Using frontier technologies for greening global value chains

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Motivation

- The digital and green transformations have developed largely in parallel, with their own trajectories and with separate drivers and policy domains.
- This is now beginning to change.
  - Digital technologies can help accelerate progress towards the 17 SDGs and particularly, to realize the goals related with environmental sustainability (e.g., SDG 7 - Affordable and clean energy - or SDG 13 - Climate change action)
  - The twin - green and digital - goals are increasingly seen to complement each other, and digital technologies such as AI, cloud computing, IoT are expected to help the economy become greener.

Are digital technologies opening green windows of opportunities in manufacturing GVCs in the latecomer countries?

The greening of GVCs

- The greening of GVCs in manufacturing industries is driven by:
  - ***Institutional drivers***: national environmental legislation (i.e., carbon tax) and public trade agreements including environmental provisions.
  - ***Market drivers***: new patterns of demand preferences and consumer behaviours.
  - ***Technology drivers:*** new technologies inducing efficiency savings with a greening effect or innovations to meet greener demand requirements.
- These drivers can open ***green windows of opportunities*** for firms in latecomer countries involved in GVCs ….
- …..but seizing these opportunities is not automatic and the failure to do so may leave enterprises worse off than before.

Environmental innovation in GVCs

- GVC greening is happening with the introduction of environmental innovations, when the net gains in environmental improvements are more than the losses.
- There are 3 types of environmental innovation :
  - **Environmental process innovation** e.g., reduction or substitution of energy sources and of scarce natural resources, reduction of waste, elimination of toxic inputs, optimization of material flow.
  - **Environmental product innovation** e.g., designed for durability, recycling inputs, recycling products, reduced packaging, re-using waste.
  - **Environmental organizational innovation** e.g., the introduction of lean production tools.

Digitalization for GVCs greening

Smart manufacturing and service technologies (advanced robotics, 3d printing, wireless technologies, and sensors, Internet of Things)

Data processing technologies (big data, blockchain, cloud computing, machine learning and AI)

Some examples

- Fixed and mobile sensors in harvesting and logging equipment to provide precise information on tree species, biodiversity, or illegal logging (Gale et al, 2017).
- Data collected from online-connected sensors and GPS tracking systems in logistics
- Using 3D printing instead of traditional production methods material savings can be substantial.

- Blockchain
  - Provide information to buyers on the origin of products and guaranteeing about the authenticity of the information;
  - Track faulty products or components;
  - Increase traceability
- Artificial intelligence reduce energy consumption and optimize green energy use in smart grids.
- In agriculture, AI is adopted to plan shipping and delivery of perishable goods

Challenges for digitalization in manufacturing GVCs in latecomer countries

- Import and adoption of advanced digital technologies is still limited to a small number of emerging economies
- Production is limited to an even smaller set of advanced economies plus China
- Heterogeneity also exists within countries at firm level, with only a minority of (larger) companies adopting digital technologies, while the majority is still involved only in analogue production.
- In GVCs there is a large digital capability gap between the leading most digitalized companies and their suppliers.

Co-creating the twin transition

- To seize the green-digital window of opportunity, latecomer countries should develop and implement appropriate policy strategies to address critical challenges in digital and green competencies, infrastructures, and institutions, building innovative capacity, and overcoming financial barriers.

How to do it?

A three-pronged policy approach

A three-pronged policy approach for the twin transition in latecomer countries

1. ***Augment the window of opportunity by aligning digital and green strategies***

2. ***Address preconditions by developing a digital infrastructure***
   addressing the connectivity gap between small and large firms and urban and rural regions within countries.

3. ***Build an effective response***
   - Building capability for green and digital manufacturing chains
   - Building international partnership
   - Setting standards and regulations
   - Providing financial support

Concluding remarks

- Little is still known about the extent to which key enabling digital technologies support the process of GVCs greening in the latecomer countries.
- Techno-institutional waves are still concentrated geographically and the full extent of the ramifications across latecomer countries remains to be seen.
- Synergy-creation is challenging and for the moment, in latecomer countries the digital and green transitions may not be twins, but merely related through the extended family!

Thanks!

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