European Commission

SCIENCE FOR POLICY BRIEF

Industrial Innovation Dynamics series

A resilient, competitive, fair and sustainable EU: Industrial Innovation for Open Strategic Autonomy

HIGHLIGHTS

Industrial Innovation as a pillar of industrial policy is central to achieving Open Strategic Autonomy (OSA) with its emphasis on building EU-wide capacities and leadership in critical sectors and technologies, responsible openness and continued strengthening of the EU's internal market.

In pursuing OSA, all synergies between social and territorial cohesion policy and industrial innovation policy should be exploited. This is likely to also involve addressing the digital and green gaps, upskilling the workforce and engaging stakeholders at all levels to identify targeted areas for investment.

Institutional capacities as well as quality and good governance are crucial to OSA. Maintaining synergy and a positive balance between well-being, twin transition and OSA in the new industrial policy agenda requires effective coordination and collaboration between policy areas, actors (public and private) and government levels (EU, national, regional, local). This for instance can take the form of well designed and implemented mission-oriented and transformative innovation policies, public R&D support measures, or effective policy mixes which increase regional shares of high-growth innovative enterprises.

More research and cooperation between practitioners and scientists is needed to underpin and monitor OSA. As a recent EU priority, policy makers need a better evidence-base to inform future OSA initiatives and strategic decisions. There is a need for more research at the intersection of industrial policy and OSA giving rise to forward-looking policy intelligence, including foresight and scenario analysis, to anticipate emerging difficulties and choke points. Setting up a community of OSA practicioners and scientists in support of policy-making would be beneficial.

"We have to make our economy and our societies more sustainable. And it must be a competitive sustainability, something which will boost Europe's open strategic autonomy – our freedom and ability to act as we see fit, when we see fit" European Commission Executive Vice-President Maroš Šefčovic, 19 Oct. 2023

"... innovation is instrumental in shaping the direction of our economic resilience and our strategic autonomy ..//.. we must not forget that our strength lies in our openness..//.. Our motto is: As open as possible, as close as necessary" European Commissioner Iliana Ivanova, 7 Nov. 2023

"Disruptive geopolitical events have demonstrated the need for the EU to further strengthen its open strategic autonomy and remain competitive in a global market, while ensuring than no one is left behind" Annual Sustainable Growth Survey 2024, COM(2003) 901, 21 Nov. 2023

1. INTRODUCTION

1.1 'Open strategic autonomy' and CONCORDi 2023

''Open strategic autonomy'' (OSA) has emerged in recent years as a concept and goal guiding the EU's political and policy framing of its response to epochal challenges threatening competitiveness and prosperity - economic and financial crises, fragmentation of economic and political spaces, supply chain disruptions resulting from COVID-19, climate change, wars and rising geopolitical tensions. OSA is central to the new European Economic Security Strategy and a core objective of the EU's socio-economic policy agenda as stated in the guidance provided by the European Commission in its *Annual Sustainable Growth Survey 2024*.[1]

OSA encompasses both enhanced self-sufficiency in critical sectors and increased openness to global trade and

[1] Investing in the EU's competitive future, COM(2023)901, 21.11.2023

Joint Research Centre

cooperation for a more united, assertive and stronger Europe, putting the interests and values of its citizens first. There is, in fact, a compatibility between openness to trade and the better understanding of where vulnerabilities/choke points are located so that certain capacity can be built around those, there where needed. In economic terms, it means optimising the use of EU resources, developing strategic sectors and investing in infrastructure and education. Industrial innovation is pivotal to this - for the technologies critical to the twin green and digital transition, for achieving a circular economy and for reducing Europe's external technological dependencies.

In order to inform the EU's research, innovation and industry policy responses to OSA, the European Commission's Joint Research Centre (EC-JRC) hosted on 24-26 October 2023 the 9th biennial European Conference on Corporate R&D and Innovation (CONCORDi)[2] - focused on *'Industrial Innovation for Open Strategic Autonomy. Leaving no one and no place behind'* - in association with the OECD and the Spanish Presidency of the Council of the European Union.

This *Science-for-Policy Brief* gives a short EU policy contextualisation of "industrial innovation for Open Strategic Autonomy" followed by a digest of the results of this conference with a focus on policy relevance – drawing on scientific evidence, insights and recommendations presented in both parallel and plenary sessions.

Furthermore, this brief highlights some of the policy challenges ahead and proposes some critical questions, both of a scientific and policy nature

Box 1: CONCORDi conference series

By bringing together the best scientists in the field, the biennial European Conference on Corporate R&D and Innovation (CONCORDi) aims at presenting recent scientific evidence and analysis in the field of industrial research and innovation economics and, in dialogue with industry and public policy stakeholders, shape a shared and policy relevant research agenda for the coming years.

In this way, the CONCORDi conferences have built over the last 16 years a unique forum for academic discussion in connection with policy-makers and industrial practitioners. https://iri.jrc.ec.europa.eu/concordi-2023

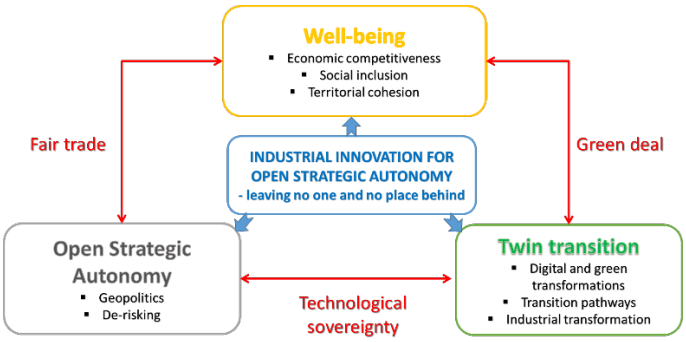
[2] https://iri.jrc.ec.europa.eu/concordi-2023

1.2 Industrial Innovation for Open Strategic Autonomy. Leaving no one and no place behind – an oxymoron, a dream, a reality?

The starting premise is that industrial innovation can be harnessed to contribute synergistically and simultaneously to three policy goals - resolving a sort of "trilemma":

(i) *Improving wellbeing* (compatible with economic competitiveness, social and territorial cohesion),
(ii) *Transforming industries* and services (including the twin transition, supporting innovative high-growth entrepreneurship, ...), and
(iii) *Achieving Open Strategic Atonomy* (technological sovereignty, de-risking supply chains, fair trade).

However, for industrial innovation to contribute positively to all three policy goals and thus achieve synergy requires sustained cross-policy coordination and adjustments among and between all levels of governance to maintain coherence, attenuating measures and tendencies which negatively impact on these goals or cause unacceptable trade-offs, and accentuating others with more positive overall impact[3]. Understanding and getting this balance right is a challenge for academia, science-for-policy practitioners and policy makers. Figure 1 schematically traces the links between industrial innovation, OSA and related topics and what they entail.



Source: Own elaboration

Figure 1. Industrial Innovation for Open Strategic Autonomy

In terms of territorial cohesion, *("Leaving no place behind")*, identifying target areas for industrial innovation investments that contribute to OSA and technological sovereignty[4] requires the engagement of stakeholders at different governance levels – EU, national, regional and local. This calls for a reinforced alignment and coordination of funding instruments and strategic planning under EU cohesion policy (regional innovation smart specialisation strategies) and under the Resilience and Recovery Facility of Next Generation EU.

[3] The conference background paper provides more contextual information on Industrial Innovation for Open Strategic Autonomy. [1]

[4] "Technological sovereignty" related to OSA means building competitive technological capacity in areas where vulnerabilities or choke points are more likely to materialise, e.g. net-zero or chips.

QUICK GUIDE

"Open Strategic Autonomy": The term "Open" stresses the fact that the EU aims for multilateral cooperation wherever possible and appropriate. "Strategic Autonomy" refers to the capacity of the EU to act autonomously in strategically important policy areas. Integrating both perspectives into policy initiatives might require considering and balancing important trade-offs.

"Industrial innovation" supports EU's technological leadership - key feature of OSA - as well as objectives related to EU policies on Industry, Innovation, the Single Market, Trade and Competition. In this context, the goal is to foster EU strategic industrial ecosystems to enhance innovation and production capabilities within its borders, thereby reducing dependency on foreign suppliers.

Strengthened interconnections between regional and local innovation ecosystems as well as synergies with more territorially dispersed ecosystems in the EU and globally should be pursued to reinforce sustainability and resilience in European value chains and deep-tech dependent sectors.

In terms of social cohesion *("Leaving no one behind")*, OSA must also be compatible with European competitiveness and social policy goals. Recently enacted measures aimed at competitive sustainability and the promotion of green growth like the "New Green Deal" in the EU or the "Inflation Reduction Act" in the US, include provisions to counter any unintended effects on equity and inclusiveness. The New Green Deal includes a focus on creating high-quality jobs, facilitating transitions to new types of employment, equipping workers with green skills and bridging the "digital divide" both within and across EU regions and member states.

2. Emerging scientific and policy views on OSA and industrial innovation

This section provides an overview of the main themes addressed in both plenary and scientific parallel sessions of the conference (reference to relevant papers are signalled in brackets and referenced in the end notes) whilst providing contextualising input from other academic and science-to-policy publications. The main messages are summarised in what follows.

2.1 Open ...

Balancing trade and strengthening international cooperation

The EU is at a crucial juncture in its trade policy dynamics, with emerging policies tailored towards OSA. This raises critical questions about whether the shift towards OSA will reshape EU's historical stance on trade openness, liberalisation, and international cooperation, possibly tipping the scales towards more autonomy. But, as one keynote speaker put it: "Resilience cannot mean retreat into protectionism in an interdependent polycrisis world."

Indeed, open strategic autonomy implies maintaining interdependencies and collaborations which are vitally important to address global concerns such as climate change and security. Partner selection criteria should not only be based on economic or technological dependencies but also on shared values and long-term sustainability goals, such as net-zero objectives.

Such a strategy aims to strengthen global partnerships while ensuring sustainable and resilient economic policies in an interconnected world. International cooperation, collaborations and knowledge exchange can also have positive spillovers to third countries e. g. Ukraine. [2] The governance of international technology cooperation requires a national innovation system with a pro-active geopolitical-aware approach to international cooperation and the ability to make strategic choices, among others. [3]

The contributions presented in the conference and the existent scientific literature point out the importance of deepening research on the role of EU trade policy in achieving OSA objectives.

Maintaining the integrity of the Single Market

The European Union's pivot towards OSA within its industrial policy framework presents complex challenges for maintaining the integrity of the Single Market. A key concern is the potential impact on competition policy, including merger control, regulation of member state and foreign subsidies, and exemptions that could affect market competition and increase market fragmentation. When considering policy competition, it's relevant to examine regulatory frameworks beyond the European Union.

The EU's competition rules should be supportive of European innovation and entrepreneurship. This necessitates a delicate balance between reinforcing strategic autonomy and preserving internal market competition. Regarding this trade-off, multinational companies carrying out innovative activities can help fostering the EU's Industry 4.0, but might create technological vulnerabilities and foreign dependencies at the same time. [4] Similarly, financial flows in the form of FDI, especially via cross-border acquisitions, can accelerate the (global) diffusion of green technology but also create dependencies. [5]

The provision of timely and unified data on supply chains, especially in critical sectors, are pertinent to increase resilience. For example, the lack of unified, EU-wide data on suppliers of critical pharmaceutical substances and the

monitoring of supply security remains a potential threat to citizens' health. [6] Exploring the role of regulatory and technological standards as means to safeguard technological sovereignty is an area requiring future research and more policy attention. [7]

2.2 Strategic Autonomy

Attaining OSA in Critical Raw Materials & Technologies

As one keynote speaker stated: "Foreign technological dependency was largely self-inflicted in the EU". Technological sovereignty fuelled by R&I policy is vital to reduce key dependencies. This should be achieved through stakeholder and policy collaborative efforts and cooperation between EU and Member States,

As a first step, mapping critical materials' vulnerabilities of European economies is key to develop appropriate counteracting measures [8] while simultaneously enhancing the circularity of supply chains, i.e. through better recycling and higher resource efficiency to support OSA in the medium-term. [9]

OSA is not only about managing dependencies but also de-stressing value chains and improving technology diffusion. The emergence of a "digital gap" between larger and more productive firms that are more likely to adopt digital technologies with regard to smaller, less productive ones [10] is illustrative in this respect.

This would require to build up cooperation agreements with new partners, e.g. in the context of critical raw materials that are particularly relevant to address green choke points .

Accelerating industrial structural changes to achieve OSA

In many economic sectors, there is a conspicuous absence of European companies among the top global R&D spenders. [11] [12] While recognising the valuable roles played by startups and other entities, the significant concentration of corporate R&D in key strategic sectors outside Europe is an issue that cannot be ignored.

This becomes even more critical considering the global increase in market concentration. The past decades have witnessed a notable increase in corporate concentration, driven by the rise of dominant firms, also known as "superstar firms" in both the US and Europe. The rise in industry concentration has been accompanied by higher mark-ups, as evidenced by OECD research presented in the conference summary by Dr Criscuolo (OECD, FRA). Such increased market power carries significant implications, including reduced productivity growth, stagnant real wages, and diminished business dynamism. [13]

One way to alleviate those challenges would be for the EU to intensify efforts in accelerating industrial innovation and promoting the creation and growth of firms, especially in strategic sectors. This strategy is essential to drive the necessary structural economic changes and reduce external dependencies in these vital sectors. Moreover, it could enhance the representation of innovative European companies in the global arena, countering the current underrepresentation.

2.3 Wellbeing – leave no place and no one behind

Mainstreaming strategic autonomy considerations into policy making should not compromise efforts to foster "creative destruction" and ensure a growth model based on sustainable competitiveness fueled by industrial innovation and R&D. At the same time, policies should be designed to ensure that, as industries evolve, no individual or region are marginalized in the process. This nuanced approach to policy formulation underscores the delicate balance required to fuel economic progress without forsaking inclusivity and equity, thereby reinforcing the interconnectedness of strategic autonomy and societal wellbeing.

2.4 Sustainable competitiveness

Financing innovation in critical sectors and technologies

Market failures hamper the financing of innovative ideas, especially for young firms. [14] Climate-enhancing innovation is disproportionately hampered by financial constraints. Facilitating access to finance especially for innovative but financially restricted companies is vital and can help generating the green-tech advancements needed to accelerate the green transition. [15] Corporate takeovers can help foster the green transition, as firms acquire external technological sources that can help to accelerate their innovation process, a strategy which has been implemented with a higher likelihood since the adoption of the *Paris agreement*. [16]

Venture capital plays an important role in financing innovative start-up and scale-up firms. [17] However, there seem to be diverging Venture Capital investment patterns and lower investment levels in the EU - a so-called funding gap – compared to leading investor countries (e.g. US, China) in selected critical sectors and technologies, for instance related to NetZero [18] and health. [19] Another source of potential concern are ownership structures in key ecosystems. As an example, a recent Europan Commission – JRC study found that EU firms in the digital ecosystem rely on foreign investors for half of venture capital funding, with 24% provided by US funders [20].

Policy makers can resort to government venture capital to support the financing of targeted sectors or critical technologies. Government venture capital (still) plays a

relevant role in the EU but shows a high heterogeneity in its design across countries and along many features.

This calls for a better understanding of the link between design and performance of government venture capital initiatives to increase its effectiveness and impact. [21]

Future research could focus on assessing financial constraints in sensitive sectors or related to firms developing critical technologies.

Enhancing Industrial and Innovation Policies to support OSA

Several papers focused on government support to R&I. First, the evidence shows that public R&D policies have a considerable impact, creating beneficial spillovers compared to a pure market-based R&D scene. For example, the decline in public R&D in the US can explain up to a third of the decline in total factor productivity since 1960, while publicly funded innovations are more likely to open new technological fields, more reliant on science and more likely to generate spillovers, especially to smaller firms. [22] Also, competitive R&D grants help direct innovation efforts towards more novel technologies whose emergence, development and diffusion might be prevented or slowed down if left to a pure market selection mechanism. [23] Lastly, government supported clean tech projects not only realized more patents, but also created positive spillovers beyond national borders, underlying the importance of open and global coordination. [24]

Second, the design and administration of R&D policies has an important impact on their effectiveness. For instance, the amount of R&D expenditure induced by a dollar of R&D tax relief can be expected to be much greater when directed towards smaller and less R&D intensive firms. [25]

Other contributions highlighted the need for careful evaluation of national and EU-level programmes to gain a better understanding of impact and to improve the design of future initiatives, e.g. relating to energy-intensive industries and reaching climate neutrality targets. [26]

Addressing the implications of OSA for the EU workforce

Engaging with Europe's diverse workforce, understanding their needs, and upskilling them for the industries of the future is crucial to ensure broad-based prosperity. The shift of resources towards specific sectors and technologies, while strategically important, carries job and skills implications that can lead to negative socio-economic consequences in certain locations.

In this regard, the EU should capitalise on its green technologies and expertise: policymakers should prioritize education and training programmes that emphasize green skills and the benefits of a circular economy to ensure a smooth workforce-wide transition. [27] More generally, investing in learning capacity leads to more innovation and better labour market outcomes, underscoring the added-value of continuous learning and skill development policies. [28]

2.5 Reconciling OSA with territorial and social cohesion

To effectively contribute to OSA, industrial innovation ecosystem requires holistic policies measures which consider cohesion (socio-economic & geographical) aspects whenever possible. Other important aspect to ponder is the policy analysis of industrial, product and technological capabilities at global, national and regional levels. As Commissioner Ferreira put it: ''No industrial policy can be spatially blind''.

Several papers stressed the importance of institutional capacities, institutional quality and good governance in this regard, for instance relating to (i) the successful design and implementation of mission-oriented and transformative innovation policies [29], (ii) the impact of EU R&I funds on employment and GDP per capita [30], or (iii) the regional share of high-growth enterprises[5]. [31]

Beyond addressing the ability of economies, companies and industrial ecosystems to excel relative to international competitors in their transition to a sustainable economy through investment in innovation, EU Industrial Policy has also to consider social cohesion objectives. These need "to be grounded on EU values, including multilateralism and a pan-European perspective on value chains'', according to one keynote speaker. Participation in global value chains (GVCs) enhances regional technological diversification, and interregional GVC linkages are positive for regions undergoing structural transition. [33] Hence the dual perspective which Smart Specialisation fosters in companies to stimulate local development but with an open international perspective, even if firms with a digital orientation generate more spillovers than those with a green focus. [34]

Complexity[6] analysis can also provide policy makers with important insights into green and other patenting trends in regions and countries and signal future opportunities. [35] However, the heterogeneous impact of policy measures at regional level may have undesirable welfare and inequality consequences. This not only happens when policies are protectionist [36] but can also occur for greening and digitalisation oriented measures - green industries tend to concentrate territorially, potentially exacerbating regional inequalities [37] while exposure to robots, for example, tends to boost regional employment but depress wages. [38]

[5] High-growth enterprises play a disproportionate role in contributing to aggregate economic outcomes. [32]

[6] https://publications.jrc.ec.europa.eu/repository/handle/JRC124939

This argues for the involvement of stakeholders at different territorial levels in the identification of industrial innovation investments relevant to strategic autonomy and technological sovereignty, for instance, by including those implicated in the new Partnerships for Regional Innovation.[7]

3 KEY POLICY ISSUES TO ADDRESS AND PRIORITIES FOR FUTURE RESEARCH

The emerging field of OSA has implications for many different fields of economics, such as industrial economics, technology adoption, competitiveness analysis, or trade and their respective links with industrial innovation. In the following, we select overarching topics which came up in the conference discussions that are both policy relevant and on which further research is needed.

3.1 Implementation and strengthening of targeted industrial policies

In order to achieve the industrial structural change needed in the EU, industrial policies should be implemented in support of strategic sectors such as Energy, Space and Defence, Critical Raw Materials, Digital, Environment, and their enablers such as finance, education and skills. Doing so from an Open Strategic Autonomy perspective requires strong coordination and cooperation without stifling competition across several policy areas and groups of stakeholders. Public R&D support is pivotal for fostering innovation-based business in the afore-mentioned strategic sectors, particularly by SMEs, young and financially-constrained firms Such support helps firms to overcome entry and innovation barriers, thereby helping to achieve sustainability and strategic autonomy[8].

Additionally, venture capital, including corporate venture capital, plays a crucial role where it effectively addresses funding gaps, particularly in the scale-up phase of innovative firms with high growth potential. This type of financing is especially instrumental in helping firms transition from startup to more mature stages, enabling them to grow and compete internationally. Increased policy attention to these aspects can contribute to the robustness and resilience of key (strategic) industrial sectors and the creation of new sectors.

Strengthening and scaling up ''important projects of common European interest'' (IPCEIs) might be another way to support EU-wide investments in critical projects and infrastructure, such as batteries, hydrogen or chips.

More generally, in order to retain and regain global technological leadership, EU and member states should strengthen their national innovation ecosystems, which will also strengthen the pan-european innovation ecosystem. This entails fostering global collaboration with selected partners and adapting to evolving funding mechanisms as well-connected industrial and innovation ecosystems are essential for ensuring fast and effective technological progress. Furthermore, the EU should aim to create a single open research market which – by encouraging international research collaboration - can enhance the EU's standing in the global tech race.

3.2 Policy coordination and cooperation

Integrating OSA-considerations into policy-making has important implications across policy-domains.

The heightened focus on industrial policy within the OSA framework calls for careful assessment of potential competition policy implications. The "open strategic autonomy" framework could shape the future direction of competition policy and help to defend EU's strategic interests and security. Attention should be paid, for example, to the role of merger control, foreign subsidies, regulatory exemptions, and other aspects of competition policy in reinforcing the European Union's strategic autonomy while simultaneously preserving open and fair competition within the internal market.

To ensure that the shift to OSA reshapes the EU's stance on trade openness, liberalisation, and international cooperation, a more autonomous policy framework should be pursued which could include: 1) strategic alignment in multilateral agreements (shared objectives, complementary strengths), setting accurate criteria to select partners for international cooperations; 2) economic considerations (trade balance, economic political, market potential); 3) technological synergy (technological expertise, R&D collaboration potential); 4) environmental commitment, and 5) political and cultural synergies[9].

While trade considerations strongly emphasise the centrality of international cooperation for OSA, they also demand a deeper understanding of how such cooperation can enhance resilience to geopolitical shocks and spearhead a sustainable economy.

EU has also a role to play in supporting the green transition in third, less developed, countries. The open questions are how to transfer green and digital knowledge effectively, how to sustainably access the natural resources of those countries (i.e., critical minerals, capacity to produce cheap and large amount of renewable energy) without resorting to unsustainable and exploitative models, and how to effectively

[7] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3008

[8] See also: Spain's National Office of Foresight and Strategy (2023) *Resilient EU2030*. NIPO: 089-23-024-6. Madrid, 15 September 2023. www.futuros.gob.es/en

[9] See also: European Commission (2021): "Trade Policy Review - An Open, Sustainable and Assertive Trade Policy", COM(2021) 66 final/ Brussels, 18.2.2021.

trace supply chains without imputing all the costs on developing countries.

Lastly, a more pro-active involvement of different institutional actors requires strengthening their capacities to design and effectively implement OSA related-policies.

3.3 Leaving no place and no one behind?

The discussion at CONCORDi 2023 highlighted the risk of the twin transition within an OSA framework exacerbating existing disparities in digital and green sectors. The COVID-19 pandemic has particularly accentuated the "digital gap" between firms that are already digitalized and those that are not, underscoring the necessity for policies that foster an inclusive digital transition. [39] Policymakers are encouraged to focus on narrowing this divide to ensure that all enterprises can reap the benefits of the digital revolution.

A parallel argument exists for a potential 'green gap', emerging [40] also following an increase in digital investments. Current evidence demonstrates that digital investments in regions already progressing in green technology significantly contribute to the further development of these technologies in those areas but not in others [41] and that the positive contribution of digital technologies to eco-innovation at the firm level is more prohibitive for small firms. [42] The emergence of this twin gap — both digital and green — warrants careful monitoring by policymakers, along with timely interventions as required.

In general, Open Strategic Autonomy requires a holistic analysis of industrial innovation ecosystems that looks at industrial, product and technological capabilities at global, national and regional levels. The regional dimension is a relevant aspect to be taken into account in the context of the new Partnerships for Regional Innovation[10] promoted by the European Commission in cooperation with the Committee of Regions, as part of the EU's climate, cohesion and innovation agendas.

3.4 Monitoring progress towards OSA

Policy makers should put in place a system to monitor the progress towards economic, social and policy objectives contributing to OSA. This should include a new comprehensive methodological approach (the ''what'' and ''how'') to observe and analyse OSA. Putting in place such a system also means identifying actors capable of undertaking the complex analyses this entails and to tackle and improve the current lack of unified, EU-wide monitoring data pertaining to critical materials, technologies and supply dependencies at different levels of aggregations (global, national, regional).

Another essential monitoring element would be the capacity to map the actors in critical industrial ecosystems. [43] Moreover, the use of tools such as complexity analysis, as illustrated by Prof. Hausmann (Harvard University, USA) [44] in his keynote and elsewhere during the conference, and strategic foresight seem promising areas in this regard and also for future research.

Lastly, the establishment of a cross-disciplinary international community of practitioners and academics dealing with OSA and related policy issues would be helpful if not necessary to inform and support policy-makers in their decision-making process.

4 Concluding remarks

In a global landscape marked by uncertainty, nations must grasp the intertwined factors influencing risk, reward, and resilience. Striving for optimal OSA outcomes in a specific country or region may involve diminishing dependencies among competitors while fostering them among allies. Conversely, there are instances when it becomes necessary to enhance national capacities, and at other times, it may entail fostering new alliances. [45]

Concerning OSA and industrial innovation, a wide range of actors, including academia, think-tanks, or policy research organisations, should take into account the entire range of research needs and knowledge gaps when prioritising their research activities.

As mentioned by several panellists and keynote speakers. there is a clear need to provide more and better research at the intersection of industrial policy and OSA giving rise to forward-looking policy intelligence, which includes foresight and scenario analysis, to anticipate emerging difficulties and choke points. This would be a concrete example of researchers moving out of their comfort zone – i.e. adding an anticipatory dimension to their work, which is mostly limited to explaining the past and to topics for which data exists.

Moving out of one's comfort zone means pushing the knowledge frontier outwards, for instance by innovating in research methods, including the use of artificial intelligence, collaborating more or doing interdisciplinary research. These steps are necessary to inform decision makers on how to handle the complexities of attaining OSA in the context of industrial transformation.

In science for policy, it is vital to scan the horizon beyond the current policy priorities in order to anticipate trends and undertake research which serves society over the medium- to long term.

[10] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3008 [11] See also: ESIR expert group (2023) '*Research, innovation, and technology policy in times of geopolitical competition*' European Commission, DG RTD.G.1, ISBN 978-92-68-07696-5. Luxembourg: Publications Office of the European Union, Oct 2023

This is necessary since, for instance, it has taken decades for key innovation economics insights to be mainstreamed into economic and industrial policies, even if in radically new and emerging contexts, as mentioned by Prof. Soete Maastricht University, NLD)[11]. Addressing urgent and long-term challenges that can be tackled by targeted Industrial Policies and Industrial Innovation requires systems thinking and insights beyond what is needed for short-term crisis management.

OSA extends beyond research and innovation, and industrial policy, implicating Trade, Competition, Employment, Single Market and Cohesion policies and calls for convergence and coordination in addressing strategic sectors such as Energy, Environment, Defense, Materials, Food, and Health. The overarching goal is a swift transformation towards a Resilient, Competitive, Fair, and Sustainable EU. Industrial innovation and both robust and dynamic policy making play a pivotal role in realizing this vision.

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[11] See also: ESIR expert group (2023) '*Research, innovation, and technology policy in times of geopolitical competition*' European Commission, DG RTD.G.1, ISBN 978-92-68-07696-5. Luxembourg: Publications Office of the European Union, Oct 2023 *research innovation and technology policy in times-KIBE23004ENN (2).pdf*

[12] The full list of Scientific Committee members is available at *https://iri.jrc.ec.europa.eu/concordi-2023/conference-committees*

REFERENCES

[1] Amaral-Garcia, S., Confraria, H., Domnick, C., Hervás, F., Moncada-Paternò-Castello, P., Rentocchini, F., Zaurino, E. (2023) '*Industrial Innovation for Open Strategic Autonomy – leaving no one and no place behind*', Science-to-policy evidence from the 9th European Conference on Corporate R&D and Innovation (CONCORDi 2023). JRC Working Papers on Corporate R&D and Innovation series No 03/2023, European Commission, Seville, JRC135258. *https://publications.jrc.ec.europa.eu/repository/handle/JRC135258*

[2] De Rassenfosse, G., Uhlbach, W. 'Science in a War Zone: The Devastating Effects of Conflict on Ukrainian Research.' Presented at CONCORDi 2023.

[3] Lehtinen, S., Deschryvere, M. 'The conduct of international technology cooperation in a turbulent geopolitical environment: the perspective of a small tech-savvy EU-country.' Presented at CONCORDi 2023.

[4] Bello, M., Castellani, D., Damioli, G., Marin, G., Montresor, S. ' Knowledge sources for Industry 4.0 technologies in European regions: The role of inward FDIs.' Presented at CONCORDi 2023.

[5] Rabellotti, R., Amendolagine, V., Hansen, U., Lema, R., Ribaudo, D. 'Do green foreign direct investments increase the innovative capability of MNE subsidiaries?' Presented at CONCORDi 2023.

[6] Ernesto, L., Mendonça, S., Damásio, B., Loureiro, R. 'Building a resilient EU pharma industry.' Presented at CONCORDi 2023.

[7] Blind, K. 'Standardization and standards: safeguards of technological sovereignty?' Presented at CONCORDi 2023.

[8] Carrara, S., Prior Arce, A., Itul, A., Kuzov, T., Alves Dias, P., Christou, M., Maury, T. 'Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study.' Presented at CONCORDi 2023.

[9] Maury, T., Eynard, U., Ardente, F., Faraca, G., Magrini, C., Ranea Palma, A. 'From critical raw materials identification and circularity analysis to enhancement of EU strategic autonomy: a product policy contribution.' Presented at CONCORDi 2023.

[10] Weiss, C., Akhan, N., Faivre, C., Harasztosi, P., Rückert, D., 'Technological innovation, digital adoption and firm performance.' Presented at CONCORDi 2023.

[11] Moncada-Paternò-Castello, P. (2022). Top R&D investors, structural change and the R&D growth performance of young and old firms. *Eurasian Business Review*, 12(1), 1-33.

[12] Grassano, N., Hernandez Guevara, H., Fako, P., Nindl, E., Georgakaki, A., Ince, E., Napolitano, L., Rentocchini, F., Tubke, A. (2022) The 2022 EU Industrial R&D Investment Scoreboard, Publications Office of the European Union, Luxembourg, 2022, doi:10.2760/485748, JRC132035

[13] De Loecker, J., Eeckhout, J., & Unger, G. (2020). The rise of market power and the macroeconomic implications. The Quarterly Journal of Economics, 135(2), 561-644

[14] Hall, B., Lerner, J. (2010) 'The Financing of R&D and Innovation' Chapter 14, Handbook of the Economics of Innovation, vol. 1, pp 609-639

[15] de Ridder, M., Aghion, P., Bergeaud, A., van Reenen, J. 'Financial Barriers to Green Innovation.' Presented at CONCORDi 2023.

[16] Martinez Cillero, M., Bose, U., Daniel Gregori, W. 'Does Green Transition promote Green Innovation and Technological Acquisitions?' Presented at CONCORDi 2023.

[17] Kortum, S., Lerner, J. (2000) 'Does Venture Capital Spur innovation?' NBER Working Paper No. w6846.

[18] Letout, S., Georgakaki, A., Kuokkanen, A. 'Role of corporate investors in the funding and growth of clean energy tech ventures.' Presented at CONCORDi 2023.

[19] Amaral-Garcia, S., Veugelers, R. 'The EU health innovation ecosystem and the role of venture capital.' Presented at CONCORDi 2023.

[20] De Prato G., López-Cobo M., Torrecillas Jodar J., Papazoglou M., Fabiani J., Calza E., Soguero Escuer J., Vazquez-Prada Baillet M. (2023) *Digital technologies: a picture of the present to anticipate the future.* Publications Office of the European Union, Luxembourg, 2023, JRC135986

[21] Testa, G., Compano, R., Quas, A. 'Novel Insights into Governmental Venture Capital Strategies in Europe.' Presented at CONCORDi 2023.

[22] Dyèvre, A. 'Public R&D and long term productivity growth. Presented at CONCORDi 2023.

[23] Iori, M., Mina, A., Santoleri, A. 'R&D grants and the novelty of innovation.' Presented at CONCORDi 2023.

[24] Montresor, S., Rentocchini, F., Vezzani, A. 'Walking the Green Mile: Government Sponsored R&D and Clean Technologies.' Presented at CONCORDi 2023.

[25] Appelt, S., Bajgar, M., Criscuolo, C., Galindo-Rueda, F. 'How Effective Are R&D Tax Incentives? Reconciling the Micro and Macro Evidence.' Presented at CONCORDi 2023.

[26] Costantini, V., D'Angeli, M., Mancini, M., Martini, C., Paglialunga, E. 'An econometric analysis of the energy savings performance of the Italian plastic manufacturing sector.' Presented at CONCORDi 2023.

[27] Pedrini, G., Antonietti, R., Antonioli, D., Cattani, L., Chioatto, E. 'Skills for circular innovation: evidence from Emilia-Romagna, Italy.' Presented at CONCORDi 2023.

[28] Napolitano, S., Greenan, N., Curci, Y. 'Innovating for the good or for the bad. An EU-wide analysis of the impact of technological transformation on the labour market.' Presented at CONCORDi 2023.

[29] Penna, C., Mazzucato, M., de Oliveira Santos, G. 'Systemic capacities and capabilities for mission-oriented innovation policies: a novel framework and a case study of Brazil's Inova programme.' Presented at CONCORDi 2023.

[30] Santos, A., Lalanne, M., Coad, A. 'Governance and the effectiveness of Research & Innovation funding: Evidence from European regions.' Presented at CONCORDi 2023.

[31] Amoroso, S., Herrmann, B., Kritikos, A. 'The role of regulation and regional government quality for high growth firms.' Presented at CONCORDi 2023.

[32] Flachenecker, F., Gavigan, J., Goenaga Beldarrain, X., Pasi, G., Preziosi, N., Stamenov, B. and Testa, G. (2020) '*High Growth Enterprises: demographics, finance and policy measures*', EUR 30077 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-10615-9, doi:10.2760/34219, JRC119788. https://publications.jrc.ec.europa.eu/repository/handle/JRC119788

[33] Hernandez Rodriguez, E. 'Technological diversification throughout global value chains: The role of interregional value chain linkages in European regions.' Presented at CONCORDi 2023.

[34] Salamone, S., Truglia, F., Cusimano, S. 'Potential of S3 specialisation areas on spillover effect and contribution to digital and green transition.' Presented at CONCORDi 2023.

[35] Sbardella, A., Consoli, D., Perruchas, F., Pugliese, E., Napolitano, L., Barbieri, N. 'Regional technological capabilities and green opportunities in Europe.' Presented at CONCORDi 2023.

[36] Palazzolo, A., Magerman, G. 'Bringing supply chains back home: effects on regional inequalities in the EU.' Presented at CONCORDi 2023.

[37] Frattini, F., Bontadini, F., Colantone, I. 'Green industrialization and local job multipliers.' Presented at CONCORDi 2023.

[38] Jaccoud, F., Ciarli, T., Petit, F., Savona, M. 'Technological cycles and labor markets: Evidence from European regions.' Presented at CONCORDi 2023.

[39] Teruel, M., Amaral-Garcia, S., Bauer, P., Coad, A., Domnick, C., Harasztosi, P., Pál, R. (2023) 'Productivity and HGEs: resilience and recovery from the COVID-19 pandemic.' *Industry and Innovation*, 30:7, 895-918, DOI: *10.1080/13662716.2023.2236565*

[40] Frattini, F. Bontadini, F., Colantone, I., Vona, F. 'Green industrialization and local job multipliers.' Presented at CONCORDi 2023.

[41] Cicerone, G., Faggian, A., Montresor, S., Rentocchini, F. (2023) 'Regional artificial intelligence and the geography of environmental technologies: does local AI knowledge help regional green-tech specialization?' *Regional Studies*, 57:2, 330-343, DOI: *10.1080/00343404.2022.2092610*

[42] Montresor, S., Vezzani, A. 'Digital technologies and eco-innovation. Evidence of the twin transition from Italian firms.' *Industry and Innovation*, 30:7, 766-800, DOI: *10.1080/13662716.2023.2213179*

[43] Calza, E., Papazoglou, M., Torrecillas Jodar, J., Vàquez-Prada Baillet, M., Lopez Cobo, M., de Prato, G. 'Linking digital and industrial transformation: an analysis of the advanced manufacturing ecosystem through the lens of strategic autonomy.' Presented at CONCORDi 2023.

[44] Balland, P. A., Broekel, T., Diodato, D., Giuliani, E., Hausmann, R., O'Clery, N., & Rigby, D. (2022). The new paradigm of economic complexity. Research Policy, 51(8), 104568

[45] Roberts H. (2023) 'From risk to resilience.' *Foreign Affairs*, Published by the Council on Foreign Relations. November/December 2003, Vol. 102, No. 6. pp. 123-133. New York (USA), 24 October 2023.

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