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Industrial Innovation and Dynamics for competitive sustainability

EU Industrial R&D Investment Scoreboard, Complexity analysis & CONFERENCE on COrporate R&D and Innovation (CONCORDI)

INTRODUCTION

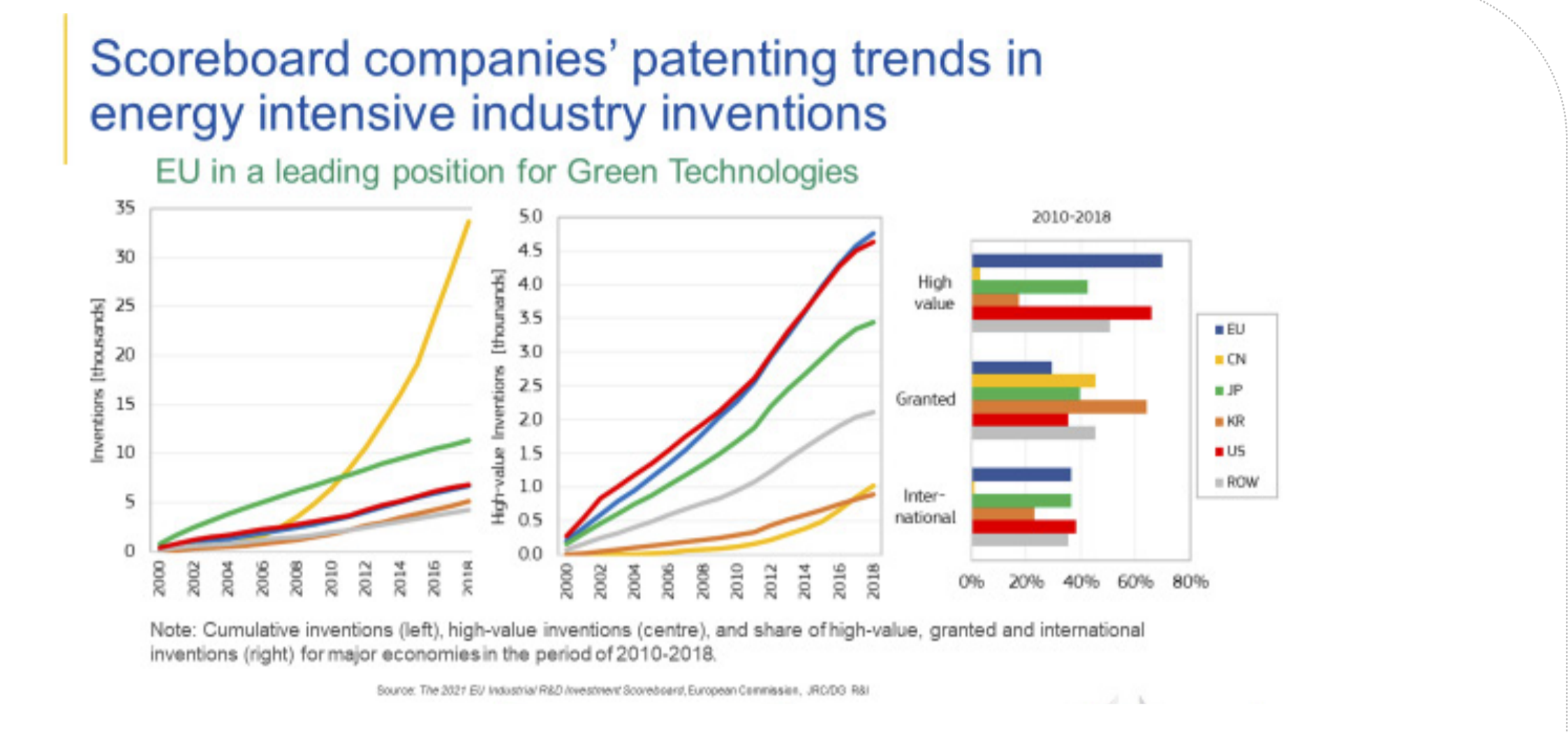
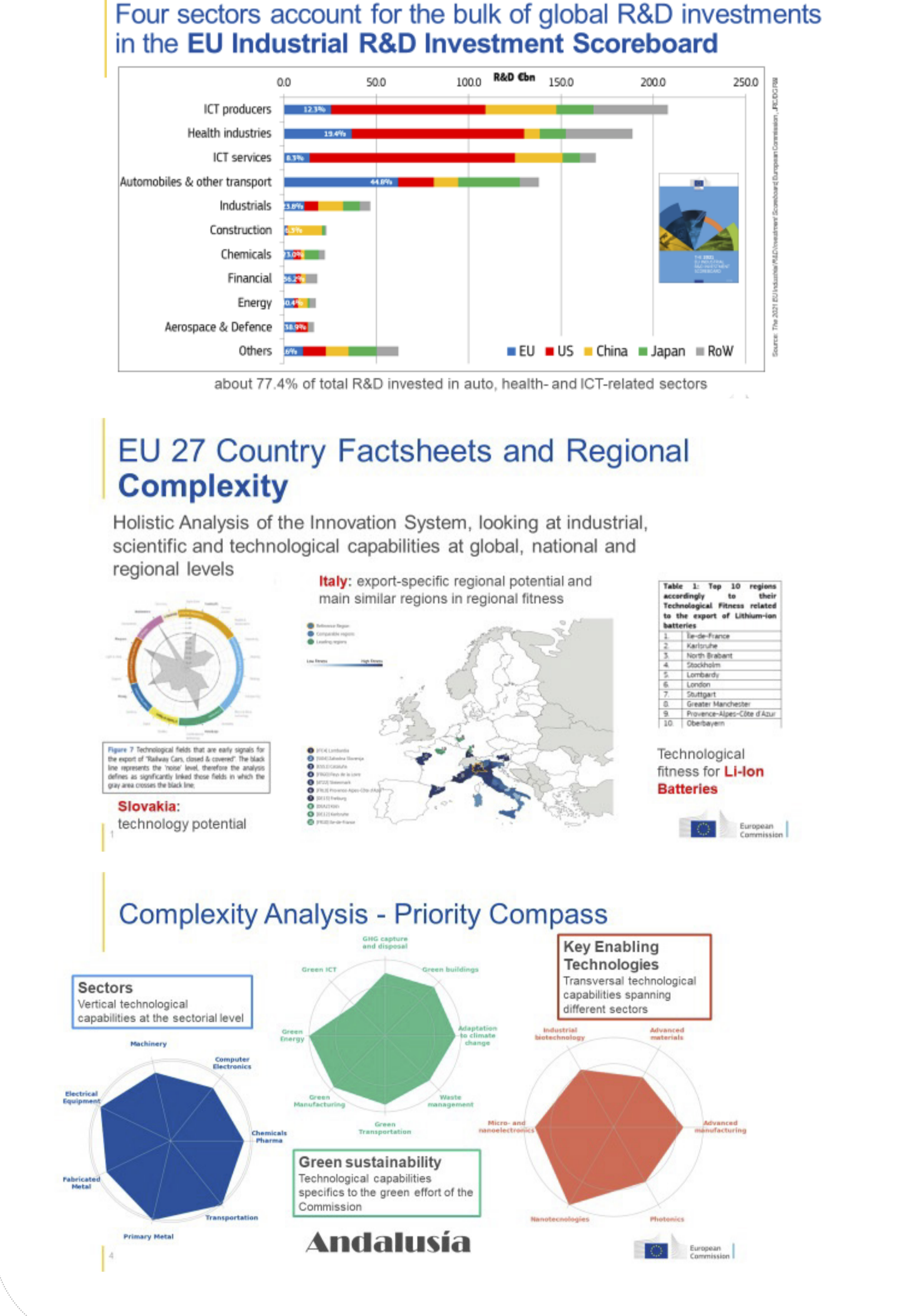
Industrial Innovation and Dynamics for competitive sustainability

The **industrial capacity of the EU** needs to remain globally competitive and resilient while achieving the twin green/digital transition and technological sovereignty-based Open Strategic Autonomy. EU policies require deep understanding of trends and driving of state-of-the-art technological innovation, fostering the emergence of new markets and businesses, protecting the environment, improving microeconomic efficiency and macroeconomic outcomes. Competitive sustainability links the EU Green Deal agenda and industrial transformation to the global reality of industrial competitiveness.

The **primary scope of the work** is multisectoral, internationally-comparative monitoring and analyses, based on a wide range of (mainly) firm-level micro data sets. Subordinate to this primary approach is the **focus on specific technological or sectoral** (industrial ecosystem) domains. A wide range of quantitative (statistical) analysis, qualitative analyses, case studies, cross-case analysis, expert workshops is used.

- Main results showcased by **three lines of activities**:
- Scoreboard and sustainability: top R&D investors, green patents / SDGs**
 Based on the most recently available financial reports of the top 2500 and EU-1000 firms, the JRC produces together with DG-Research & Innovation* the **EU Industrial R&D Investment Scoreboards** show the main trends and drivers of private R&D representing approximately 90% of global private-funded R&D. The 2021 edition addressed COVID-19-related policy concerns, esp. with the observation of negative (-2.2%) R&D growth in the EU compared to positive trends in main competitors (US +9.1% and China +18.1%). The trends are enriched with technology-relevant granularity and dedicated chapters on key green technologies (elaborated with JRC.7) and SDG orientation give additional insight to the Green Deal policy agenda.
 - Complexity and green innovation opportunities:** Economic Fitness and Complexity tackle the complexity of Economics systems by describing economics as an evolutionary process of globally interconnected ecosystems using recent development in **complex and dynamical systems and deep learning**. The framework, allowing the connection between scientific, technological and industrial activities in a natural way, gives the opportunity of impacting several cross-cutting themes. In the activities of the group we inform innovation and industrial policy at the regional and national level, looking both at economic growth and green sustainability.
 - CONCORDI conference series:** the scientific "Conference on COrporate R&D & Innovation" is organised biennially since 2007 by the JRC Seville. CONCORDI provides a unique forum for researchers to present scientific evidence and analysis linked to the EU policy agenda, and for discussions with industry and public policy stakeholders. It brings together the best scientists and policymakers in the field to shape a shared research agenda, maximizing impact on both policy-making and scientific research. The 2021 edition – organised in association with EARTO, the OECD and UNIDO - focussed on competitive sustainability. The **2023 edition will be on Innovation in the Open Strategic Autonomy context**.

RESULTS



Scoreboard corporate R&D investors and SDGs

- Own firm-level key performance indicators on SDG disclosure & reputation behavior
- SDG practices of the top R&D investors have improved over 2016-2020
- EU and Japanese companies globally leading in SDG performance. EU strength in Energy & Chemicals and Japan in ICT & Transport
- US and RoW more heterogeneous performance with strength in Construction (US) and Financials (RoW), and China lagging but improving in ICT producers and Energy
- In Energy intensive industries, higher R&D is associated with higher SDG scores, esp. SDG 7 (affordable and clean energy), SDG 8 (decent work and economic growth) and SDG 15 (life on land)

CONCORDI 2023 – Industrial innovation to foster the European Open Strategic Autonomy

Topics to focus

- Industrial innovation to alleviate the **vulnerability** and reinforce **technological sovereignty in strategic sectors**
- Industrial innovation in **critical technologies** and for the reduction of **strategic dependencies** for a better twin transition
- Identification of the **territorial opportunities** related to the industrial innovation relevant for the Open Strategic Autonomy
- Deep tech companies** in the prominent **deep tech fields**

Enabling factors

- Leadership in science / knowledge production
- Strong industrial base, entrepreneurship / start-up and scale-up ecosystems
- Ambitious innovation targets for solutions to key societal challenges (e.g. environment, health)
- Appropriate framework in the European internal market – also including financial and fiscal – conditions conducive to innovation

Why a science & policy conference?

These topics and factors **need more/better scientific-evidence** able to interconnect them to **give appropriate support to EU policy-making**

Main EU policies to support

EU industrial and innovation policies

See: <https://iri.jrc.ec.europa.eu/concordi-2021>

CONCLUSIONS

The EU Industrial R&D Investment Scoreboard and green patents / SDGs

Past 2500 Scoreboard's companies invested €908.9bn in R&D, **6.0% more than in 2019**, slightly less than previously (9.2%), and most other financial indicators negative due to the pandemic. Companies based in the US and China showed the largest R&D growth (9.1% and 18.1% respectively). This is not surprising since the **US has a large proportion of ICT and Health companies that were not affected by the pandemic and China has a particularly large share of ICT companies**, exacerbating the global tech race. In contrast, EU companies R&D investment fell by 2.2% which broke the positive trend observed over the past years (6.0% increase in the prior year). There are 401 companies from the EU, 779 from the US, 597 from China and 293 from Japan. Comparing the 2016 and the 2021 Scoreboards, the **increased presence of high-tech companies, mainly from China**, which comes at the expense of more traditional sectors, mainly from the EU and Japan.

The **EU remains among the leaders in green high-value patents technology and for green patents in energy intensive industries**, which reflects its transformation towards climate neutrality. **Firm-level indicators on SDG-orientation** (disclosure & reputation) of Scoreboard firms show increasing commitment, esp. on SDG 7 (energy), 8 (decent work) and 15 (life on land). SDG practices of the top R&D investors have improved over 2016-2020, with **EU and Japanese companies globally leading in SDG performance**. EU companies show strength in Energy & Chemicals, and Japanese in ICT & Transport, whereas US and Rest of the World (RoW) more heterogeneous performance with strength in Construction (US) and Financials (RoW), and China lagging but improving in ICT producers and Energy.

Complexity analysis to identify green opportunities

The activities of the group provided an in-depth information on innovation and industrial policy, with directionality in mind: green targets, industrial targets, innovation targets, are computed in a comparable way to give policy makers an holistic view of the capabilities of national and regional innovation systems. **Country-level forecasts for each EU-27 Member State** are provided at the national level GDP growth, as well as product level progression probability up to regional level technological capabilities. This allows us to provide each region and country with detailed product-level information on opportunities and barriers in different export markets. **Relative technological capabilities of regions** (example of Andalucía above) show technological capabilities with respect to advanced manufacturing sectors (in blue), green objectives (in green) and transversal Key Enabling Technologies (in red). Inner circle represents average tech capabilities of the region.

The green complexity analysis suggests that **regions specialised in green domains, irrespective of their complexity, have a higher propensity to develop technologies connected with green technologies**. Green technologies are linked mostly to technologies related to the production or transformation of materials; with engines and pumps; and with construction methods. The regions with the highest Green Potential are not necessarily those with the highest Green Fitness. The results suggest that there is a **potential for green and non-green technological advances to generate positive spillovers in terms of capabilities to produce innovations across the spectrum of technological complexity**. We used this output to inform policy with respect to very heterogeneous goals from international trade relationship to EU dependence in strategic markets, from market opportunities in different export markets at the regional level to estimate the feasibility of the green targets of regions.

The European Conference on Corporate R&D and Innovation highlights from the 2021 edition on 'competitive sustainability':

- Public policies have a critical role to play** to stimulate the necessary investments in low-carbon energy sources and production processes across the economy. This requires a comprehensive set of policy instruments – a "green industrial and innovation strategy" – including ambitious technology support, infrastructure planning, pollution pricing, regulatory standards and public procurement.
- More effort is needed from companies in **gender balance**, which can also leverage the twin transition.
- Strengthen and secure an easy access to state-of-the-art technology infrastructure through the **collaboration of companies with other research & innovation actors** at local level.
- Support **young and innovative companies** to foster the growth potential of new ideas, particularly in strategic sectors. Increase collaboration and support programmes among developed and developing countries in environmental and socio-economic Sustainable Development Goals.
- Continue to **invest in people's education and skills**, re-skilling and re-training, particularly in skills needed for hybrid (mix of remote and office-based) work.
- Industrial innovation policy needs to be transformative**, including new directions in objectives and investments, co-creation, a "whole government" approach and anticipation of future change.

ACKNOWLEDGEMENTS

More information can be found here:
<https://iri.jrc.ec.europa.eu/home/>

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