Green Windows of Opportunity Latecomer development in the age of transformations toward sustainability

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Background

- The green transformation of the global economy is underway and accelerating.
- The green transformation is a major techno-economic paradigm shift, and compared to earlier paradigm shifts, greening is more deliberate and directed.
- **A big questions arises:**

What does the green transformation mean

for latecomer development?

It could increase entry barriers making latecomer development more difficult, but it may also open windows of opportunity.

Research questions

- Is the green transformation opening new latecomer development opportunities?
- What are the conditions and dynamics of green latecomer development?
- Do we need a new conceptual framework to understand the determinants of green latecomer development?

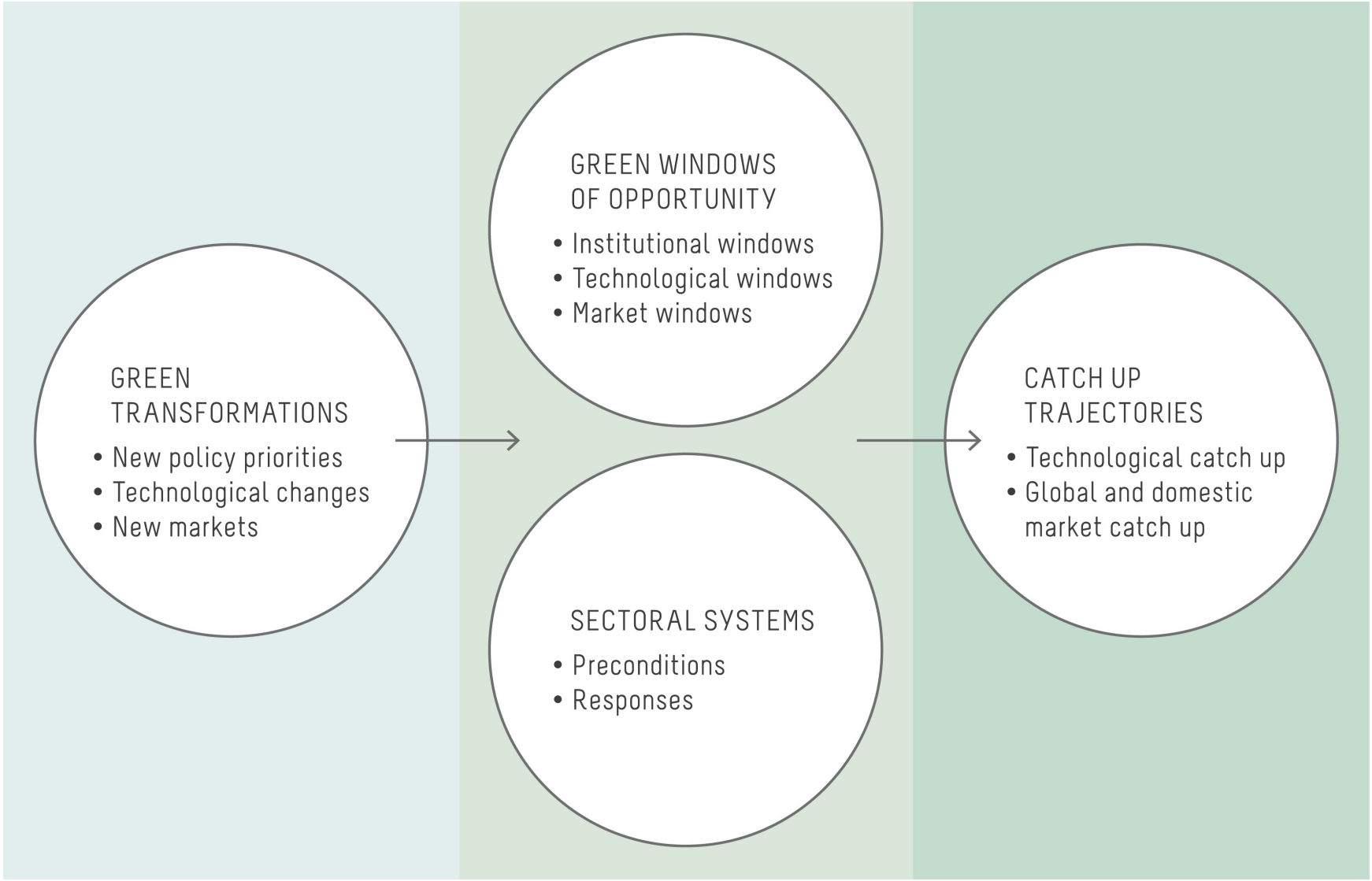
Why a new framework?

- Other frameworks for the analysis of low carbon technologies are mainly concerned with the development and deployment of such technologies, rarely situating the discussion in the context of latecomer development;
- Existing frameworks on latecomer development do not focus on the green economy;

Latecomer economies should from the outset develop differently rather than catch up along established pathways

NO: grow first and clean up later model!

GWO framework



1. Green Windows of opportunities

2. Sectoral system of production and innovation: preconditions and responses of public and private actors

3. Catch up trajectories resulting from the interactions of GWO with stakeholders' actions

Empirical evidence

- Combining qualitative sectoral case studies with quantitative analysis (patents and simulation models): case studies on China renewable energies (Biomass, CSP, Solar PV, Wind, Hydropower) published in Lema, Fu & Rabellotti (*Industrial and Corporate Change*, 2020)

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Green windows of opportunity: latecomer development in the age of transformation toward sustainability

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UNCTAD

- New countries and new industries (i.e. green hydrogen and EVs) for UNCTAD 2023 Technology and Innovation Report on **Green windows of opportunity: Innovation that is good for people and the planet**

Green windows of opportunity

- GWO are mainly endogenous, and can be created by governments and influenced by domestic and global environmental and industrial policies;
- This is different from previous catch up processes in industries such as cell phones or steel production in which windows of opportunity are predominantly exogeneous, created by technological or market changes.
- Examples from China are:
  - 2006 Renewable Energy Promotion Law;
  - Golden Sun Demonstration Program;
  - Ride the Wind Program.

Sectoral systems: preconditions & responses

- The exploitation of GWO depends on the existing preconditions and on the responses of firms and other public and private actors;
  - There are countries with sufficient and appropriate public and private sector preconditions, but with no strategic response to seize GWOs.
  - Other countries have high green strategic intent and provide strong responses, but they have a weak pre-existing supply base in the relevant sectors.
- Technological maturity and tradability of green technologies significantly affect sectoral trajectories.

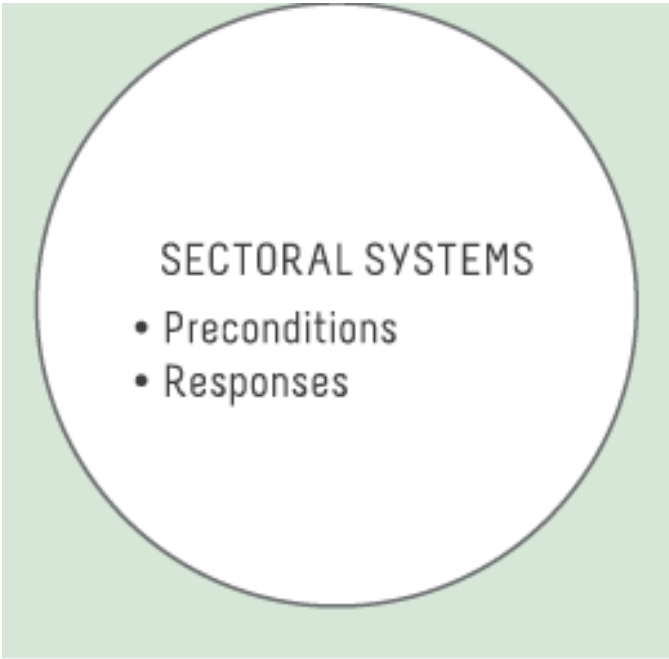
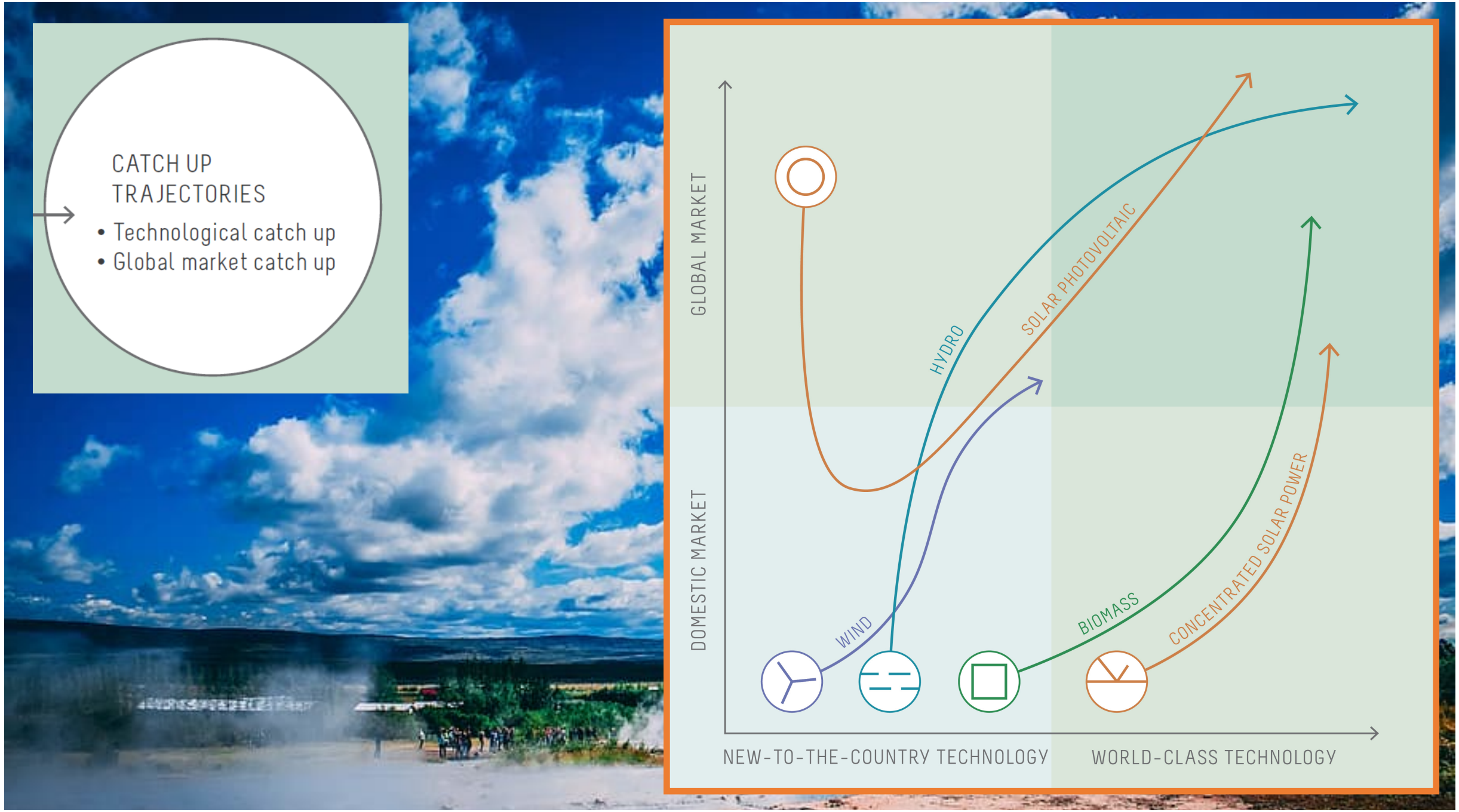


Table 4: Seizing green windows of opportunity: four scenarios and some examples

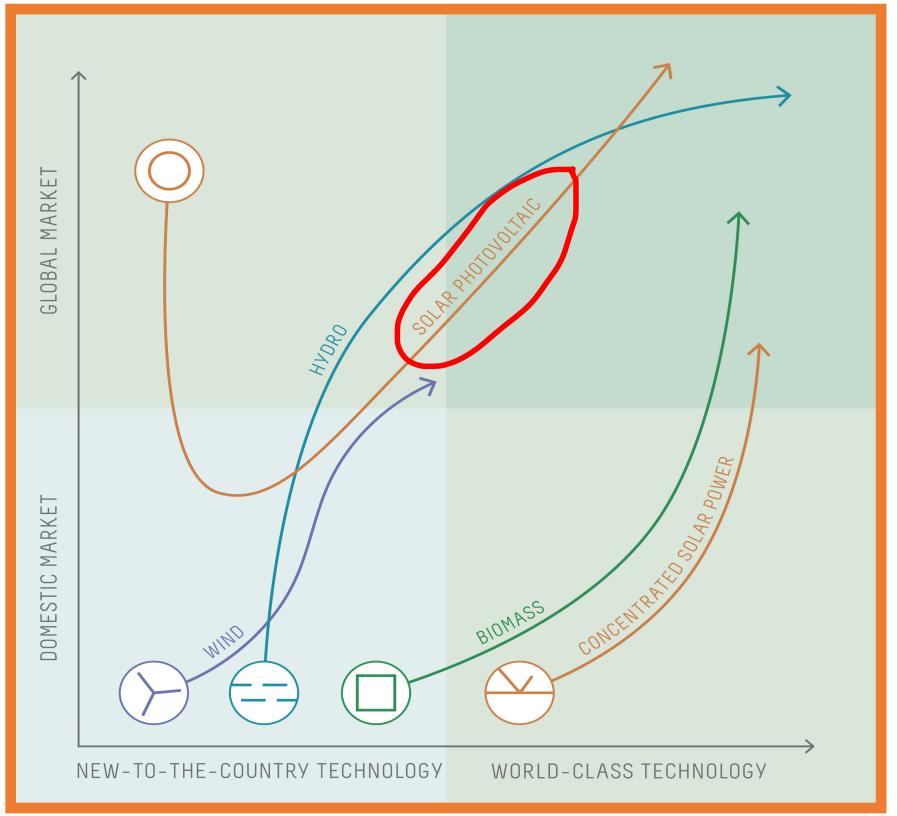
Responses / Preconditions	Strong	Weak
Strong	**Scenario 1: Effective GWO seizing** Solar PV, Biomass, CSP: China Bioethanol: Brazil Hydrogen: Chile (potentially)	**Scenario 2: Missed opportunity** Solar PV: India Biogas: Bangladesh CSP: Morocco Wind: China
Weak	**Scenario 3: Active approach** Biomass: Thailand and Vietnam Hydrogen: Namibia	**Scenario 4: Distant opportunity** Wind: Kenya Bioenergy: Mexico and Pakistan

- **Solar PV – Mature and highly tradable technology**
  - **China**: Acquisition of world class technology combined with capital investments and building of organizational capabilities.
  - **India:** Missed opportunity with the solar mission.
- **Biomass - Mature and low tradable technology**
  - **Thailand**: Active approach with limited initial knowledge and strong policy response.
- **CSP – Immature and low tradable technology**
  - **Morocco**: Missed opportunity with international projects.
  - **China:** Effective seizing of GWO with R&D demonstration projects and alignment of actors.


CATCH UP
TRAJECTORIES
• Technological catch up
• Global market catch up
GLOBAL MARKET
DOMESTIC MARKET
HYDRO
SOLAR PHOTOVOLTAIC
WIND
BIOMASS
CONCENTRATED SOLAR POWER
NEW-TO-THE-COUNTRY TECHNOLOGY
WORLD-CLASS TECHNOLOGY

The Chinese solar PV trajectory: From learning from exporting to domestic strengthening and then to market and technological global leadership

- Solar PV started in the global market exporting solar panels made with imported technology, so learning from export.
- After a fall in global demand, Chinese companies substituted the international demand with domestic demand thanks to the incentives created by public policy.
- Huge investments in building domestic technological capacity and domestic capacity in the whole solar value chain.
- Chinese companies went back to international markets as technological and market leaders.



Key takeaways

- New *green windows of opportunities* are opened by institutional (policy) changes;
- The seizing GWOs depends on the country's preconditions and the response patterns of public and private actors;
- There is significant variability in catch up trajectories at the sector and country level;
- Tradability and technological maturity are key in explaining the variability of the trajectories;
- In mature sectors such as biomass or solar PV, readily available technologies can provide a relatively fast track to the boosting of economic activities.
- Newer technologies such as green hydrogen, CSP, or EVs are more demanding in terms of new technological capabilities and require significant investments in R&D and innovation system development.

Policy implications

- Policymakers need to **co-design policies** in otherwise distinct domains: environmental and energy policies as well as industrial and innovation policies.
- **Calibration, coordination and prioritization** of policy instruments and the timing of interventions can deeply influence the industrialization outcomes.
- Support policies **need sector-specific approaches** and **sequencing.**
- International organizations and national governments can **sustain institutional change-led, mission-oriented GWOs**, facilitating the entry in the global market of new champions in the green economy and expanding the diversity of green pathways.


Thank You!
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