

Innovating our way to net-zero

Research and Innovation (R&I)

pathways for the energy transition

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**RFF
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European Institute
on Economics
and the Environment



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The European Union is strongly committed to reaching a zero carbon economy by mid-century: deep transformations are required in all sectors and regions. Research and innovation (R&I) investments and policies play a crucial role in the development and successful uptake of the clean technologies necessary for the transition. This presentation touches upon four topics.

- The **EU strategy towards zero-carbon economy**, and ways to implement it
- Study on the **value of R&I investments** in key non-mature technologies: CCS, advanced biofuels and batteries for electric vehicles
- Insights on the **ability of different policy instruments to promote innovation** in countries at different level of specialization in renewable innovation
- R&I investments for **socio-economic research and social innovation**.

EU strategy towards zero-carbon economy

2020 climate and energy package: a set of binding legislation for three key targets by **2020**:

- **20%** cut in greenhouse gas emissions (from 1990 levels)
- **20%** of EU energy from renewables
- **20%** improvement in energy efficiency

2030 climate and energy framework: EU-wide targets and policy objectives for the period from 2021 to **2030**:

- **At least 40%** cuts in greenhouse gas emissions (from 1990 levels)
- **At least 32%** share for renewable energy
- **At least 32.5%** improvement in energy efficiency

Current policies to achieve emissions reductions will have to be strengthened to achieve 2030 targets: EU emissions trading system (EU-ETS), National short terms and long-term strategies, Innovation and financing



EU strategy towards zero-carbon economy

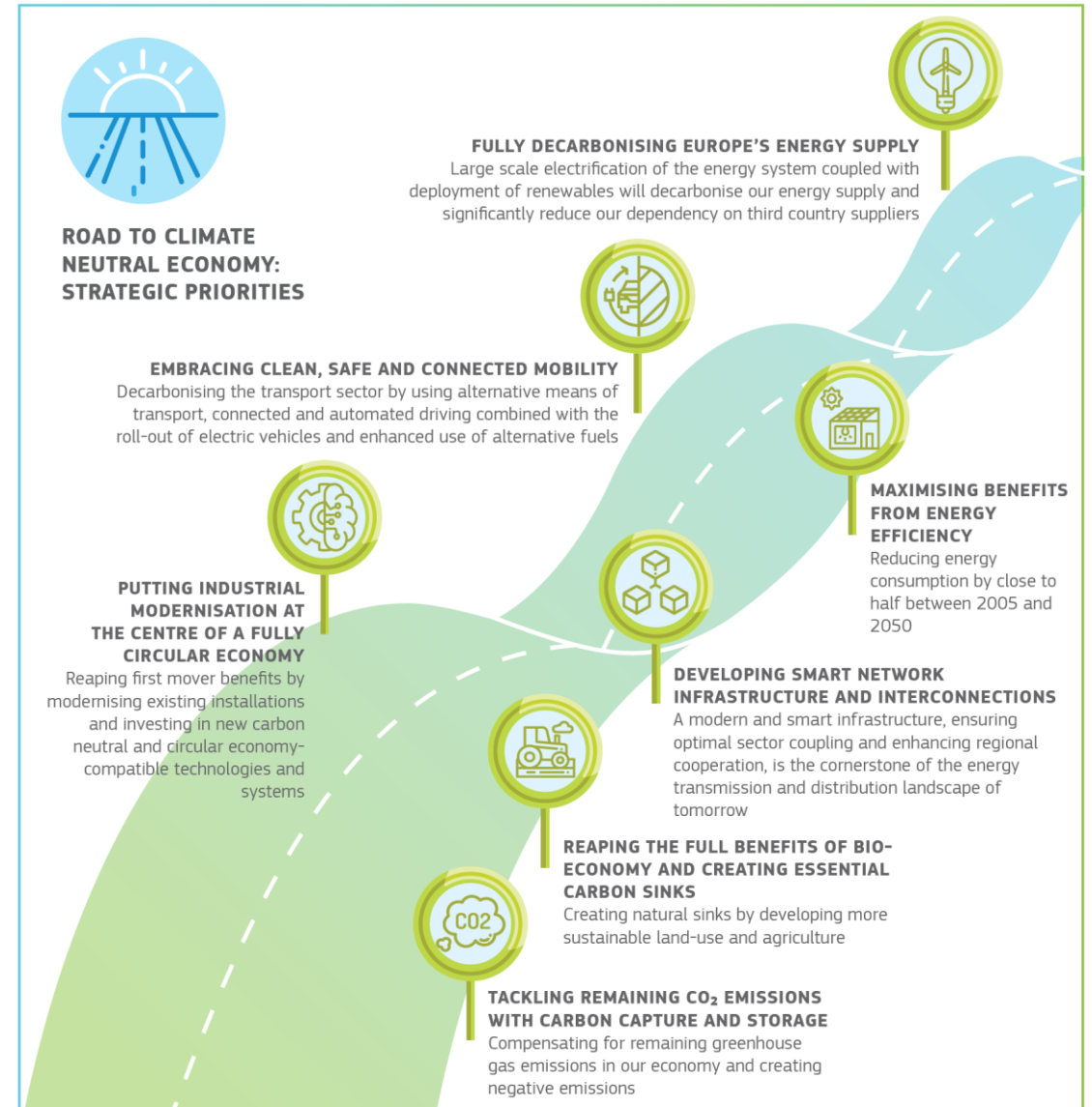
2050 long-term strategy

(Nov 2018) the EU Commission calls for a **carbon-neutral EU by 2050**. Key aspects:

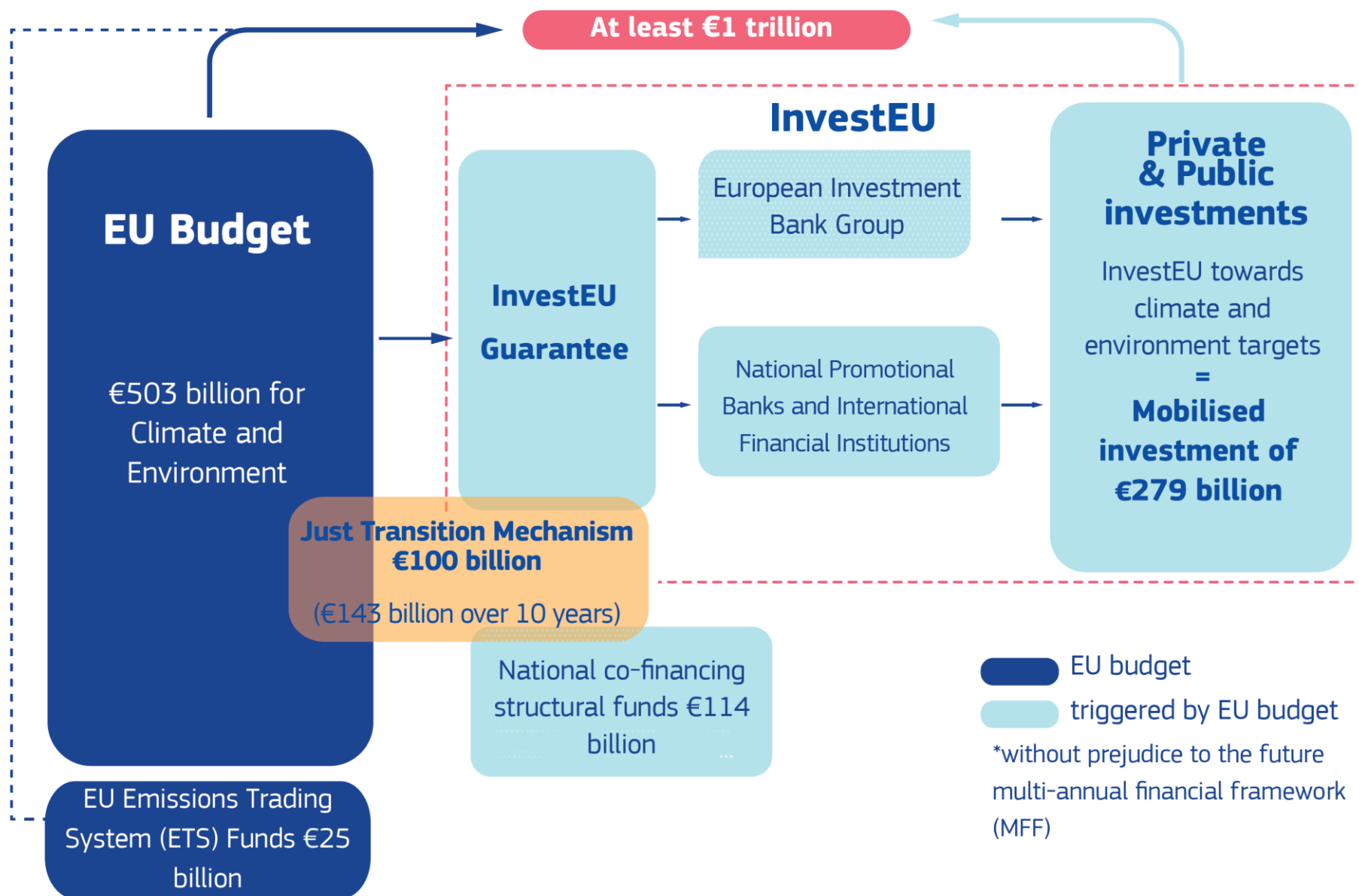
- Economic transition
- Industrial transition
- Societal transition (“Just Transition”)

EU Green deal

“a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use”



EU strategy towards zero-carbon economy

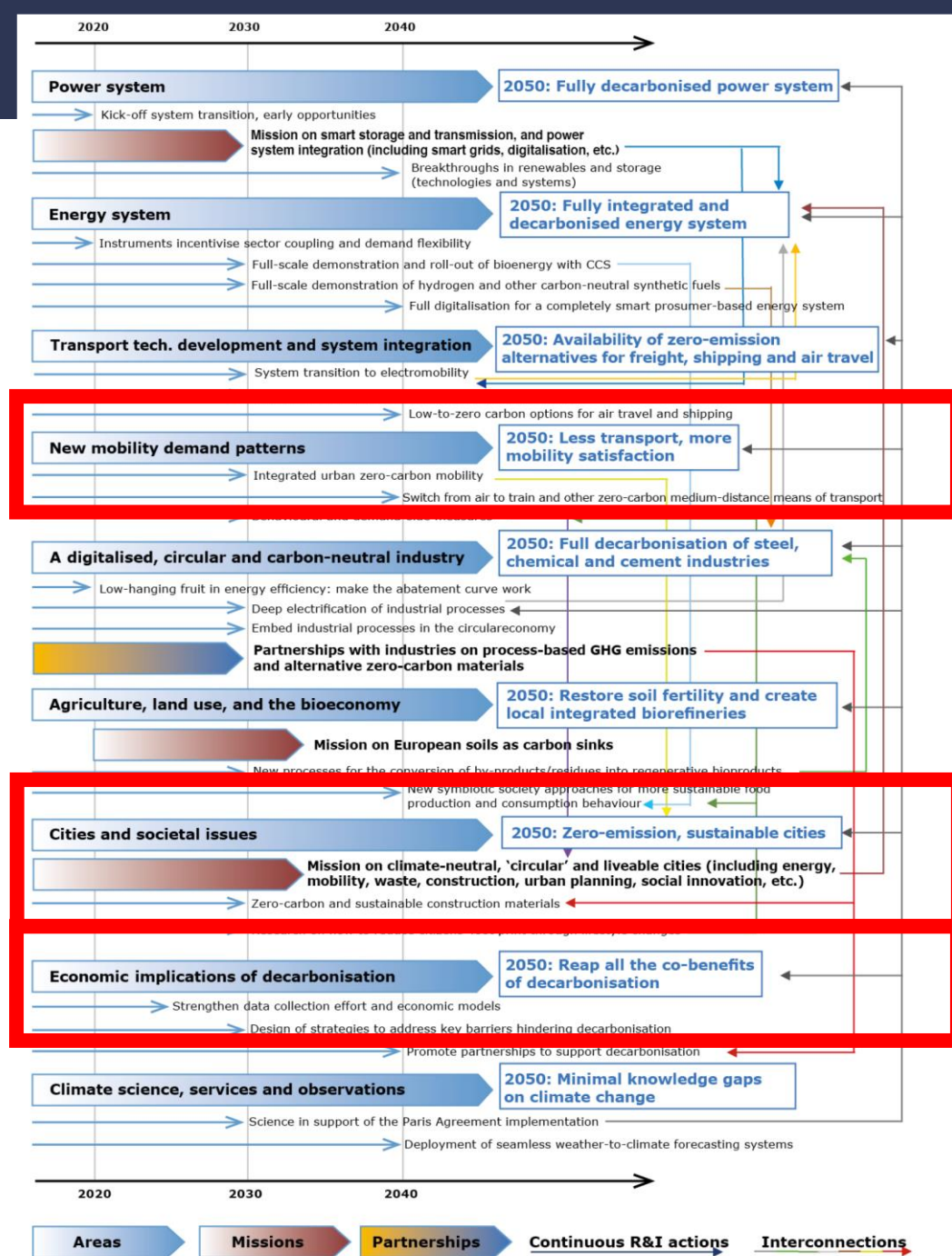
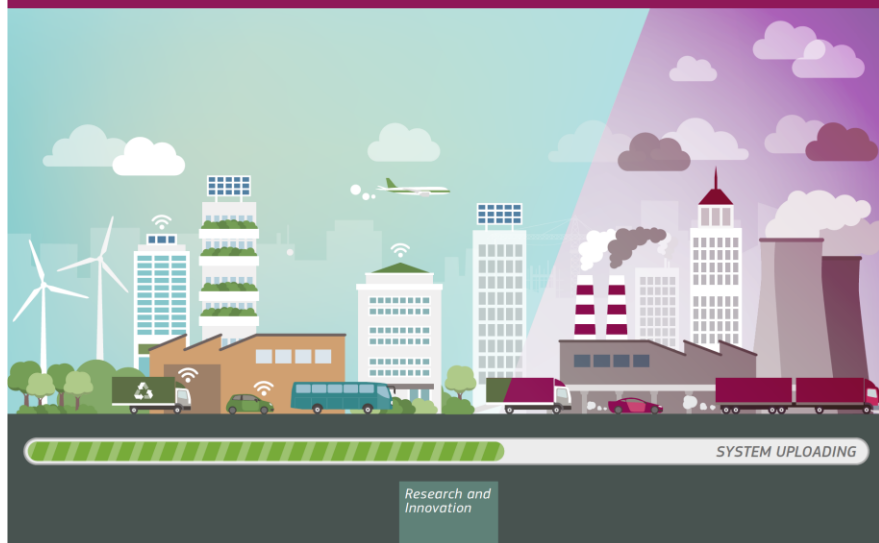


R&I pathways

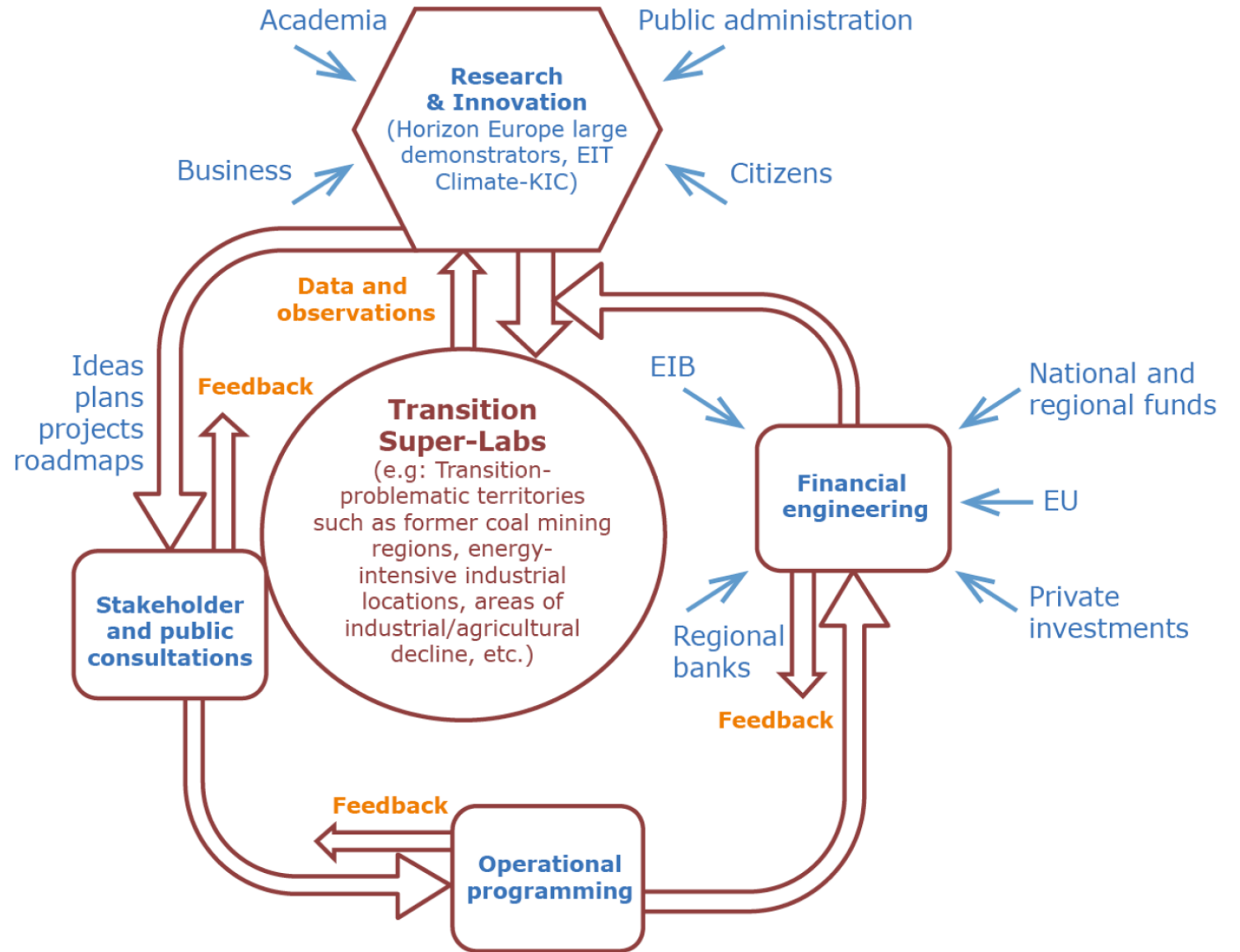
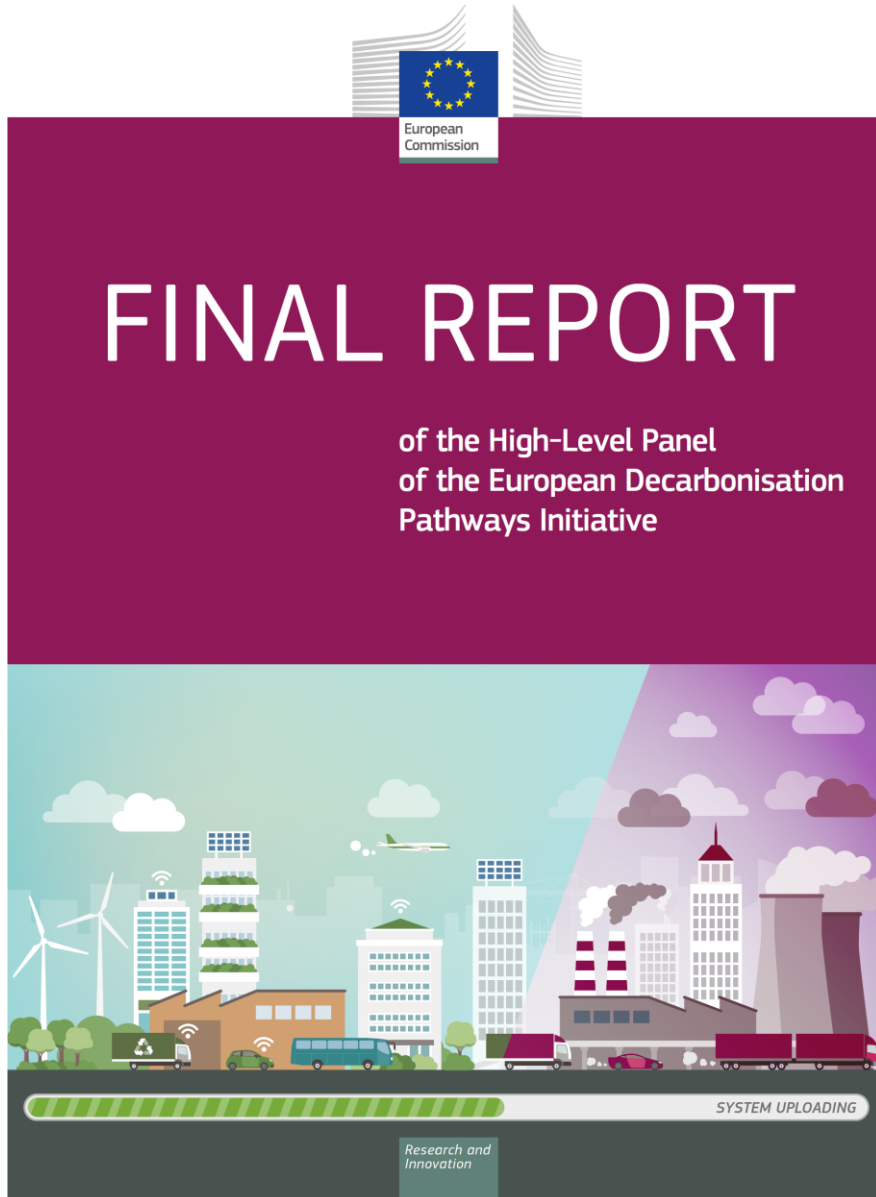


FINAL REPORT

of the High-Level Panel
of the European Decarbonisation
Pathways Initiative



R&I pathways





Mission

to improve **environmental, energy and natural resource decisions** through **impartial economic research** and **policy engagement**



A transatlantic partnership between two leading international research institutes **on economics, climate and the environment**



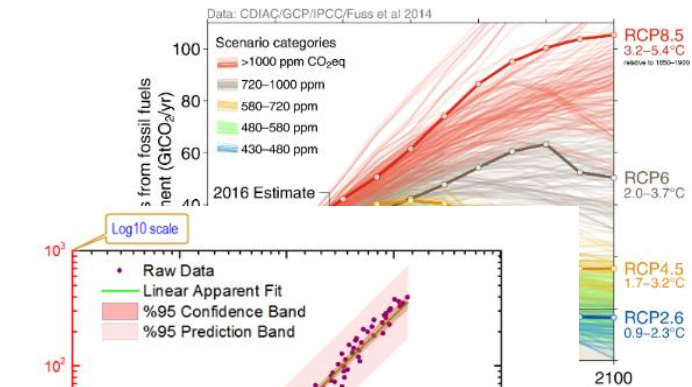
Key insights from EIEE's research



Integrated Assessment Models and low-carbon scenarios

Econometrics and data science

Experimental and behavioral economics



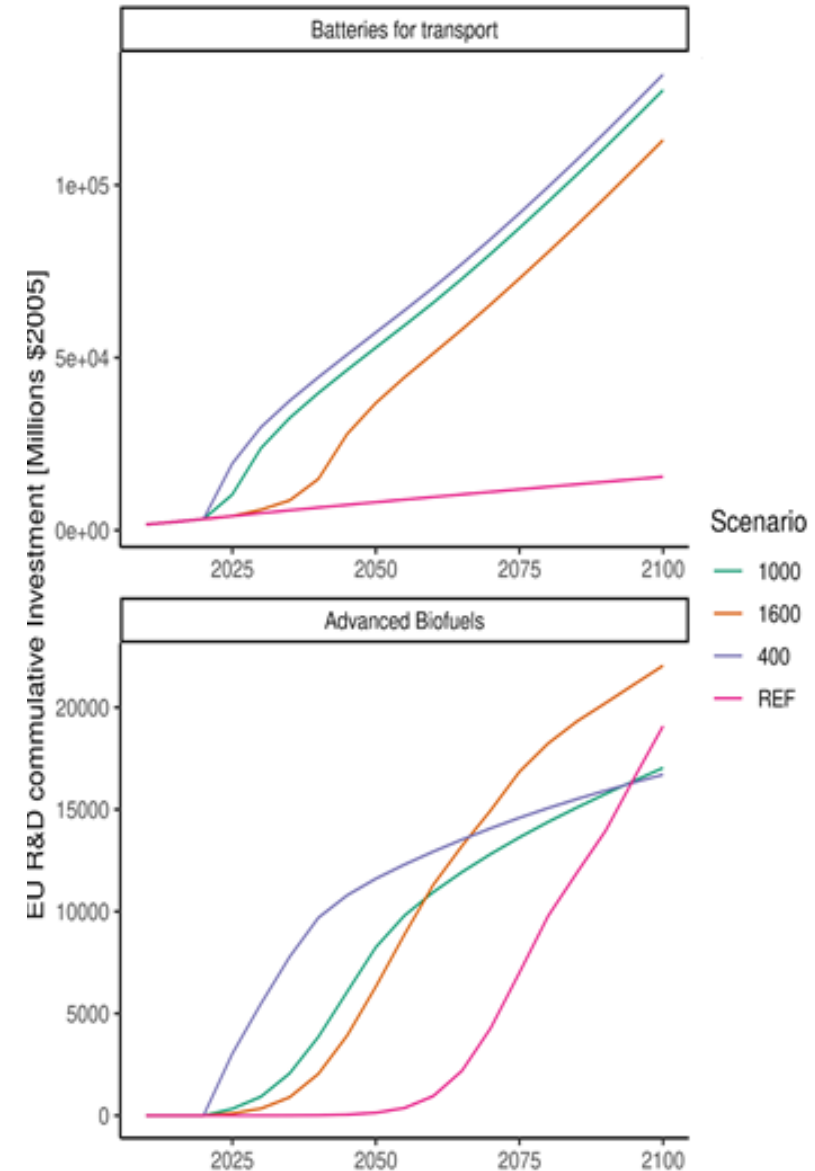
Macro-economic implications of R&I investments

Study of **optimal R&I investments** in biofuels, batteries and CCS

To reach 2° target, EU needs to invest rump up investment starting from about 2025 (compared to **REF scenario**)

To reach 1.5° target, EU needs to also start investing sooner

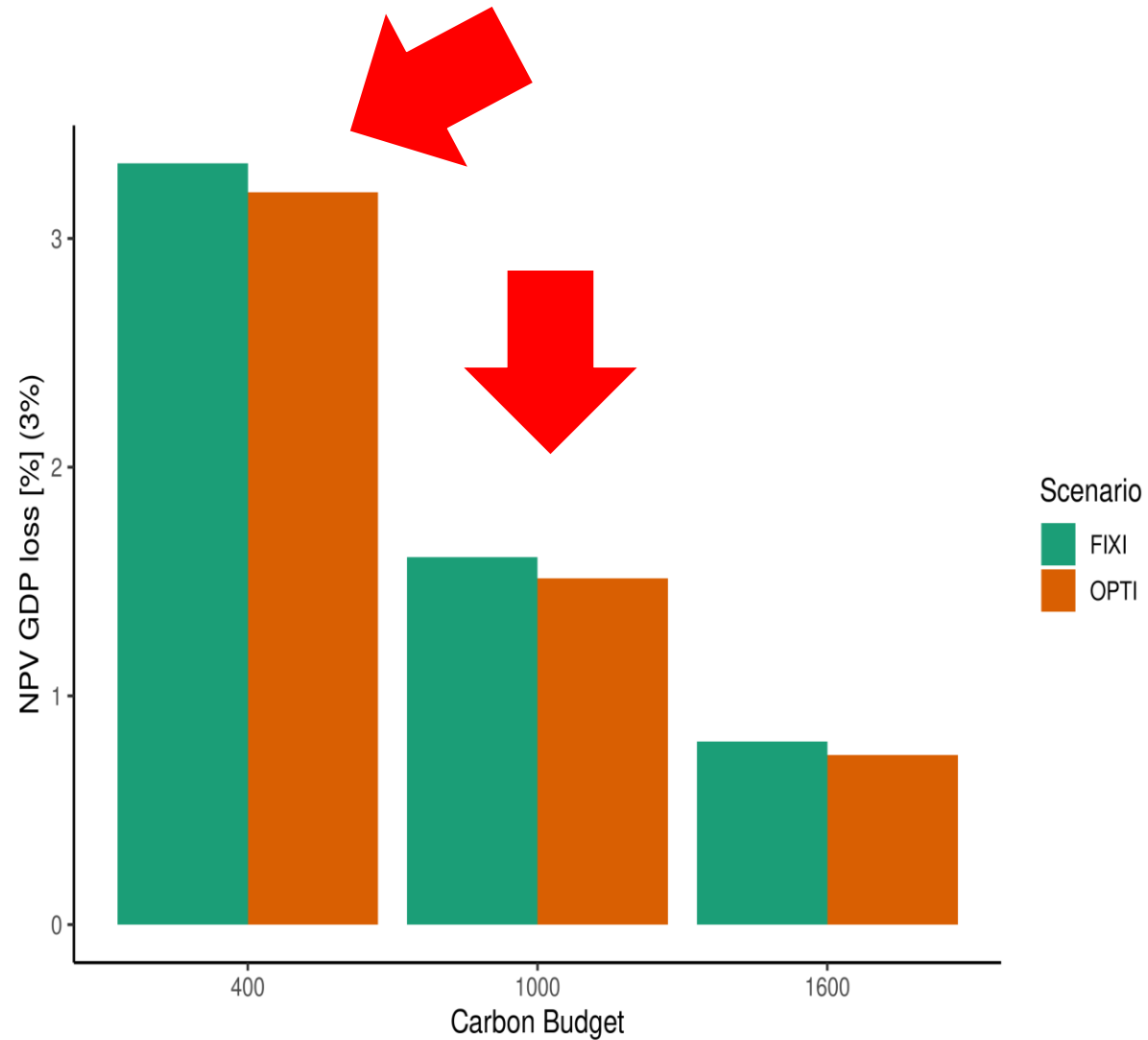
This implies an urgent requirement for policies and governance that enables investments of such magnitude



Macro-economic implications of R&I investments

The **cost** of mitigation for the **1.5° C** target is **roughly double** that of the **2° C** target

→ Such **costs** can be lowered through optimal **R&I investment policies**



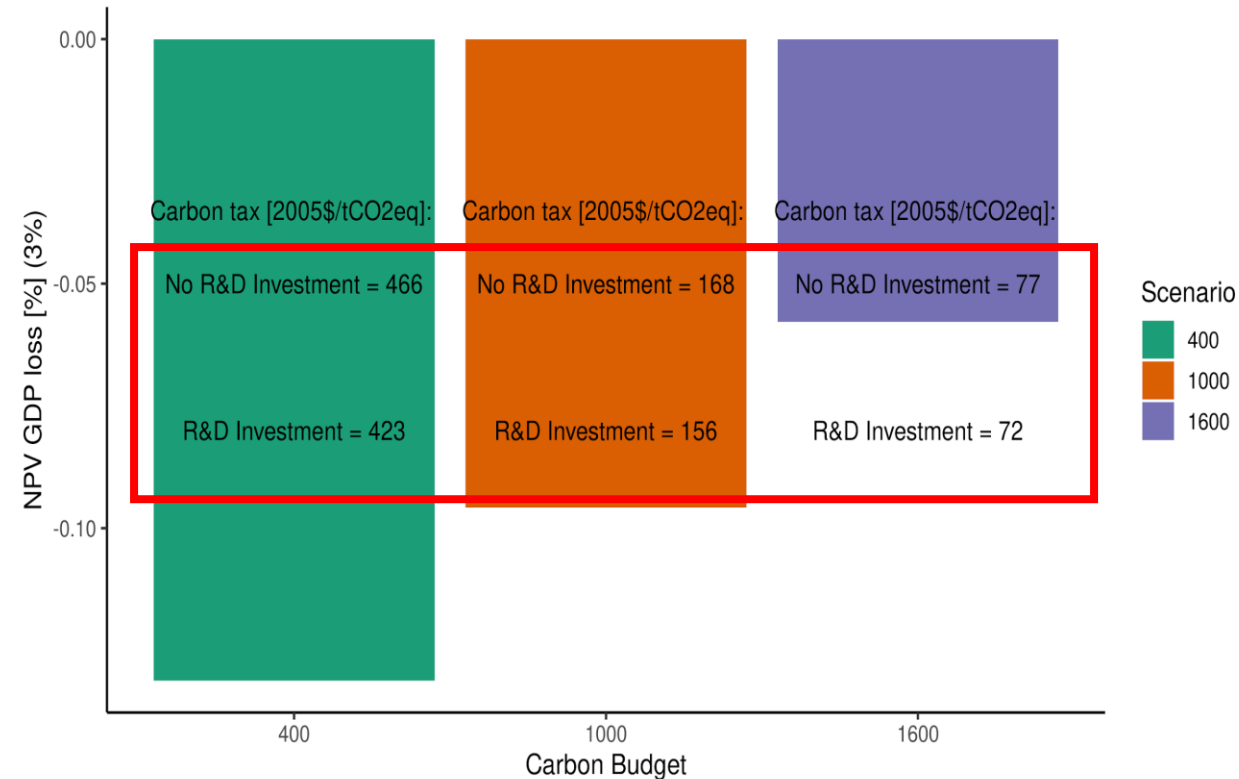
Macro-economic implications of R&I investments

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→ Such **costs** can be lowered through optimal **R&I investment policies**

The **carbon prices** is **lower** under **optimal R&I investment**.

Optimal R&I strategies increase the feasibility of ambitious climate stabilization targets: costs of mitigation decreases, even if EU is the only region undertaking R&I investments



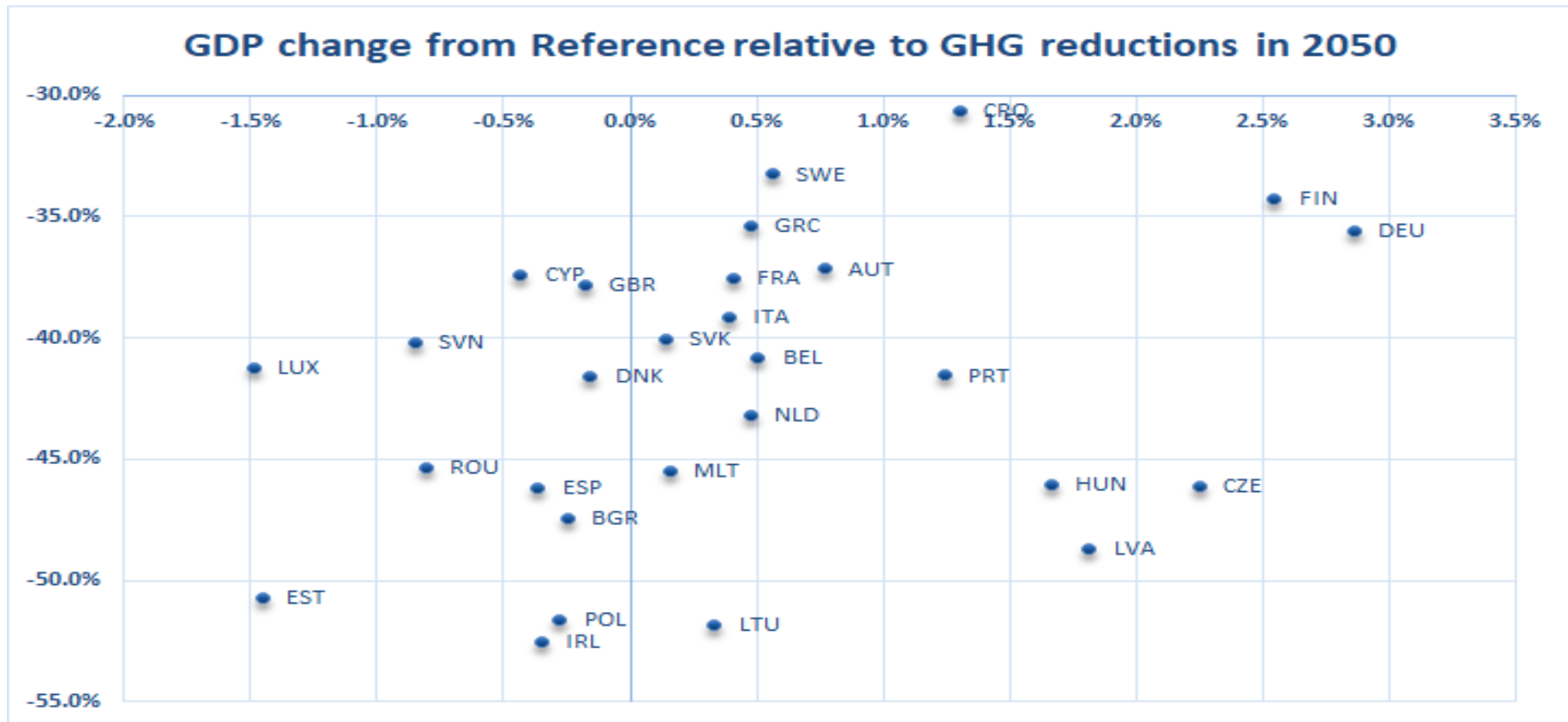
GDP in 2050: 1% - 2.5% higher if optimal R&I



Macro-economic implications of R&I investments

Optimal R&I expenditure can be financed through carbon tax revenues use of carbon tax revenues (1% - 8%). (!) But overtime diminishing carbon tax revenues

Yet, not all countries can achieve the same gains



Policy instruments to promote innovation

Environmental policies other than R&I investment generate incentive for innovation (NB: in addition emission reduction)

Yet, it is widely known that **not all policy instruments are equally effective** in promoting innovation for the low- and zero-carbon transition (market-based versus command-and-control)

We show that the ability of different policy instrument to promote innovation depends on **the relative innovative capability/specialization of a given country** (renewables as opposed to fossil innovation)

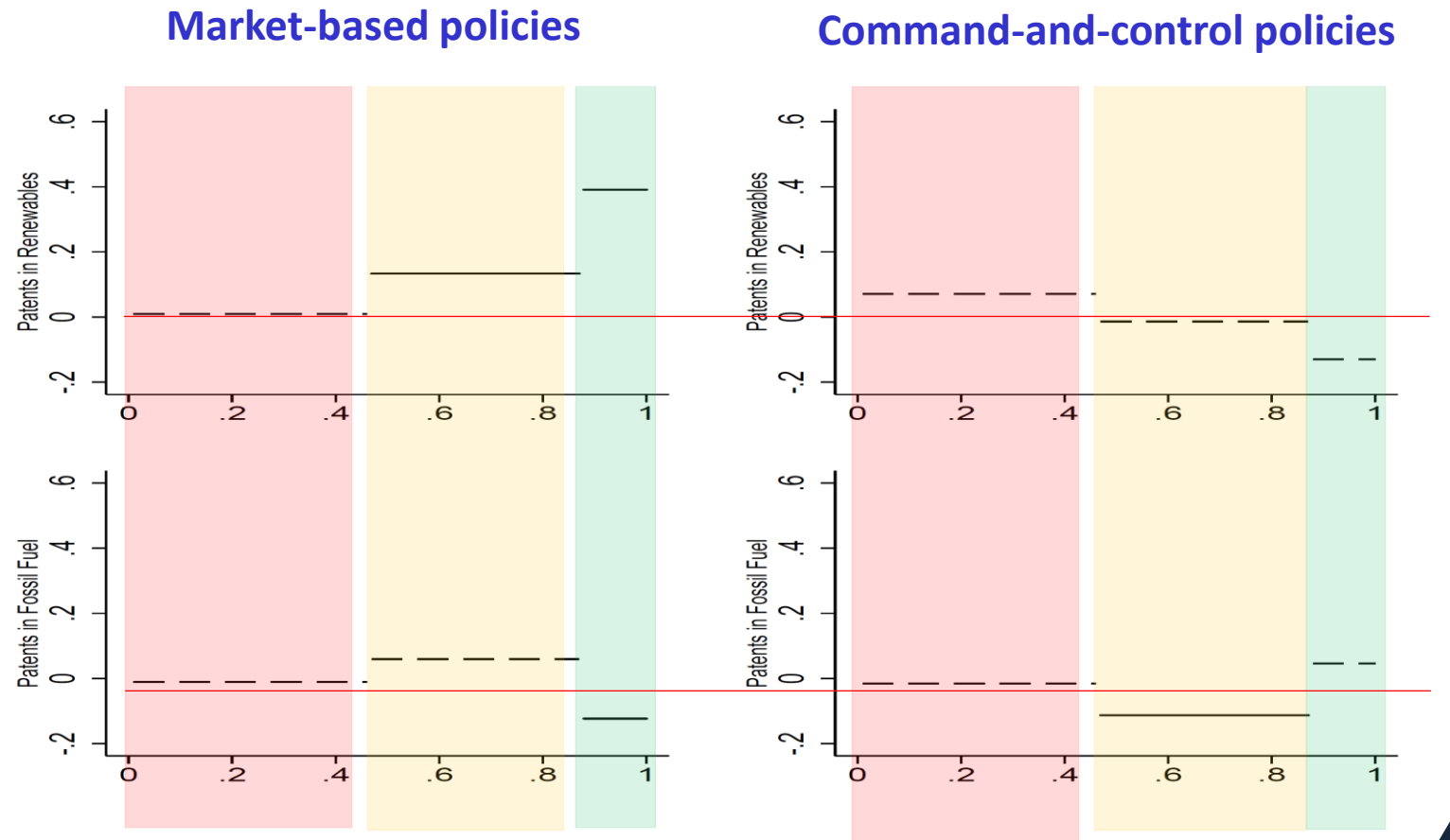


Policy instruments to promote innovation

1st regime: No policy instrument is effective in promoting innovation. “Laggard” countries should invest in R&D first to build competences

2nd regime: market based policies are successful at promoting renewable innovation, command-and-control at depressing fossil innovation. A policy mix required in the crucial phase

3rd regime: market-based policies very effective to promote innovation. These instruments can be used to reinforce a green advantage when competencies are high



Back to the future: EU strategy towards zero-carbon economy

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The EU Green Deal requires a JUST TRANSITION

→ **Crucial to understand the impacts of different policy instruments on key societal outcomes including competitiveness, distribution of wealth, access to resources, trade patterns, demand for skills**



Conclusions

Innovating our way to net-zero: effective way to reduce the costs associated with climate mitigation

Innovation investments should be coupled with the appropriate combination of climate policies (command-and-control and market-based) to provide even greater incentives for innovation

The zero-carbon transition is not only about bringing to the market new technologies, rather it is about **radically changing financial flows which support a carbon intensive society**, as well as **social and inclusive innovation to change lifestyles**



Thank you for your attention

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