



Green Windows of Opportunity

Latecomer development in the age of transformations toward sustainability

Rasmus Lema (University of Aalborg - Denmark)

&

Roberta Rabbellotti (University of Pavia - Italy)



AALBORG UNIVERSITY
DENMARK

Background

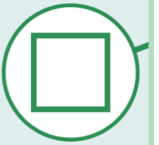
- **The green transformation of the global economy is underway:** Shifting discourses, changing national policy regimes, new parameters driving investment decisions, new business strategies etc. The trends are accelerating.
- **The green transformation is a major techno-economic paradigm shift:** Earlier paradigm shifts were driven mainly by changes in technologies and markets – but greening is driven by policy.
- **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.

Empirical studies

- Focus on experiences of renewable energy industries in China (and globally)
- Insights from combining sectoral case studies and cross-cutting analysis
- Seven articles published in a Special Section edited by [Lema, Fu & Rabellotti in *Industrial and Corporate Change*, Volume 29, Issue 5](#)

Sectoral studies

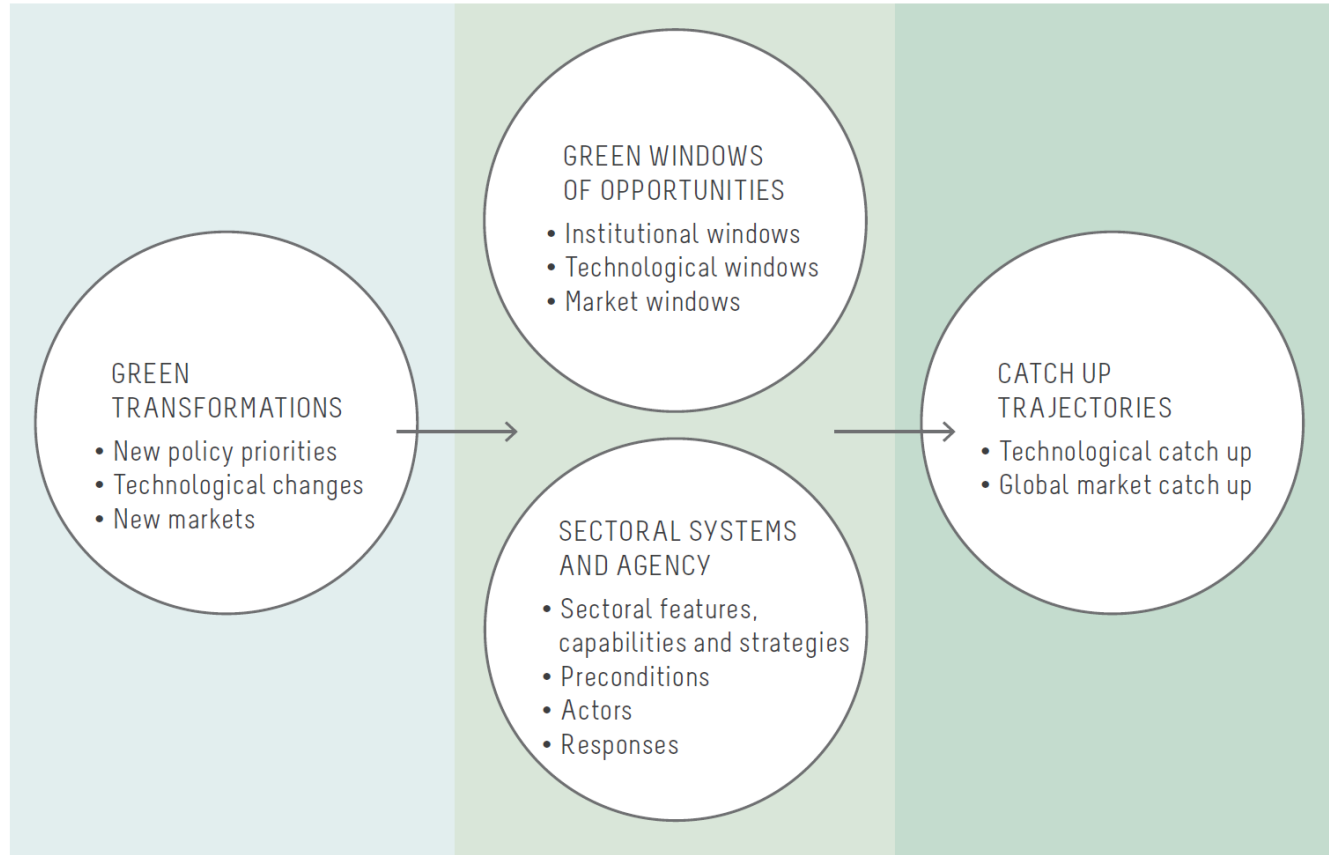
- Biomass
- Concentrated Solar Power
- Hydropower
- Solar PV
- Wind power



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?

A new analytical framework



- Essential to deviate from the environmentally unfriendly pathways paved by the advanced economies of North America and Western Europe.
- Emerging economies should from the outset ‘develop differently’ rather than catch-up along established pathways.
- The green transformation is the first industrial revolution which has a deadline, explicitly steered by public policy, driven by economic utility functions and also by social value.

Green windows of opportunity

- Green Windows of Opportunity (GWO) are a set of favorable, temporary conditions for long-run latecomer catch-up in sectors central to the green economy;
- GWO are driven by institution-cum-policy changes rather than by modifications in technologies or markets:
 - 2006 Renewable Energy Promotion Law;
 - Golden Sun Demonstration Program;
 - Ride the Wind Program.

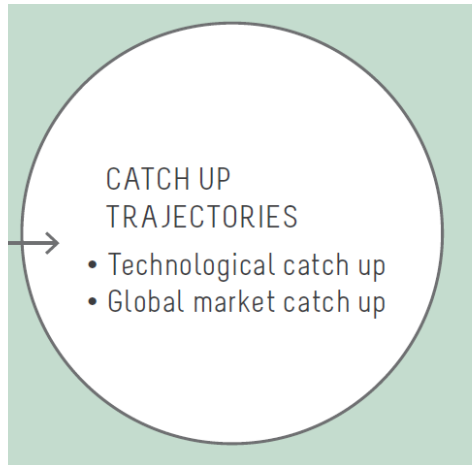


Firms and other sectoral system actors

- The exploitation of GWO depends on the actions of firms and on the sectoral innovation system;
- Technological maturity and tradability of green technologies also significantly affect sectoral trajectories.
 - Acquisition of world class technology combined with capital investments and organizational capabilities (biomass & solar);
 - Public R&D (hydro energy);
 - Interactions among lead firms, suppliers, technology providers and financial institutions within the sectoral innovation systems
 - Domestic trap and inability of the system to progress from technology absorption to technological leadership in the global market (wind).

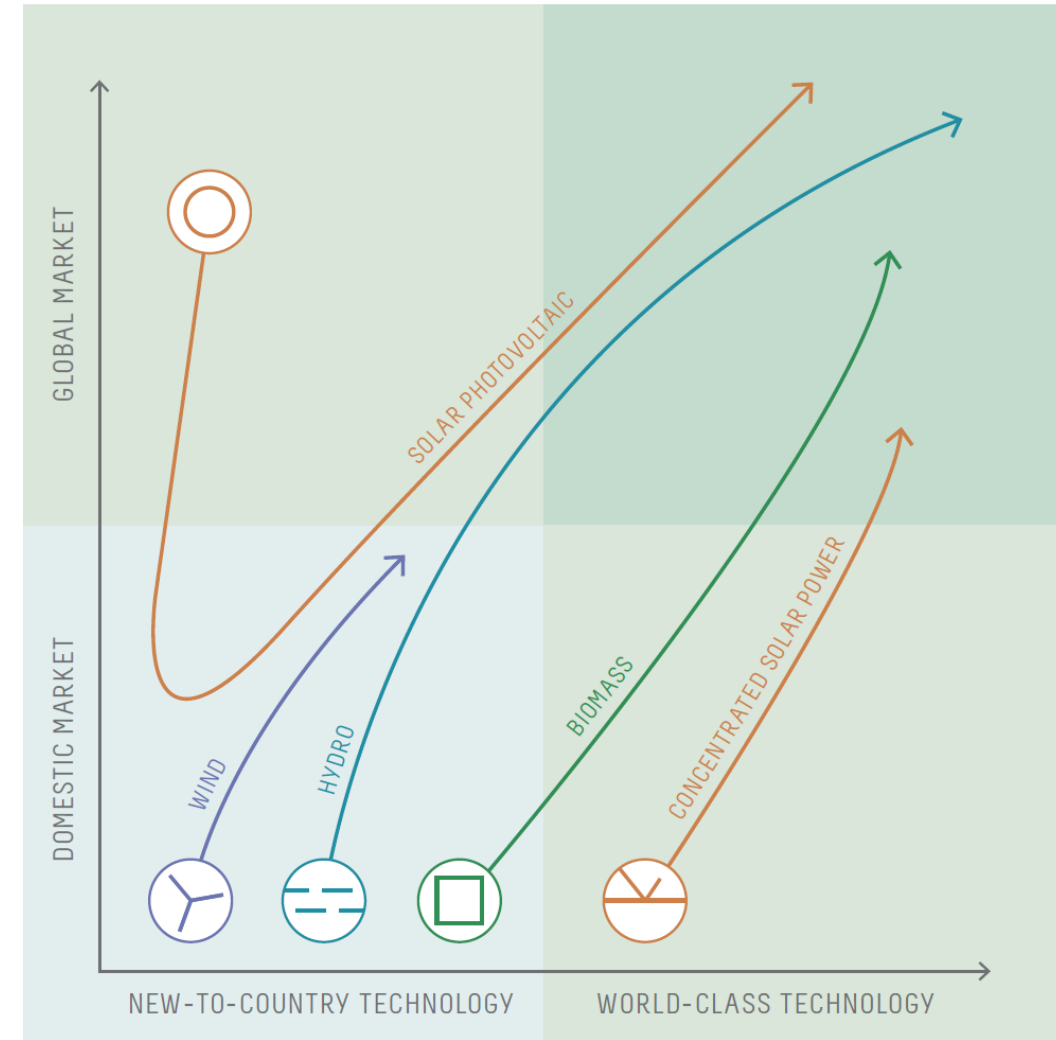


Sectoral catch-up trajectories (1)



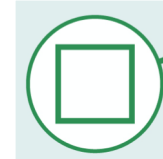
- Two dimensions of latecomer development: market and technology
- Qualitative case data and patent analysis

- Four main types of trajectories identified



Sectoral catch-up trajectories (2)

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



Biomass



Hydropower

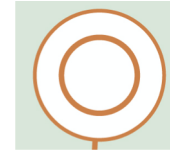
- **Domestic imitation \Rightarrow limited global progression**
Technology gap and limited exports. Technology transfer and state support. Rapidly evolving technology regimes such as new hybrid-digital technologies constrain leadership for the moment



Wind power

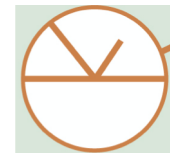
Sectoral catch-up trajectories (3)

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



Solar PV

- **World-class technology** \Rightarrow **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 energy transition technologies 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.

Thank you!

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Lema, R., Fu, X., & Rabelloiti, R. (2020). [Green windows of opportunity: latecomer development in the age of transformation toward sustainability.](#) *Industrial and Corporate Change*, 29(5), 1193-1209.