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

Roberta Rabellotti

University of Pavia - Italy

roberta.rabellotti@unipv.it

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Motivation of the study

- **The green transformation of the global economy is underway:** shifting discourses, changing national policy regimes, introducing new parameters driving investment decisions and business strategies.
- **The green transformation is the first industrial revolution which has a <u>deadline</u>**, explicitly steered by <u>public policy</u>, driven by economic utility functions <u>and</u> also by social value.
- **Big questions arise:** it is still uncertain what the green transformation means 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 development opportunities for latecomer countries?

- What are the conditions and the dynamics of green latecomer development?

- Do we need a new conceptual framework to understand the determinants of changes in green industry leadership?

  - Focus on **renewable energy industries in China,** combining insights from qualitative sectoral case studies with quantitative analysis (patent analysis and simulation models)

Sectoral studies

- Biomass
- Concentrated Solar Power
- Hydropower
- Solar PV
- Wind power

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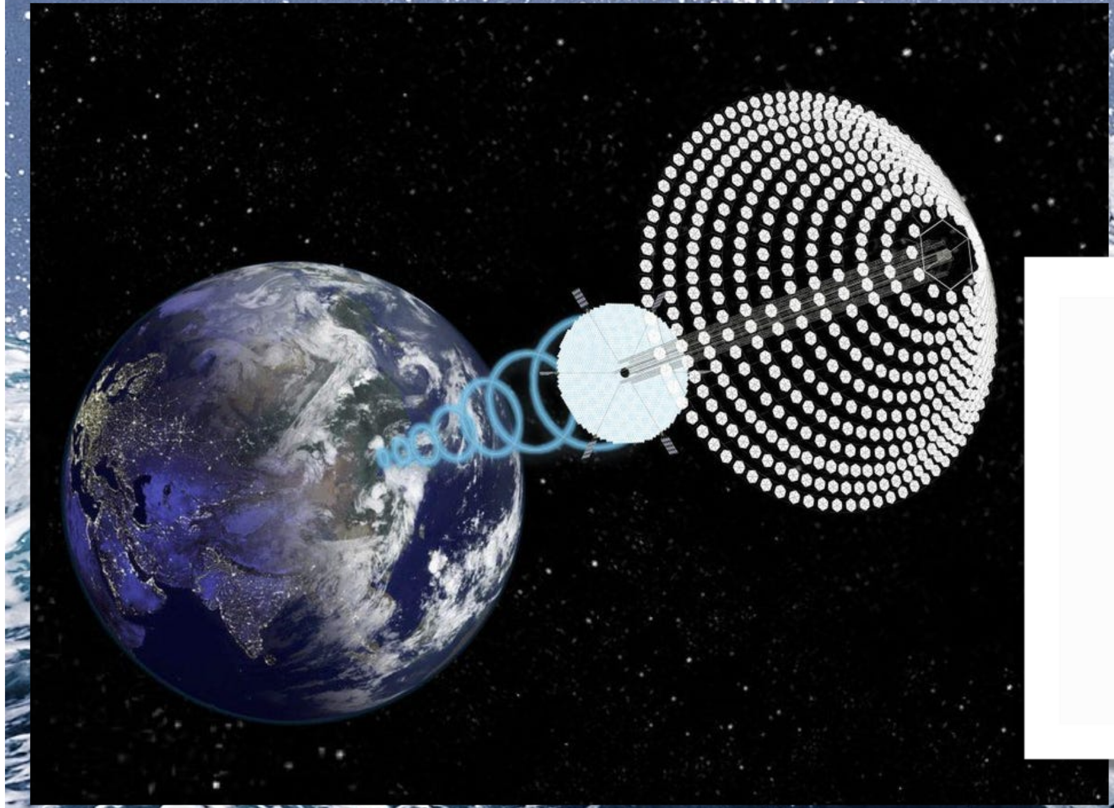

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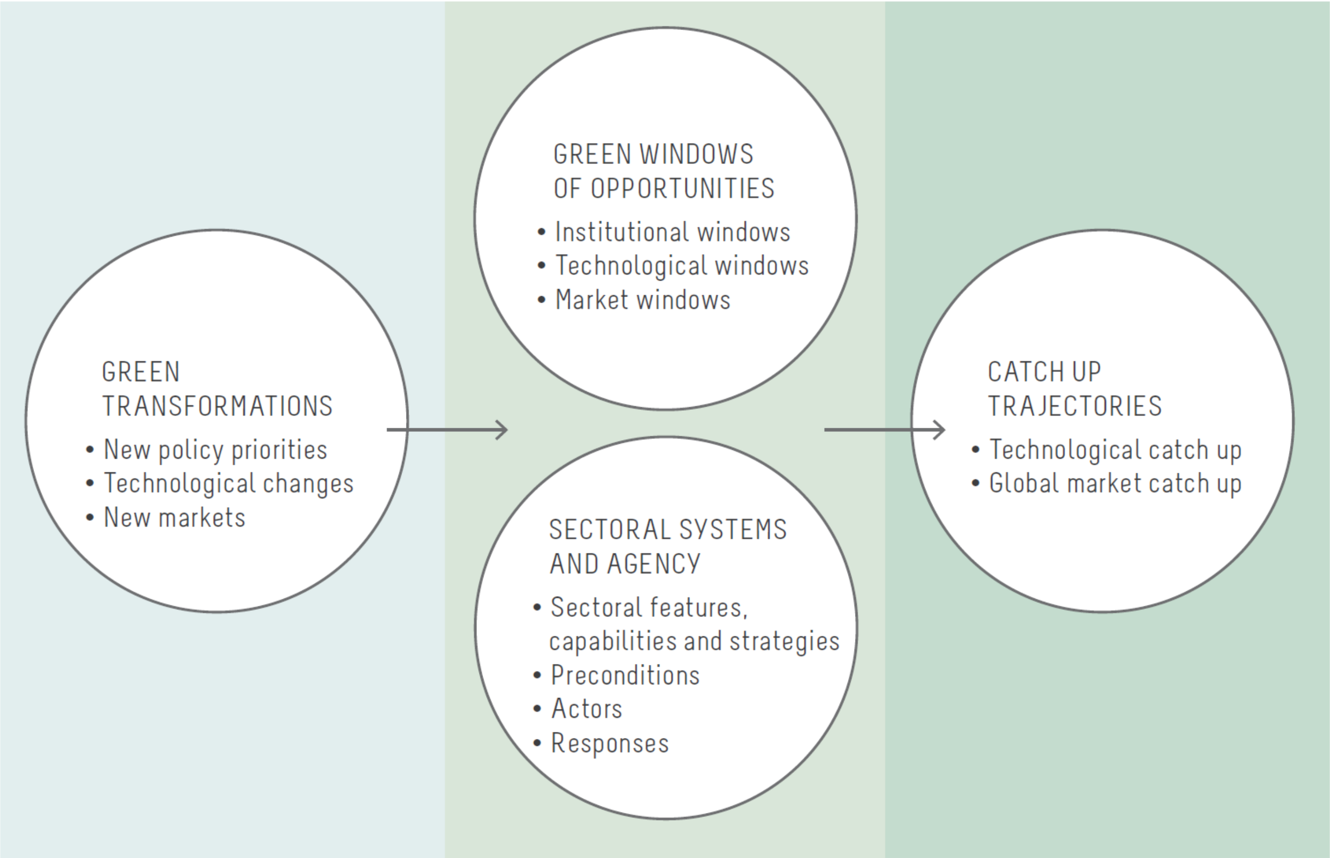
A new analytical framework



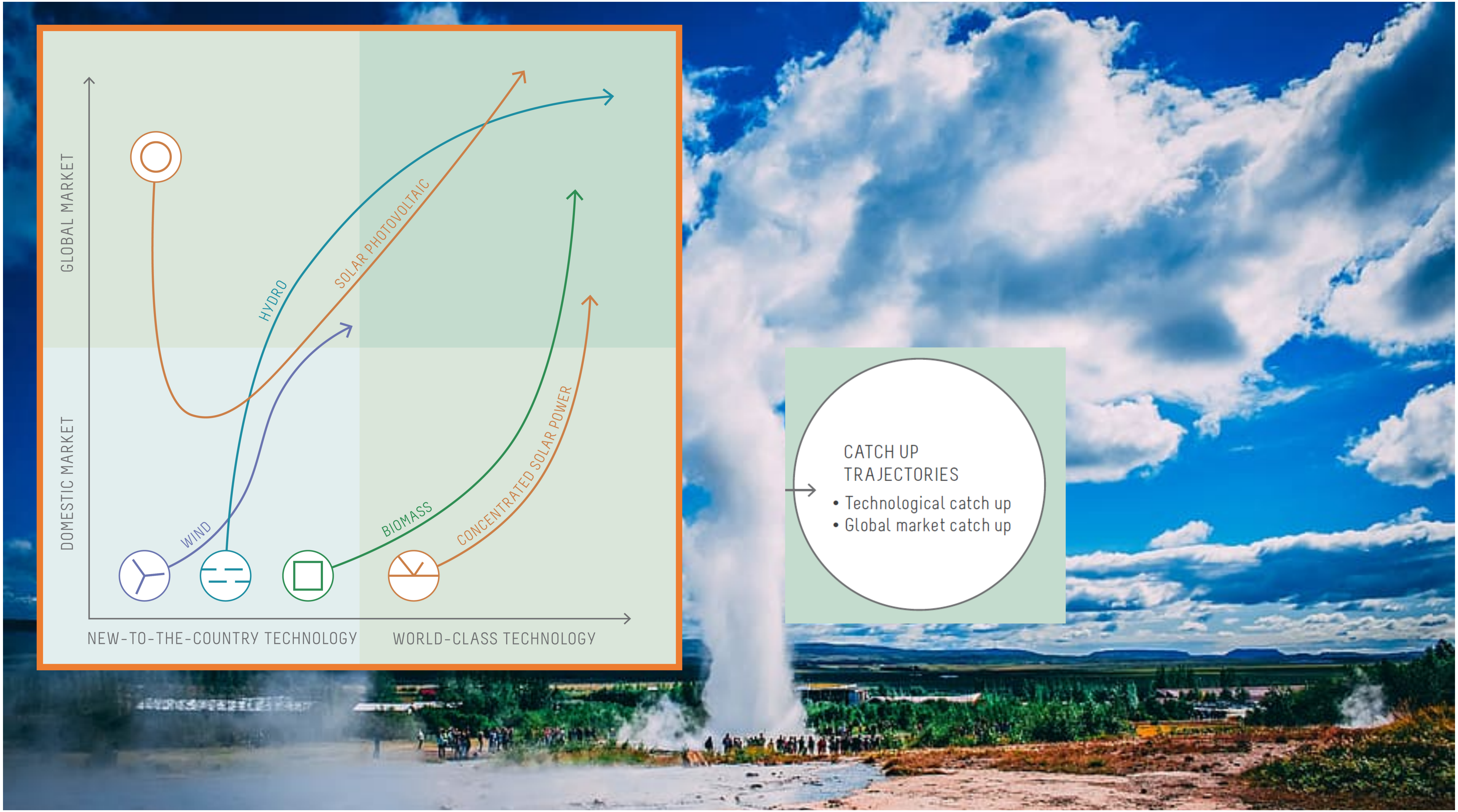
- Essential to deviate from the environmentally unfriendly pathways paved by the advanced economies of North America and Western Europe:
  - *grow first and clean up later.*
- Emerging economies should from the outset 'develop differently' rather than catch-up along established pathways.

Green windows of opportunity

- Green Windows of Opportunity (GWO) are favorable, temporary conditions for long-run latecomer catch-up;
- GWO are driven by policy changes rather than by modifications in technologies or markets:
  - 2006 Renewable Energy Promotion Law;
  - Golden Sun Demonstration Program;
  - Ride the Wind Program.
- GWO are endogenous and this implies that they 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 mobile phones or steel production in which windows of opportunity have been predominantly exogeneous.

Firms and other sectoral system actors

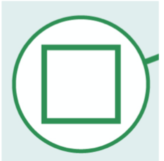
- The exploitation of GWO depends on the actions of firms and other public and private actors;
- Technological maturity and tradability of green technologies significantly affect sectoral trajectories:
  - Acquisition of world class technology combined with capital investments and organizational capabilities (biomass & solar);
  - Public R&D (hydro energy & CSP);
  - Intensiveness of the interactions among lead firms, suppliers, technology providers and financial institutions within the sectoral innovation systems (solar PV).


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

Sectoral catch-up trajectories (1)

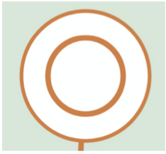
- **Domestic imitation ⇨ global leadership**
  Clear lead-firm status. Latecomer effects, using technology transfer and borrowed technology aided by state support. Stable technologies.

- **Learning from exporting ⇨ domestic strengthening ⇨ global leadership.** *Clear global leadership in production, less in technology*. Multiple iterations driven by global policy change and domestic policy and innovation system response.



Biomass

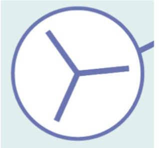
Hydropower



Solar PV

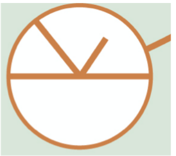
Sectoral catch-up trajectories (2)

- **Domestic imitation ⇨ limited global progression** *Technology gap and limited exports.* Technology transfer and state support. Rapidly evolving technology regimes such as new hybrid-digital technologies constrain leadership for the moment



Wind

- **World-class technology ⇨ limited global market progression.** *Technological development at the frontier*. Significant investments in domestic demonstration projects. Technological uncertainty and competing standards.



Concentrated Solar Power

Key takeaways

1. GWOs, opened by institutional changes, in particular, new policies and new legislations, related to domestically or global sustainability transformation agendas, are central to latecomer catch up in all sectoral ‘take off’ cases;

2. Emerging countries that take active measures to enhance their technological capabilities and build open national and sectoral innovation systems through trade and investment policies and internationalization of R&D may achieve faster catch-up and, even, leadership.

3. The emergence of latecomer countries in the green economy has an internationally beneficial effect by reducing the price of renewable energies and mobilizing finance and technology for more affordable green energy systems in the global South.

Policy Implications

- International organizations and national governments should sustain institutional change-led, mission oriented GWOs facilitating the entry in the global market of new green innovation leaders.
- Policy makers need to bring together, otherwise distinct, policy domains: environmental and energy policies as well as industrial and innovation policies.
- Our findings are also relevant for other sectors such as public health and digital infrastructure, critical for building an inclusive society:
  - Global policy coordination in ensuring equal access and responsible provision of global public goods (e.g. COVID vaccines) could create 'global challenge-led windows of opportunity'.
  - The global community should facilitate changes of leadership to ensure equal access to high quality, responsible, economically affordable and technologically appropriate services, products and facilities.

Implications for Italy and Europe

- EU Green Deal and Italian Recovery and Resilience Facility (60 € billions over 248 on the ecological transition);
- Italy and EU will not be able to do the ecological transition on isolation;
- It's key for firms, business associations and policy makers to know what China and other emerging countries are doing for the ecological transition. This knowledge is needed to <u>cooperate, negotiate and compete </u>with the other key players in the global market.

Thank You!

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