of projects can be run in parallel" or an advanced market commitment (AMC) reallocating risks between stakeholders. However, Foray also acknowledges the intrinsic limits of such new funding tools: "Ultimately though scientific research aims at producing a public good – knowledge – and in most cases, features of unhedged uncertainty and absence of clear determination of success and failure will dominate. In such cases, it seems vain to try to attract private investors (with a few exceptions). It eventually binds to a choice which society has to make knowingly: that of bearing all the risks research entails".

Nevertheless, the currently limited opportunities for applying AMC to fund research within the EU illustrates neatly the need for more synergies between various policy areas: in this case e.g. how its further integration in a number of policy procurement areas is likely to open up new opportunities

[31] Dominique Foray (2024), New ideas for funding scientific research in areas of societal relevance – analyzing the co-evolution of research methods and financial tools. JRC Working paper, series: For a Fair and Sustainable Economy.

for using AMC for funding research. At the same time the principles of the mega-fund mechanism also appear to be reflected in the first ideas on merging existing European funding initiatives into a massive European Competitiveness Fund (ECF) with a 'single rule and with all and strategic EU funding programmes'. Doing so would bring together research programmes such as Horizon Europe with InvestEU, which funds projects that support sustainable investment, innovation and job creation, under the same roof in the next Multiannual Financial Framework (MFF), the EU budget for 2028-2034. In short, European policymakers are also realizing the value of new financial engineering tools.

2.7 Europe in search of security: Synergies of military and civil R&I

One area which offers significant opportunities for AMC and research funding is the defence and security area. As already highlighted in the Introduction, the geopolitical landscape within which the EU operates in the 2020s, has dramatically changed.

As Rainer Kattel and Luc Soete point out in their contribution[32], the military sector has remained largely absent in the European integration project. Although the first steps were made in the midst of the Cold War, the European integration project appeared primarily as a peace project. That feature was also what was most clearly recognised in the granting of the Nobel Peace Prize to the EU in 2012, as mentioned in the Introduction. Hence, the peaceful exploitation of nuclear power, as with the setting up of Euratom (a forerunner of the European Community of Coal and Steel), became fully part of the European project. The same applies for the development of civil aviation with the development of the Concorde and the creation of Airbus. Dual-use military applications of civilian technologies remained explicitly outside of the European scope of action; they were eliminated from any of the framework research support programmes of the EC when they were first developed in the 1980s and subsequently renewed and enlarged to the current Horizon Europe R&D support programme.

To quote Kattel and Soete: "the industrial sector with possibly the greatest "single market" potential – the military sector – never developed as an integrated European sector, and advantages of European scale were never realised. The procurement of European defence markets did not develop and did not contribute to the overall competitiveness of Europe's defence and security industries. By contrast, most dual-use, technological breakthroughs of existing, often highly specialised defence firms in individual Member States, particularly the small ones, were transferred to and became exploited in the US… Mostly large Member States (the UK before Brexit, Germany, France – but also Sweden) succeeded in developing a dynamic defence sector/industry. In the US, such integration has famously led to significant technological advances, as exemplified by the role DARPA and other organisations played in the emergence of the digital revolution (Mazzucato 2013 and 2021). Europe, or its Member States, have failed to develop similar public organisations…"

In short, there is little doubt that the fragmented European defence market has not contributed in any way to the overall competitiveness of Europe's defence and security industries, on the contrary. It raises major, existential challenges for the EU in a new era of geopolitical tensions and insecurities. How can the EU position itself in a world in which economic openness and global trade

[32] Rainer Kattel and Luc Soete (2024), European security in a changing geo-political context: From the European Research Area to the European Defence Research and Innovation Area and from Cohesion to European territorial security policy. *JRC Working paper*, series: For a Fair and Sustainable Economy.

appears no longer to secure peace? How to reduce the risks of war if major economic powers and blocs become protectionist, mercantilist and inward looking?

3 The challenge of implementation for structural, transformative impact of EU policies

3.1 The bumpy road from input to impact

Being rich and versatile in its nature, the collection of papers touches on several features of EU policy going well beyond industrial policy. A recurrent theme is the policy making process and how to optimise the impact of policy initiatives. In simplified terms, EU policy consists of a large variety of combinations of investments and reforms; a more nuanced picture would distinguish between resources (investment), regulations (legislation) and reforms (mainly pursued in dialogue with EU member states within the so-called European semester). In reality, the policy process is even more complex with the simultaneous mobilisation of many policy instruments (the 'policy mix') complemented by a multilevel governance process, where EU-level policy initiatives and investment are negotiated and transformed in the transposition of legislation, resources and reforms to national, regional and local level.

Particularly in an EU context, science for policy must take into consideration specific policy objectives but also these interactions of policies and policy objectives at different governance levels (EU, national, regional, local). These interactions mean that policies can be synergetic and complementary but also that they can overlap with, duplicate, offset or even inhibit or undermine each other. This holds not just for the variety of innovation and industrial policies but also for what Luke Georgiou refers to as the "policy mix"[33] addressing sustainability transitions as well as fairness issues defined either in terms of income, wealth and/or regional inequality, or even in terms of perceived fairness[34].

There is a clear tension here between the continuous call for additional policy measures at the level of the European Commission and the focus on implementing the already very complex policy mix of

[33] As Luke Georgiou summarizes in his contribution Corporate Transition pathways from a Policy Mix Perspective, the literature on policy mixes:

i) The co-existence of policy instruments often reflects their origins in different policy objectives… Any given instrument can have effects (spillovers) in domains other than that for which it was originally intended;

ii) Even when they are addressing the same objectives, the application of multiple policy instruments can both enhance the effectiveness of a given policy through synergies and inhibit it through antagonistic interactions;

iii) Policy mix is significant at different levels of granularity including the environment and process in which policies are formed, the mix of policies, the mix of policy instruments and the means and effectiveness with which they are implemented;

iv) In a European context the mix is also affected by multi-level governance with policies and instruments being formulated and/or implemented at EU, national and regional levels;

v) There may be effects of a temporal difference in the origin and effect of policies or instruments in any particular mix. Existing measures often persist while new ones are introduced;

vi) Policymakers and analysts should caution against the assumption of Olympian rationality, accepting rather that they operate in conditions of bounded rationality and ambiguity." Luke Georgiou (2024), Corporate Transition pathways from a Policy Mix Perspective, JRC Working paper, series: For a Fair and Sustainable Economy.

[34] See in particular the contribution of Pete Lunn (2024), Perceived Fairness and the Green Transition, JRC Working paper, series: For a Fair and Sustainable Economy.

legislation and reforms, which have been introduced over the last five years[35] . Today, and as acknowledged in a certain way in both the Draghi report and von der Leyen's Political Guidelines, priority should be given to implementation and science for policy advice on the effectiveness of implementation strategies.

In times of transformation and disruptive change, a continuous learning based on a comprehensive monitoring of the policy initiatives is more important than ever. Most monitoring systems distinguish between input, output, outcomes and impact. EU policy making is no exception. The input is the above-mentioned combination of resources, regulations and reforms, shaped by appropriate policy mix approaches and an effective multi-level governance. The output can range from EU projects, the transposition of EU legislation to concrete reforms, resource allocation, or new corporate sustainability strategies in firms. The outcomes are tangible and intangible results, which include the creation of new innovative firms or start-ups, more effective administration, changes in behaviours, or less pollution from firms operating in the EU. Finally, the impact is the fulfilment of the objectives the EU policy set up to itself from the start, e.g. achieving climate neutrality by 2050, catching-up in productivity and growth with our main international competitors and partners, a more resilient and secure society, and the creation of jobs and decreasing inequality.

The first step in EU policy making is of course setting the overall goals and various policy objectives. In this context, the authors in this collection reflect on the interplay between the objectives of EU policy, and they touch upon four overarching objectives or goals: sustainability, competitiveness, fairness and security.

In 2019-2020, the EU agenda introduced sustainability as a mayor EU objective, operationalised in a new European Green Deal, a kind of social contract between governments and EU citizens, in particular the younger generations who most probably will live in a world deeply affected by climate change. The runup to the European elections in 2024, with fervent protests by farmers across the EU and an increased support for anti-EU parties and positions in the European Parliament and in national elections, pointed to trade-offs between the efforts to achieve sustainability and the perceived fairness for those who would bear the short-term cost of the transitions. As a result, new overarching goals were added to the EU agenda.

3.2 Understanding and addressing trade-offs between EUs policy goals

As explained in the first section of this report, , we are witnessing a return of EU policy to a focus on competitiveness. According to Andrea Renda: "A returning emphasis on a cost-efficiency logic was already seen in Von Der Leyen's 2023 State of the Union's speech; the mandate given to Mario Draghi for a forthcoming report on European "competitiveness" may also signal a departure from a more integrated, goal-based approach to Europe's future agenda. And indeed, the Draghi report ended up placing competitiveness… at the forefront of the EU agenda, with other goals such as decarbonisation, social cohesion and even territorial, place-based development being considered useful add-ons to the extent that they can contribute to a more competitive Europe." However, as Andrea Renda himself argued in his contribution: "the complexity of, and interplay between, intermediate policy goals such as resilience/economic security, competitiveness, territorial cohesion

[35] Luke Georgiou provides a nice overview in his contribution of the full spectrum of EU Policies and Measures for Corporate Sustainability

and decarbonisation warrants an approach oriented towards the pursuit of a plurality of goals, and decision-making tools that account for possible trade-offs."[36]

This line of reflection is also visible in the contribution of Eloi Laurent[37], Ana Boskovic and Peter Benczur. From the perspective of achieving well-being for EU citizens, one of the founding principles of the EU Treaty, Éloi Laurent and his colleagues, reason along the same line of a pluralistic goal-oriented policy, highlighting the many trade-offs between the goal of economic growth and that of sustainability and more broadly wellbeing. "Climate crisis and the destruction of the biosphere, the Covid pandemic, financial crises, persisting poverty, social exclusion and increasing inequality and societal polarisation all clearly demonstrate the limits of policies building predominantly on GDP as the most important yardstick of a country's economic performance and overall progress. Human wellbeing is plural: it can hardly be summed up and governed with one single metric and needs to be approached from different angles… To progressively complement the use of GDP with wellbeing indicators in EU policymaking, the European Commission is working on an integrated approach to develop a framework and propose metrics for capturing sustainable and inclusive wellbeing. The framework aims to account for wellbeing today, resources for future wellbeing within planetary boundaries, resilience, intergenerational fairness and inclusiveness. Corresponding metrics, including a holistic indicator dashboard and augmented GDP measures are being developed. The availability and use of such metrics would help demonstrate the progress of wellbeing inside and outside the EU, highlighting in particular the contributions of environmental, health, or social policies to people's wellbeing beyond the traditional economic perspective." In this sense, wwellbeing appears to be a concept better aligned with planetary boundaries than growth.

Luis Ayala in his more macro-economic contribution[38] elaborates further on the well-known trade-offs between the goals of long-term economic growth and fairness in the sense of economic equality. "For many years, it was believed that high rates of sustained economic growth would lead in the long term to a narrowing of income differences among households and an improvement in social welfare levels by combining higher income with a more equitable distribution. However, as a growing body of empirical literature has shown, the complexity of contemporary European societies suggests questioning the establishment of linear relationships between economic growth and distributive outcomes. The aggregate rate of economic growth is the result of very diverse processes, which can have opposing effects on inequality and poverty." The challenge of combining economic growth with equitable distribution is more pronounced in the current period of energy transition and the digital transformation. "New challenges arising from the two major transitions currently underway in the European Union add to those that have been ongoing for decades. Decarbonisation and digitalisation are reshaping the processes of income distribution, bringing great uncertainty for the future wellbeing of many households and locations."

As a result, the EU is facing today a new challenge of "income insecurity". "Economic insecurity, characterized by the fear of financial instability and the inability to recover from economic shocks,

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[36] Andrea Renda, (2024) "Combining place-based industrial transformation with centrally coordinated industrial policy in the EU", *JRC Working paper*, series: For a Fair and Sustainable Economy.

[37] Éloi Laurent, Ana Boskovic, Peter Benczur (2024),"The Wellbeing economy: Beyond GDP and beyond growth", *JRC Working paper*, series: For a Fair and Sustainable Economy.

[38] Luis Ayala (2024), "The Role of Tax-Benefit Systems in Reducing Income Instability n EU countries", *JRC Working paper*, series: For a Fair and Sustainable Economy.

has become a significant issue in Europe, especially following the Great Recession and the COVID-19 pandemic. This insecurity manifests through income losses, unemployment, and rising household debt, leading to increased anxiety about future economic prospects. Economic insecurity not only impacts household welfare but can also have broader macroeconomic consequences by reducing investment and consumption, thereby amplifying economic downturns." As a response to the trade-offs, Luis Ayala highlights the need to revisit the tax-benefits systems in EU member states as the major policy instrument to strengthen distribution of capital and income. "There is also strong evidence that the increase in household inequality has been due, above all, to the reduced capacity of public policies to mitigate market income inequalities. The capacity of cash transfers to redistribute income increased at least until the 1990s but began to decrease from the mid-1990s onwards." Public tax-benefit systems must adapt to this new social reality. "These systems should focus on minimizing the risk of negative economic events and stabilizing incomes to enhance financial security. More generous social benefits and progressive tax schemes have been shown to reduce income instability and provide social insurance, particularly in high-risk countries."

In a similar logic, Andrés Rodriguez-Posé and Lewis Dijkstra analyse the lack of distribution of economic growth across EUs territories, highlighting trade-offs between the EU's overall economic competitiveness and widening regional economic disparities (a dimension of fairness). "Over 60 million EU citizens today reside in regions with lower GDP per capita than in 2000, and one-third of the EU's population lives in areas that have either stagnated or experienced economic decline." The authors continue: "The pursuit of competitiveness can be economically, socially, and politically counter-productive if it does not involve all citizens in the process. If it is done at the expense of creating more territorial polarisation, the likelihood that Europe will be able to counter its economic decline will remain limited." This polarisation is not only economic but also tends to trigger a political resentment against EU policy and even to the European project as such. "Long-term relative economic and demographic decline and stagnation fuel discontent, particularly in regions that have fallen into a development trap. Such discontent translates into disengagement and growing animosity towards the European project and scepticism about addressing collective challenges like climate change."[39]

Andrés Rodriguez-Posé and Lewis Dijkstra present both a regional mapping of the "development trap index" and a mapping of EU sceptic votes in the elections to the European Parliament in 2024. In doing so, they provide a quantitative analysis of the political costs of the economic concentration and polarisation in the EU from a territorial perspective. Their analysis shows a clear correlation between the economic and political, social dynamics. "The sense of despair extends beyond economic and social hardships to political disenfranchisement and social alienation. Such malaise drives support for ideologies seeking to undermine the EU or, in extreme cases, advocate for its dissolution. This sentiment has been capitalised on by Eurosceptic groups. Both soft Eurosceptics, who oppose specific EU policies, and hard Eurosceptics, who frequently challenge the EU's viability, have gained traction by tapping into this growing discontent with deep geographical roots … The consequence of all this is the surge of support for Eurosceptic parties in national and European elections over the past decade. In 2003, hard Eurosceptic parties garnered less than 4% of the vote. The combined vote for both soft and hard Eurosceptic parties remained around 7%. By 2023, these numbers had dramatically risen: hard Eurosceptic parties received nearly 15% of the vote; hard and

[39] Andrés Rodriguez-Posé and Lewis Dijkstra (2024), "Cohesion and the Competitiveness Challenge in the EU", *JRC Working paper*, series: For a Fair and Sustainable Economy.

soft Eurosceptics together reached 28.5%. … While the rise in Euroscepticism is not uniformly distributed across the continent, it is particularly evident in areas that have experienced acute economic stagnation or prolonged development traps."

Pete Lunn complements this analysis of the trade-offs of EU policies focusing on the individual or collective experience of fairness in the roll-out of climate mitigation policy. "Perceived unfairness is a strong driver of behaviour." He argues that local reactions against the implementation of EU-level objectives - be it climate sustainability or competitiveness - are not always rationale in the sense of purely favouring self-interest. The experience of citizens of what is "fair" is far from simple and unidimensional. "In theory, an individual affected by a reform may simply compare their situation before the reform to their situation after and, providing they do not lose out, conclude that the policy is fair and go along with it. In practice, this is unlikely. Instead, they will ask how their experience compares to that of everyone else involved. Are others like me having to go through the same? Are others not like me having to contribute something too? What about people in other sectors, other regions and other countries? Does anyone have an exemption? How big is the benefit? Who gets the most benefit? How are those who designed the reform benefitting?" Pete Lunn concludes that a successful implementation of the European Green Deal, with its focus on sustainability, will require a deeper understanding of how citizens on the ground perceive policy-driven changes. "Europe is experiencing political upheaval and polarisation, with opposition to environmental policies playing an increasing part. Those who protest are, generally, not climate deniers. Instead, they believe that what is being asked of them is unfair."[40]

Aside from different trade-offs between competitiveness, sustainability and fairness as highlighted in the various contributions reviewed above, there are, however, also new potential synergies emerging between policy objectives. Sometimes these are the result of the changing geopolitical landscape as in the case of security and acknowledged in both the Letta and Draghi reports; sometimes require an active search for new policy mixes in 'science for policy' advice.

3.3 Potential synergies across policy objectives and the introduction of security

Over the last two years, a fourth overarching objective has joined sustainability, competitiveness and fairness on the top of the EU policy agenda. This is the goal of security, in a political and defence-oriented sense, but also as a strategic vision of economic policy. Several authors analyse this new goal on the EU policy agenda, focusing mainly on potential synergies and on how to design policies to reduce trade-offs with the other three EU goals.

As we already discussed in chapter 2, Paula Kivimaa and Karoline Rogge's contribution identifies in quite some depth different avenues for achieving complementarity between policy efforts to promote open strategic autonomy and the sustainability transition. They do so also with respect to the new economic security concerns specifying the ways in which the two goals relate to each other: "Sustainability transitions are shaped by developments in global geopolitics and security, and second, that transitions, when accelerating or gradually stabilised into new socio-technical systems, will alter security and trade." Getting this balance right will, among several dimensions, require a

[40] Pete Lunn (2024), "Perceived Fairness and the Green Transition", JRC Working paper, series: For a Fair and Sustainable Economy.

revisiting of science for policy tools. “Creating improved alignment between the policy objectives for sustainability transitions and open strategic autonomy means an increasingly heightened role for cross-domain policy networks and coordination – i.e. identification of critical sectors, key technologies, needed capabilities and favourable international relations that benefit both OSA and ST. … Important conditions for such increased strategic intelligence and improved coordination are foresight capacity, geopolitical skills and sustainability monitoring, to name but a few examples of the required state capacity.”[41] The authors also identify possible synergies building on domestic industrial production and sourcing of clean-tech, and the potential of replication, diffusion and on scaling-up of existing sustainability innovations.

In their contribution, Rainer Kattel and Luc Soete show that synergies are possible by linking security objectives with competitiveness goal (i.e. more innovation) but also with the fairness goal (i.e. with a new vision of Cohesion policy). First, the integration of research and innovation in the realm of defence (including defence procurement) can strengthen the current European Research Area opening up for the creation of new dynamics and instruments already available e.g. in the US. However, current legal restrictions in the use of the EU budget for defence, anchored in the EU Treaty, prevent the full potential of these synergies between innovation and security from being realised. Integrating defence and security R&I with the EU’s civilian R&I efforts would open up for new instruments generating the ‘disruptive innovation’, which the Draghi report calls for. “DARPA has allowed the US to drive disruptive innovation and technology development that meet both national defence needs and benefit US economic growth (through commercial applications). China has pursued civil-military fusion for many years. For historical reasons, Europe has sought to keep civilian and military research and innovation systems apart. Yet as illustrated in many new areas, such as space, public-private cooperation has accelerated technological advances. In a time of increasing geopolitical tensions where Europe’s freedom and democracy are increasingly threatened, innovation, security and sustainability need to cross-fertilize and reinforce each other.”

But there are also possible synergies between the security-defence objective and the fairness objective through e.g. the strengthening of EUs Cohesion policy. As Kattel and Soete notice: “From a historical perspective, the creation and development of national defence oriented industrial policies can be considered as national “cohesion” policy tools ‘avant la lettre’. It was accompanied with an explicit industrial policy aimed at creating a defence industrial and technological base (DITB). It involved territorial “specialisation”, with an attempt to exploit the border region’s natural absolute advantages, such as sea and/or air proximity, and also involved the relocation of staff, education and maintenance facilities, leading to a major development impulse for many of those peripheral regions.” The authors propose the recognition of the concept of ‘territorial security’ within European cohesion policy – Europe’s ‘secret weapon’ – “a broader European security aim that benefits all Member States. It represents an additional feature of European solidarity, now addressing the continent’s territorial security. It explicitly acknowledges the place-based, territorial nature of security needs and, in doing so, justifies the transfers from more centrally located member states and regions to border and peripheral places.[42]

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[41] Paula Kivimaa and Karoline Rogge (2024), “Pursuing sustainability transitions and open strategic autonomy: a policy mix perspective on synergies and trade offs”, JRC Working paper, series: For a Fair and Sustainable Economy.

[42] Next to cohesion policy with its focus on territorial differences within the EU, the EU mission on cities could also play a key role in ensuring a coherent integration of sustainability and security agendas.

In short, it is clear that an effective impact of a multi-goal EU policy agenda requires a full understanding of likely trade-offs between the goals from the very outset, and a capacity to identify new synergies unleashed by a multi-goal policy. Moreover, the tensions arising from the trade-offs can be diffused or at least tempered through an optimal policy design and an inclusive and transparent implementation. In the collection of papers there are several hints on what such an approach would imply.

3.4 New policy mixes – combining policy instruments

As we already pointed out in the introduction, particularly in Europe, science-based advice to policymaking will have to take into consideration the interactions of policies and policy objectives at different governance levels: the policy mix. In his contribution, Luke Georghiou analyses the framework conditions most likely to incentivize business firms, particularly large-scale incumbent firms, to engage in the sustainability transition through their corporate strategies for transition pathways. In other words, how can from the view of business corporations the goals of sustainability and competitiveness be combined? Or what are "…ways in which governmental actions at national or EU-level would incentivise firms to choose strategies that align with sustainable pathways and to accelerate their progress along these, while, at the same time, continuing to meet other policy objectives that are more traditionally aligned with corporate (and political) goals, principally those of maintaining value creation and competitiveness."[43]

In response, Luke Georghiou showcases two possible taxonomies for the appropriate combination of policy instruments: the traditional strategy, seldom fully implemented, finding simultaneous effects of policy instruments stimulating both supply and demand for sustainability innovations. An alternative policy mix approach presented is what he describes with the abbreviation 'RICO'. This refers to the provision of Resources ("the financial input which changes the economics of its activities in the desired direction"). The establishment of Incentives ("which may be positive incentives such as favourable fiscal treatment for a sustainable pathway or use of public procurement to guarantee an early or lead market to de-risk an innovative sustainable solution…[or] negative incentives such as use of taxation, tariffs or legal action to enforce compliance with regulations that demand higher levels of sustainability"). The support for Capabilities ("where for example there is a lack of available green skills in a sector or region and intervention in education and training or more directly in the labour market is needed"). Finally, the provision of Opportunities ("meaning support for research and innovation relevant to sustainability to create the opportunity set from which a company may replace its current base, for example moving from fossil fuel-based feedstocks to a bio-based economy").

The policy challenge is to trigger long-lasting effects in the firm's behaviour, described by Luke Georghiou as "*behavioural additionality*". "Behavioural additionality … focuses on changes in firm's behaviour and is inherently more likely to be sustained over a longer period. The effects of the support are targeted on capabilities or, at a higher level, strategy and culture. Specific behaviours which may be encouraged are collaboration (including engaging in programmes targeting systemic change) and risk-appetite (bearing in mind the conservatism of large corporates which we have noted)."

[43] Luke Georghiou (2024), Corporate Transition pathways from a Policy Mix Perspective. *JRC Working paper*, series For a Fair and Sustainable Economy.

3.5 Multi-level governance and the local articulation of EU policy

Alongside the importance of 'policy mix' approaches, several authors also stress the multi-level governance and its direct influence on the policy cycle, and in particular on the implementation of EU policies in concrete output and outcomes. In his contribution, Andrea Renda outlined how the new industrial policy should take into account place-based articulations and a combination of EU-wide and bottom-up industrial initiatives.

Philip McCann, Matthijs Janssen and Johan Stierna in their contribution propose a similar line of thought, introducing a new concept they call 'local missions'. These missions complement and reinforce the EU missions with a place-sensitivity, reversing the dominant top-down dynamics of policy implementation by starting bottom-up. They are "… targeted at stakeholders located in different regions, each with their own specificity when it comes to particularly prominent problems; capabilities for developing or adopting certain solutions; local policies and institutions; and characteristics of the particular actors and networks in those regions (e.g. in relation to resources and power). All these place-specific features translate to differences in priorities, perceptions, fears, concerns, incentives, assets or endowments. For missions to spark action, they need to be reframed (in terms of values) and re-scoped (in terms of problems and solutions) in a way that matches these place-specificities."[44]

Local missions would increase the policy engagement of local stakeholders in the EU policy objectives, and in particular the *salience, credibility and legitimacy* of EU missions and their objectives. This policy approach also illustrates the possibility of EU-wide multi-level governance to develop initiatives bottom-up, building a traction and scale from a multiple of local independent initiatives moving in a similar direction. "In terms of EU governance, at the top-down central level embodied by the European Commission, the saliency and credibility of the case for widespread and wholesale climate change-mitigation agenda is obvious and arises from the worldwide scientific evidence of global warming. At the same time, the legitimacy of these activities being initiated, promoted and orchestrated by the centre arises from the EU-wide legal underpinnings of the role of the European Commission. At the local and regional level, however, this is not the case. At these lower governance and geographical scales, the salience of the EU Green Deal does not concern climate change per se, but rather, the relative importance of climate-change issues in comparison to other day-to-day socio-economic issues, as perceived by local citizens."

In terms of EU policy, local missions contribute to building bridges between R&I policy and Cohesion policy, an important aspect in the reflection on synergies across EU investment programmes. They build a social innovation dynamics nurtured by diversity; they allow the EU to create value from its cultural, social, political and economic diversity. At the same time, they complement the top-down approach with a bottom-up creativity and engagement. "… in the case of missions associated with the EU Green Deal, the top-down directionality embodied in the mission-oriented logic leads to a profound ambiguity regarding exactly how the legitimacy, salience and credibility essential establishing reference frameworks are to be established locally. Without these features, across the EU, it is impossible for any genuinely-held and widely-held reference narratives to be established in each region ensuring that people will act for sustainability in the face of radical uncertainty. This is especially the case in the EU's economically weaker regions."

[44] Philip McCann, Matthijs Janssen, Johan Stierna (2024), "Can 'local missions' play a role in linking climate change mitigation and Cohesion policies?", *JRC Working paper*, series: For a Fair and Sustainable Economy.

In this sense, 'local missions' contribute to both R&I policy and Cohesion policy and open up for unexplored policy synergies: "This is exactly why the cross-fertilisation and leveraging of the EU Cohesion Policy logic, architecture and delivery agenda is so crucial for the mission-oriented success of the EU Green Deal. EU Cohesion Policy provides a ready-made governance and behavioural framework highly amenable to mission-oriented approaches. EU Cohesion Policy has long-established salience, credibility, and legitimacy in the weaker regions of the EU, backed up by significant medium and long-term financial commitments which cannot be undermined by short-term political manoeuvring. Moreover, this takes place in a multi-level governance setting, which maximises bottom-up initiative alongside both top-down and bottom-up shared management."

In the same spirit of combining EU-wide initiatives with value creation from regional or local diversity, Daria Golebiowska-Tataj proposes new measures to stimulate regional ecosystems and growth: "Innovation strategies should be tailored to the unique characteristics and strengths of each region, ensuring initiatives are relevant and effective by leveraging regional assets and addressing specific needs."[45]

[45] Daria Golebiowska-Tataj (2024), "Enhancing European Competitiveness with Fairness, Sustainability, and Open Strategic Autonomy", *JRC Working paper*, series: For a Fair and Sustainable Economy.

4 Conclusions

4.1 Revisiting science for policy concepts: in search of impactful EU policies in times of transitions

As illustrated in both the detail and depth of the many expert papers reviewed here, an optimal impact of EU policy requires a solid and adequate science for policy monitoring and learning system, whereby policy makers at all levels of the governance system receive feedback and launch corrective measures to re-adjust or tilt investment and reforms for highest possible impact.

In this line of thought, Slavo Radosevic and Sylvia Schwaag Serger[46] argue that times of transitions and deep socio-economic transformations, such as the current systemic transition of the energy system, the accelerating digitalisation, the climate adaptation, or more recently the societal transition in view of security, create new requirements on this science for policy dynamics. Agile and continuous monitoring, solid ex ante impact assessment, ex post quantitative and qualitative learning gain increasing importance for an optimal impact of EU policies.

The authors argue that in our present time of deep transformation, science for policy (or rather their preferred 'knowledge for policy') must be able to understand and continuously monitor four 'dynamics of change': direction, speed, contestation and experimentation. "First, it is about the direction of technological, social and economic transformation. Second, the pressure of climate change and the effects of disruptive technologies add urgency or speed of transformation, which is important because it requires accelerating knowledge generation, application, and learning. Third, in response to the shift toward increased directionality and different benefits and costs that accrue to various stakeholders, further amplified by disagreements about the speed of change, the contestation of STI policy is the major novelty compared to conventional S&T policy. Fourth, uncertainty is the pervasive feature of the transformative context, which calls for exploring different technological and organisational solutions, especially as science cannot give definite answers to questions about instruments, interactions, and causalities."

In this context, new guidelines for supporting information systems are needed. A detailed technical paper by Alexandra Mazak-Huemer, Christian Huemer, Michael Vierhauser, and Jürgen Janger describes a robust information system currently in use in Austria that efficiently organizes and disseminates extensive datasets. This system provides a comprehensive architecture for web-based, interactive monitoring across multiple levels in the Science, Technology and Innovation (STI) context such as inputs (e.g., funding, human capital), intermediate outputs (e.g., publications, patents), final outputs (e.g., innovation revenue), outcomes (e.g., export quality, export complexity), and broader impacts (e.g., GDP in percent per capita). In addition, the paper presents a three-layer structure which can be generally used for implementation of such a tool: a foundational data ingestion layer that evaluates data from trusted sources, a business layer that supports policy analysis and

[46] Slavo Radosevic and Sylvia Schwaag Serger (2024), "Science for policy in a transformative policy context", JRC Working paper, series: For a Fair and Sustainable Economy.

decision-making, and an interface layer with diverse user-access points, including dashboard modules[47].

Referencing Luke Georghiou's assertion that *"in times of transformation and disruptive change a comprehensive monitoring of the policy initiatives is more important than ever,"* the middle, or business logic layer of this architecture incorporates a comprehensive input-output-model. For example, the RTI Monitor presented in the paper traces innovation linkages between various STI domains (such as funding, higher education, academic research, digitalization, corporate R&D, climate and environment, circular economy, location appeal, and even more) based on various input and output indicators (currently there are 244 indicators in the Austrian RTI Monitor). STEM graduates, for instance, are identified as both an output indicator for tertiary education and a key input indicator for location attractiveness. Andrea Renda calls for *"goal-based rather than purely growth-based"* approaches, suggesting that decision-making tools in transformative times should weigh potential trade-offs between growth and strategic goals. In alignment with this, the RTI monitor's structure enables alignment between Austria's strategic policy objectives and its RTI system, leveraging input-output indicators to highlight impactful areas for intervention.

The paper by Mazak-Huemer et al. marks a major advancement in creating a web-based, interactive, and openly accessible tool for monitoring research, technology, and innovation (RTI) systems. Its effectiveness will depend not only on the quality of RTI input data but also on a broad and diverse set of output data. A notable area of potential application is in industrial decarbonization, where the system could help structure and monitor technologies that support European industry's shift toward sustainable production.

This brings us back to Éloi Laurent, Ana Boskovic and Peter Benczur's point already discussed above in chapter 3, about the need to use the right indicators when designing a monitoring system that can go beyond pure growth for its own sake to a more balanced goal setting including fairness and sustainability. "In the shifting paradigm, economic growth is no longer seen as an end in itself but a means to achieving wellbeing. It therefore requires identifying an alternative set of indicators that can better measure, monitor and steer policies into the right direction. Environmental and social aspects are already reflected in many public and private decisions, but they need to be further mainstreamed. This more holistic concept of wellbeing can help guide European societies through the current "polycrisis" and transitions, themselves complex processes." The JRC is developing a framework and propose metrics for capturing sustainable and inclusive wellbeing.[48] "The framework aims to account for wellbeing today, resources for future wellbeing within planetary boundaries, resilience, intergenerational fairness and inclusiveness."

And as we saw in chapter 2, in the review of the contribution of Arnold Tukker with his JRC colleague José M. Rueda Cantuche, it is not just the search for alternative set of indicators, but also different modelling options, reflecting diverse framings and possible solutions. The hybrid model proposed by Tukker and Rueda Cantuche allows policy makers now to evaluate the economic, social

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47 Alexandra Mazak-Huemer, Christian Huemer, Michael Vierhauser, Jürgen Janger (2024), "Requirements Engineering for a Web-based Research, Technology and Innovation Monitoring Tool", JRC Working paper, series: For a Fair and Sustainable Economy.

48 See the Commission's 2023 Strategic Foresight Report, and Benczur et al, (2024): Sustainable and Inclusive Wellbeing, the road forward

https://commission.europa.eu/document/download/ca1c61b7-e413-4877-970b-8ef619fc6b6c_en?filename=SFR-23-beautified-version_en_0.pdf and doi:10.2760/828060

and environmental impact of circular economy policy in a comprehensive way. And as Tukker and Cantuche point out, the urgency is there. "Humans extract more than 80 billion tons of natural resources each year … Under a business-as-usual scenario this increase to 160 billion tons in 2060 … Studies suggest that material extraction and use drive a wide variety of environmental harms including ~25% of greenhouse gas (GHG) emissions, increasing to almost 50% if food products are included."[49]

In short, the science for policy measurement toolbox is in need of more careful exploration and analysis, particularly in times of systemic transformation. As Andrea Renda highlights in his contribution[50] "*Goal-based rather than purely growth-based*" pursuing a plurality of goals, and decision-making tools that account for possible trade-offs. This opens for "new frontiers in public policy in the era of complex choices as the dawn of *quantum policymaking*".

4.2 Industrial policy at the crossroad of competitiveness, decarbonisation and security

In commenting on the Draghi report, some foreign, non-European experts such as David Teece, wondered why the relative decline of Europe in competitiveness had been hidden for so long to Europe's policy makers. David Teece suggested that the decline in Europe's competitiveness was camouflaged by some specific features of what could be described as "economic somnolence".

First, there was the 'running out of steam' of previous competitive growth engines such as the automotive vehicles industry which established itself as a high quality, technologically sophisticated premium consumer goods sector which generated more or less "guaranteed" export markets, accompanied at the same time by a prospective regulatory framework offering primarily foreign competitors the single market benefits for new growth opportunities in both green and digital transformations areas. As Daniel Gros points out in his paper, entering new, strategic sectors such as semiconductors needs to take into account the global value chain of such production whereby the EU appears to be stuck in some sort of middle tech trap: "Strengthening the EU presence in the chip 'ecosystem' requires addressing this fundamental weakness with support for software development and R&D in the critical elements of the supply chain."

Second, the easy, pipeline access to cheap oil and gas from Russia sustained the international competitiveness of large incumbent European firms in energy- and scale intensive industries such as chemicals and many basic industries. It allowed them to reap the low-hanging fruit benefits of the policy commitment to the Paris convention by introducing the more easily implementable, incremental reductions in CO2 emissions as governed through the ETS with its many exemptions and free emissions allowances, effectively postposing any systemic transformation. In this context, it is interesting to note that the outbreak of war in Ukraine and the resulting boycott of Russian oil and gas only led to a replacement of the oil/gas supplies from Russia with other, often more

[49] Arnold Tukker (2024), "Modelling circular economy impact in the context of a transition to a fair and sustainable economy. The Need to Combine bottom-up and top-down MFA, LCA and GE Models", *JRC Working paper*, series: For a Fair and Sustainable Economy.

[50] Andrea Renda (2024), Combining place-based industrial transformation with centrally coordinated industrial policy in the EU, *JRC Working paper*, series: For a Fair and Sustainable Economy.

expensive, LNG supplies of other countries such as the US. In some EU countries, as Kivimaa and Rogge[51] notice, the green energy transition was even halted.

Third and finally, there was the so-called 'peace dividend' which many European countries absorbed through increases in publicly funded social welfare systems, because the European treaties did not allow for EU funding for military purposes. As Kattel and Soete[52] point out, this institutional bottleneck prevented Europe from benefiting not just from the emergence of single market and standardization advantages in the European defence industry, it also undermined the occurrence of technological breakthroughs because of limited opportunities for up scaling and limited procurement.

The Draghi report similarly pinpoints these three features as priority areas for bold reforms in EU policy making. First, the emergence of an "innovation gap" in the new growth areas of the 21st Century associated with digitalization and AI. Second, the emergence of a "competitiveness gap" with much higher energy prices in the EU undermining as a result industry's attempts at decarbonisation. Finally, the emergence of a "security gap" with the sudden realization of the vulnerabilities of Europe's open, international trade and investment model. We would add here, as discussed in more detail in various contributions of amongst others Andrea Renda, Andres Rodriguez-Pose, Eloi Laurent, Luis Ayala, Philip McCann, Matthijs Janssen, Johan Stierna, and Pete Lunn, the "fairness gap" in terms of rising inequality of income and across territories, further reinforced by widespread perceptions of inequality.

To manage these transformations, the Draghi report calls for a 'new industrial strategy' "consisting of closing the innovation gap, developing a joint plan for decarbonisation and competitiveness, and finally moving in a new direction of increasing security and reducing dependencies". The question is of course whether the EU has the institutional set-up to deliver on these three strategic aims. As Fontana and Vannuccini (2024) in a recent historical assessment of European industrial policy point out: "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…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

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51 As discussed in section 2.3, and highlighted by Kivimaa and Rogge, the RePowerEU package "included contrary goals to sustainability transitions, such as improved liquified natural gas (LNG) investments and infrastructure… some EU Member States (e.g., Estonia) and Norway even changed policy to strengthen support for domestic fossil fuel production – that is, some countries… opted for the recontinuation or restabilisation of fossil fuel production". As Kivimaa and Rogge explain, there was in this 'new' industrial policy vision, a lack of alignment between the Open Strategic Autonomy objective and the Sustainability Transition one. Paula Kivimaa and Karoline Rogge (2024), Pursuing sustainability transitions and open strategic autonomy: a policy mix perspective on synergies and tradeoffs. JRC Working paper, series: For a Fair and Sustainable Economy.

52 Rainer Kattel and Luc Soete (2024), European security in a changing geo-political context: From the European Research Area to the European Defence Research and Innovation Area and from Cohesion to European territorial security policy, *JRC Working paper*, series: For a Fair and Sustainable Economy.

champions, who help reproduce within the border of the EU the logic of rivalry that is gaining momentum globally.[53]"

As Andrea Renda points out in his contribution: "*since 2019 EU industrial policy has been rebuilt around the notion of industrial ecosystems, and (after 2021) the launch of transition pathways* jointly defined by existing stakeholders in a collective process. Such transition pathways, however, have taken too long to kickstart. In addition, they have been typically defined in an incremental, incumbent-driven way, which in turn reduces their potential to trigger the systemic transformation that European industrial sectors need to embrace competitiveness and sustainability over time. Moreover, transition pathways that have already seen the light (e.g. in energy-intensive industries, construction, mobility, chemical industry, tourism) do not seem to have adequately incorporated key elements of the emerging EU agenda, including security and resilience, the creation of good jobs, as well as territorial impacts, *i.e.* the possible mapping of existing specialisations, the identification of hubs and interrelations between them, and the consequent redesign and diversification of EU supply chains. In a nutshell, existing EU industrial policy is hardly wired for a coherent multi-level industrial transformation strategy in the EU."

This opens up the discussion on the need for an 'institutionalisation' of European industrial policy, effectively the "creation of agencies, authorities, or enterprises as goal-oriented, specialised institutional vehicles." As Fontana and Vannuccini (2024), observe: "Throughout its 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… Balland and Renda[54] speak of the need for an 'Airbus moment' for the EU in the domain of artificial intelligence. Kleimann et al.[55] 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)."

The idea of European ARPAs is actually close to some of the original proposals put forward by Spinelli in the 1970s with respect to European industrial policy and have been elaborated more recently in new institutions such as the concept of European Public Enterprise of General Interest or the Important Project of Common European Interest (IPCEI). However, as highlighted by Paula Kivimaa and Katherine Rogge and discussed in section 2.3, alignment between the different policy objectives will be crucial.

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[53] Fontana, O. and S. Vannuccini (2024), 'How to Institutionalise European Industrial Policy (for Strategic Autonomy and the Green Transition)', *Journal of Industry, Competition and Trade* (2024) 24:20, https://doi.org/10.1007/s10842-024-00429-2

[54] See Balland, P-A. and A. Renda (2023), Forge Ahead or Fall Behind. Why we need a United Europe of Artificial Intelligence, CEPS Explainer, 2023-13, https://cdn.ceps.eu/wp-content/uploads/2023/11/CEPS-Explainer-2023-13_United-Europe-of-Artificial-Intelligence.pdf

[55] Kleimann, David et al. (2023), How Europe should answer the US Inflation Reduction Act, Bruegel Policy Contribution, No. 04/2023, Bruegel, Brussels,

4.3 Disruptive innovation: what lessons for the next wave of disruptive tech-innovation, headed by AI?

What is probably most striking in the Draghi report, and as also highlighted by Daria Golewioska-Tataj[56] is the speed at which the innovation gap widened over the last decade. Jacques Pelkmans in commenting on Draghi puts it as follows: "It's about greater risk taking in the EU rather than risk-avoidance. It's about ways to become more innovative, to help innovators become true investors that will spur EU economic growth and generate real benefits for the entire EU market. It's about the benefits of having EU countries working more closely together, in designing financing methods and new funds that make a new and more daring form of entrepreneurship in Europe possible that removes the allure of the financiers across the Atlantic."

More concretely, did old industrial policy, particularly with respect to microelectronics and later on ICT, focus on the wrong actors? It kicked off by liberating national telecom markets instead of creating a common European telecom market[57]. Despite being ahead in many of the new, emerging mobile telephony markets, the EU subsequently missed the market of digitalisation and the emergence of platform firms which benefited optimally from European single market harmonization.

The current, big divide in the provision of digital services between Europe and the US and even China does not imply though that the EU will necessarily lose out in the next phase of digitalisation associated with AI. As Renda and Balland have pointed out, AI specialization can be built around local areas of technological software expertise and be fed by the huge demand for GovTech in the multi-governance European world. From this perspective, regulatory frameworks do not create just create barriers to entrepreneurship and growth but also provide opportunities for innovation and entrepreneurship. The multi-language requirements in Europe now become AI opportunities for media, education, communication; just as the cross-border differences in regulation in health provisions, education, energy subsidies, even taxation can, with the help of AI, be "translated" into opportunities for increased efficiency and precision resulting in both private and public led innovation.

Traditionally, there has been a natural limit to the pursuit of single market principles in the EU set by the national prerogatives of Member States with respect to taxation and the organisation of the nation's public funding in what each country considered its political priority: health, social welfare systems, education, justice, security, etc. Given the size of such large public funding contribution in most European countries – more or less half of each country's GDP[58] – the natural limits of reaping single market advantages are significant for the EU as a whole, following the application of

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[56] Daria Golewioska-Tataj (2024), Enhancing European Competitiveness with Fairness, Sustainability and Open Strategic Autonomy, *JRC Working paper*, series: For a Fair and Sustainable Economy.

[57] As Fontana and Vannuccini (2024) observe: "Geroski and Jacquemin (1985)… challenge the idea that betting on economies of scale as policy goal carries benefits automatically, and stress how the creation of super-large firms capable of competing with American counterparts in the 1960s led to limited gains and serious drawbacks (in particular, a rise in market concentration). For them, European industrial policy should have focused on the removal of barriers (e.g. to entry) and on integrating further the common market. Such vision interprets industrial policy as a complement of, rather than in tension with, competition policy. A similar approach is the one promoted in the Letta report (2024), which we might summarise in brief as 'remove barriers before sponsoring Champions'.", op. cit.

[58] France has the highest public spending ratio among all EU countries with general government spending amounting to some 59% of GDP, while Germany represents more or less the EU average with 51%, compared to 45% for the US. The exception is Ireland with only 24% (data for 2021, General government spending | OECD).

subsidiarity principles. As a result, there are huge differences across the EU in the "best-practice" delivery of particular public and semi-public services.

From this perspective, AI offers the possibility to overcome these typically European, public so to say "natural" inefficiencies to achieve productivity gains in areas which typically were non-tradable sectors and hence also in a region or country's competitiveness. In this sense, the application wide diffusion of AI illustrates in a certain sense a unique opportunity for the EU: a "competitiveness transformation" challenge. It brings to the fore the importance assigned to AI adoption and entrepreneurship in both the Draghi report and the Political guidelines for the next European Commission, as highlighted by Daria Golewioska-Tataj[59]: "Europe's ability to innovate in AI hinges on fostering creativity and entrepreneurship… To remain competitive, small firms must embrace AI, while larger firms must adapt or risk obsolescence."

In short, and as also highlighted in Daniel Gros' contribution, focusing competitiveness and industrial policy on frontier technologies such as semiconductors or AI should cover the much wider spectrum of possibilities and bottlenecks in diffusion. "Industrial development involves the percolation of technologies across user industries, and the provision of key inputs. 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." (Fontana and Vannuccini, 2024).

4.4 Security - a new social contract for Europe's citizens?

Both the Letta and Draghi reports added the security dimension as a new European challenge following the increased geo-political tensions. Again, and as argued by Kivimaa and Rogge and Kattel and Soete in their contributions, it will be crucial that the EU develops in this context a coherent and overarching approach to security investments and align these with both the green and digital agendas. Pulling the debate together under the notion of 'competitiveness' will not be sufficient.

Rainer Kattel and Luc Soete propose two fundamental shifts in the EU's main funding programmes: the so-called framework programmes funding research and innovation and the regional structural funds, the so-called cohesion funds. In their words: "The first is the area of research and innovation policy where the nature of the multi-level governance between the EU and its Member States has been one of "shared parallel competence", implying that EU member states can carry out national science and research policies (including legislation) in parallel to the EU, no matter whether the EU legislates or not. It would be an area that can be easily expanded to include more explicitly defence-focused research.

In short, to broaden the *European Research and Innovation Area to a European Defence Research and Innovation Area* (EDRIA). The second framework is Europe's cohesion policy, described here as Europe's "secret weapon". As the REGDUALOS JRC project/survey illustrates[60], there is, unsurprisingly, a geographical mapping of military facilities, the further exploration of defence

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[59] Daria Golewioska-Tataj (2024), Enhancing European Competitiveness with Fairness, Sustainability and Open Strategic Autonomy, *JRC Working paper*, series: For a Fair and Sustainable Economy.

[60] This ongoing JRC project, REGDUALOSA, analyses how to leverage the Dual use potential of some key strategic technologies. https://place-based-innovation.ec.europa.eu/projects-0/dual-use-defence-innovation-leveraging-regional-industrial-development_en

research and so-called cohesion regions. This is not surprising. In the current insecure international geo-political environment, the integration of security issues into European regional policies represents a logical, new expression of intra-regional European solidarity. In short, enlarging current *cohesion policy to European territorial security policy*."

As Kattel and Soete conclude: "These shifts would allow, first, for market expansion and integration in security and defence-related national expenditures (for example, through much broader dual-use allowances in R&D and procurement); second, by introducing conditionalities to such investments, governments can advance their green and digital growth agendas; and third, by integrating territorial development goals into defence programmes, governments address regional imbalances in their societies."

However, the science for policy reflection on security goes beyond defence and military concerns. In their concept papers, several experts advocate for a broader definition of security also including economic, social and even existential dimensions of security. As an illustration, Luis Ayala stresses the concept of "economic insecurity" experienced by citizens. This concept emerges from the increasing disconnection between macroeconomic growth and income equality in the EU.

In the same line, Andrea Renda notes: "Security, in this respect, should be intended in its social, economic and geopolitical dimensions. Place-based industrial transformation should then be incorporated in cohesion policy by directing policy and spending measures towards specialisations that can enable specific regions to achieve higher levels of security. The public goods nature of the latter goal would also mean that the EU as a whole would benefit from enhanced social, economic and geopolitical security in each of its regions (i.e. the Union is typically as secure as its "weakest link")."

4.5 The territorial articulation of policy

This brings us to a final possible Science for policy concept, broadly overlooked in the Draghi report, that of the *territorial articulation of policy*. Territorial articulation is the 'échelon perdu' between on the one hand EU scale/bottom-up support to competitiveness as in so-called smart specialisation strategies and on the other hand fairness and regional/local (dis)content.

This holds for sustainability and the European Green deal where the "space blindness" of the policy framework was already highlighted in previous publications for the JRC[61]. In a changing climate context, it will be primarily the economically weaker regions – typically more carbon-intensive and carbon-extensive – which will be most in need of re-equipping for a sustainable future. At the same time, it will also be these same regions which will be the most exposed to the risks and uncertainties associated with climate change-mitigation actions and lacking capabilities to diversify in more sustainable directions.

As Philip McCann, Matthijs Janssen and Johan Stierna argue along similar lines in their contribution *Can 'local missions' play a role in linking climate change mitigation and Cohesion policies?* "Such regional misalignment, in terms of the greater needs of climate change mitigation occurring in economically weak regions, also facing the greatest risks of climate change mitigation activities,

[61] See Schwaag Serger, S, L. Soete and J. Stierna (Eds.), (2023), The Square: Putting place-based innovation policy for sustainability at the centre of policymaking, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/135706, JRC131244

poses a profound challenge to centrally orchestrated mission-oriented innovation policies seeking to spur and align bottom-up experimentation". This is because the local and regional geography of incentives is likely to be fundamentally mis-aligned with any top-down mission framing… the top-down directionality embodied in the mission-oriented logic leads to a profound ambiguity regarding exactly how the legitimacy, salience and credibility essential establishing reference frameworks are to be established locally."

It is without any doubt the missing element in both the Draghi and Letta reports and the Political guidelines for the next European Commission, the need to incorporate much more clearly the dramatically grown "geography of discontent" in the EU. As Andrea Renda points out: "This should allow to better reflect the substantial trade-offs that have emerged over time when it comes to socio-economic, territorial and security aspects of the implementation of Europe's "growth strategy". The challenges Europe faces in the coming years cannot, unfortunately, be approached one by one."

The 15 contributions of the various experts highlight the fact that mono-dimensional approaches to competitiveness, industrial innovation, sustainability, fairness or even security are likely to ignore some of the underlying key trade-offs. To *paraphrase* Andrea Renda "This, inevitably, is likely to make things more complex for EU policymakers, and this is why this scientific report suggests, in line with what has been authoritatively advocated, that the EU fully embraces economic complexity when looking at its geography, and that of the rest of the world."

4.6 Ways ahead

Looking forward, the science for policy tabled by the 19 experts calls for three broad lines of conceptual analysis where more efforts should be made in the years to come.

First, the challenge of achieving a competitive economy through a deep industrial transformation in the EU. This implies unleashing the industrial specialization by capitalizing on radical and transformative innovation and a construction of a genuine and multilevel European innovation system.

Second, reaping the opportunities of the EU's accumulated efforts to position itself globally on sustainability and in the intersections between sustainability and digitalization. This continent-wide "smart specialization" can now be further enriched with the new security and defense transformation, opening up for synergies, but also raising new trade-offs with the ongoing twin transition.

Third, and finally, a full understanding of the challenges of fairness and security, in a broad sense, both those facing the EU and those perceived by its citizens. This is not less urgent than the first two fields of work, since what is at stake is the legitimacy of public policies and in its extension the European project itself. If the two first work streams call for science for policy addressing an "innovation gap" and an "implementation gap", this third line of reflection touches on the "fairness gap", on citizen's engagement and trust in the current "social contract" underlying the European project.

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