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Innovation in Global Value Chains

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23. Innovation in global value chains

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Innovation in GVCs

- Innovation is a prerequisite for sustainable economic growth and development
- Global value chains (GVCs) plays a key role in global interconnectedness among countries and firms within them;
- The involvement in GVCs is generally considered as a key channel for accessing external knowledge and technology and for improving innovation capabilities, especially in developing countries.

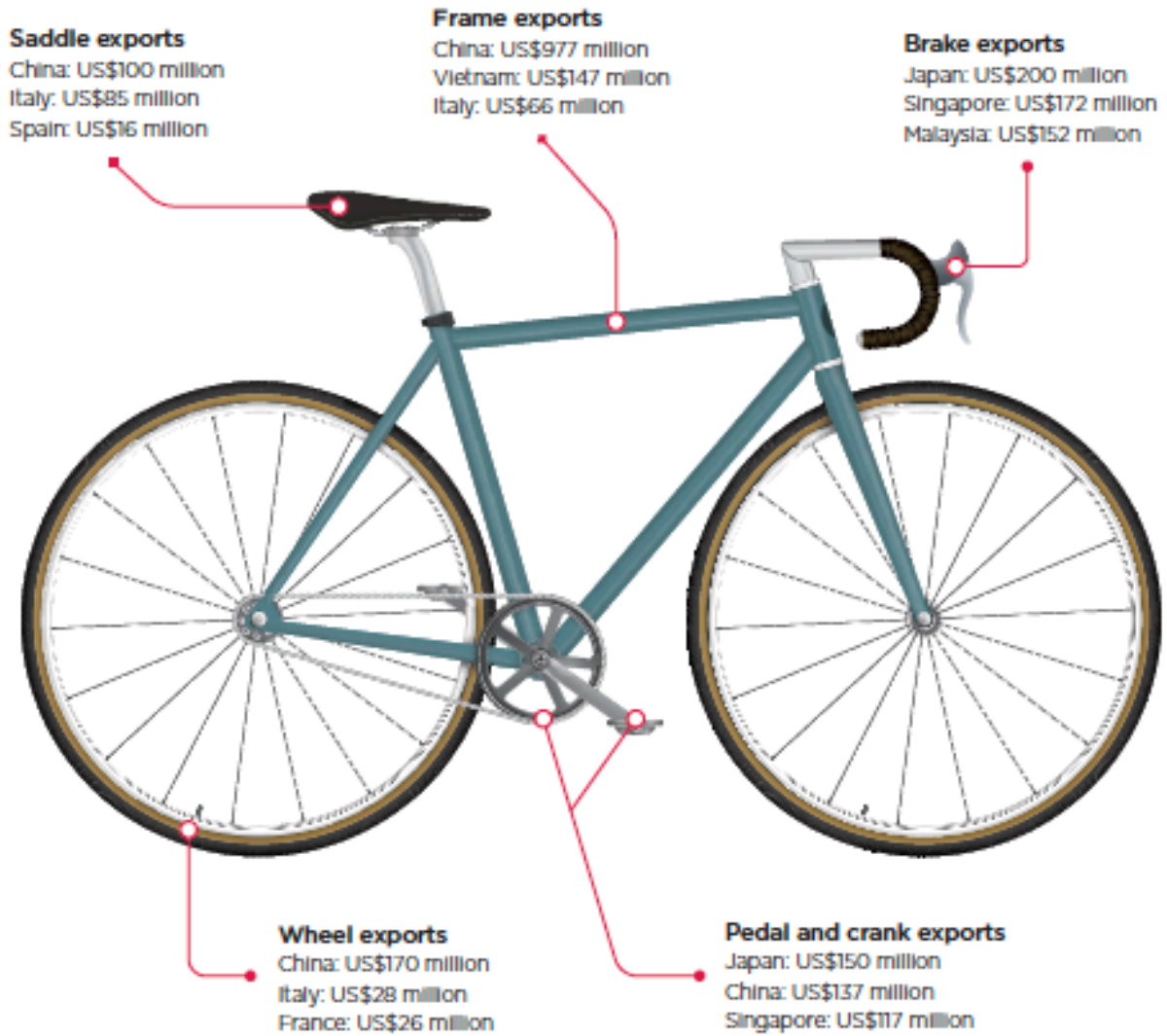
Research Questions

- **Whether and under what circumstances does GVC involvement create new opportunities** for learning and innovation?
- How **global value chain** and **innovation system** co-evolve and influence the **trajectories** of learning and innovation in firms in different countries?

Agenda

- Introduce the concepts of Global Value Chain and Innovation Systems;
- Discuss innovation in GVCs and how different governance patterns impact on local firms' processes for building innovation capabilities;
- Combine Global Value Chains and Innovation System (IS) approaches , propose some possible trajectories of innovation and provide some examples from different countries.

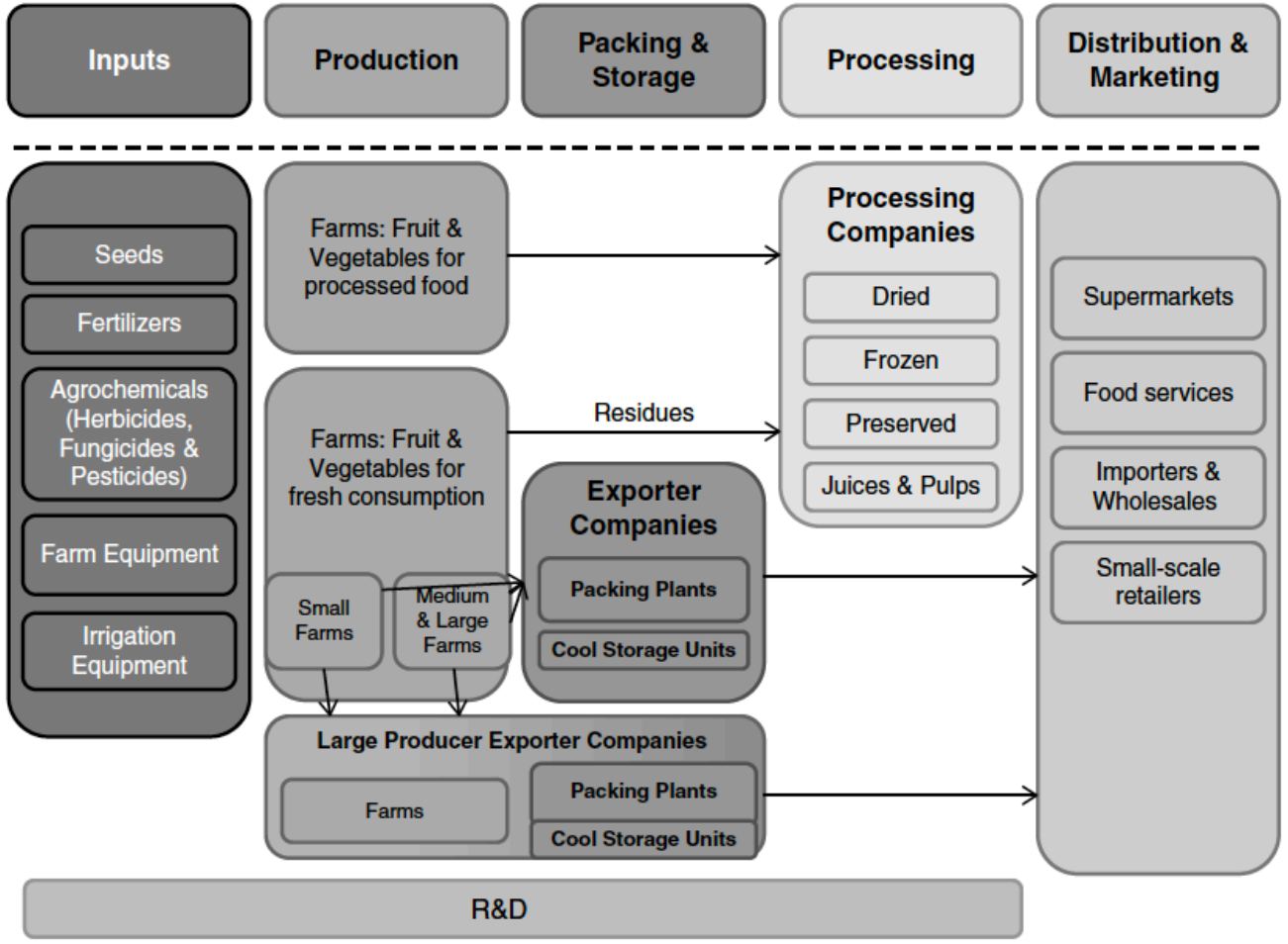
Figure 1.1 Where do bicycles come from?



Source: WDR 2020 team, using data from UN Comtrade database. See appendix A for a description of the databases used in this Report.

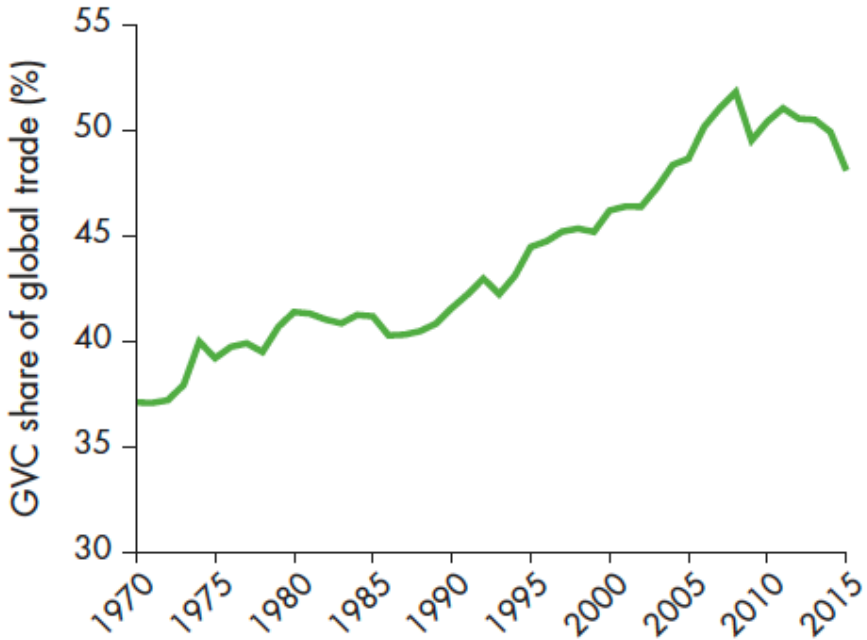
Global Value Chains in a nutshell

- A value chain describes the full range of activities that firms carry out to bring a product from its conception to its end use and beyond.
- Today, supply chains are globally dispersed and different activities are usually carried out in different parts of the world.



Source: Fernandez-Stark et al. (2011c).

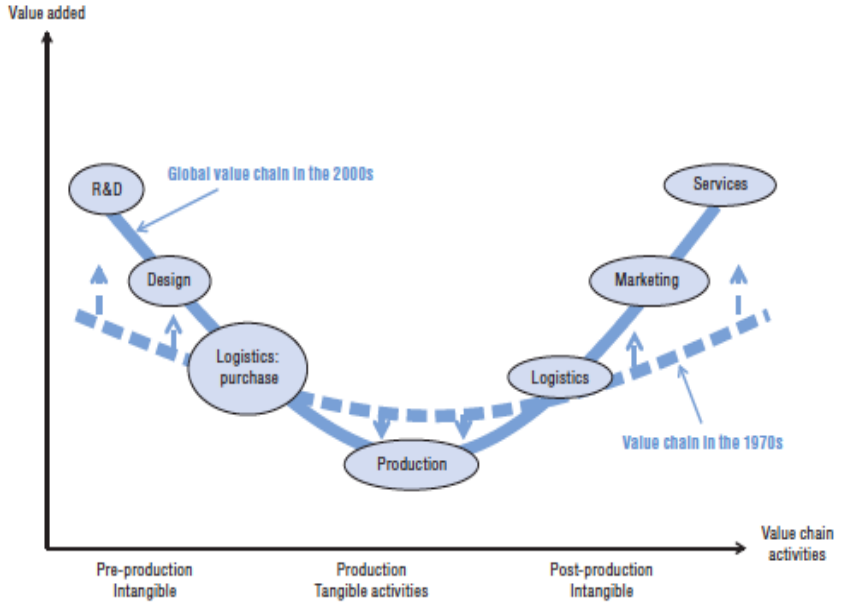
Figure O.1 GVC trade grew rapidly in the 1990s but stagnated after the 2008 global financial crisis



Sources: WDR 2020 team, using data from Eora26 database; Borin and Mancini (2019); and Johnson and Noguera (2017). See appendix A for a description of the databases used in this Report.

Note: See figure 1.2 in chapter 1 for details. Unless otherwise specified, GVC participation measures used in this and subsequent figures throughout the Report follow the methodology from Borin and Mancini (2015, 2019).

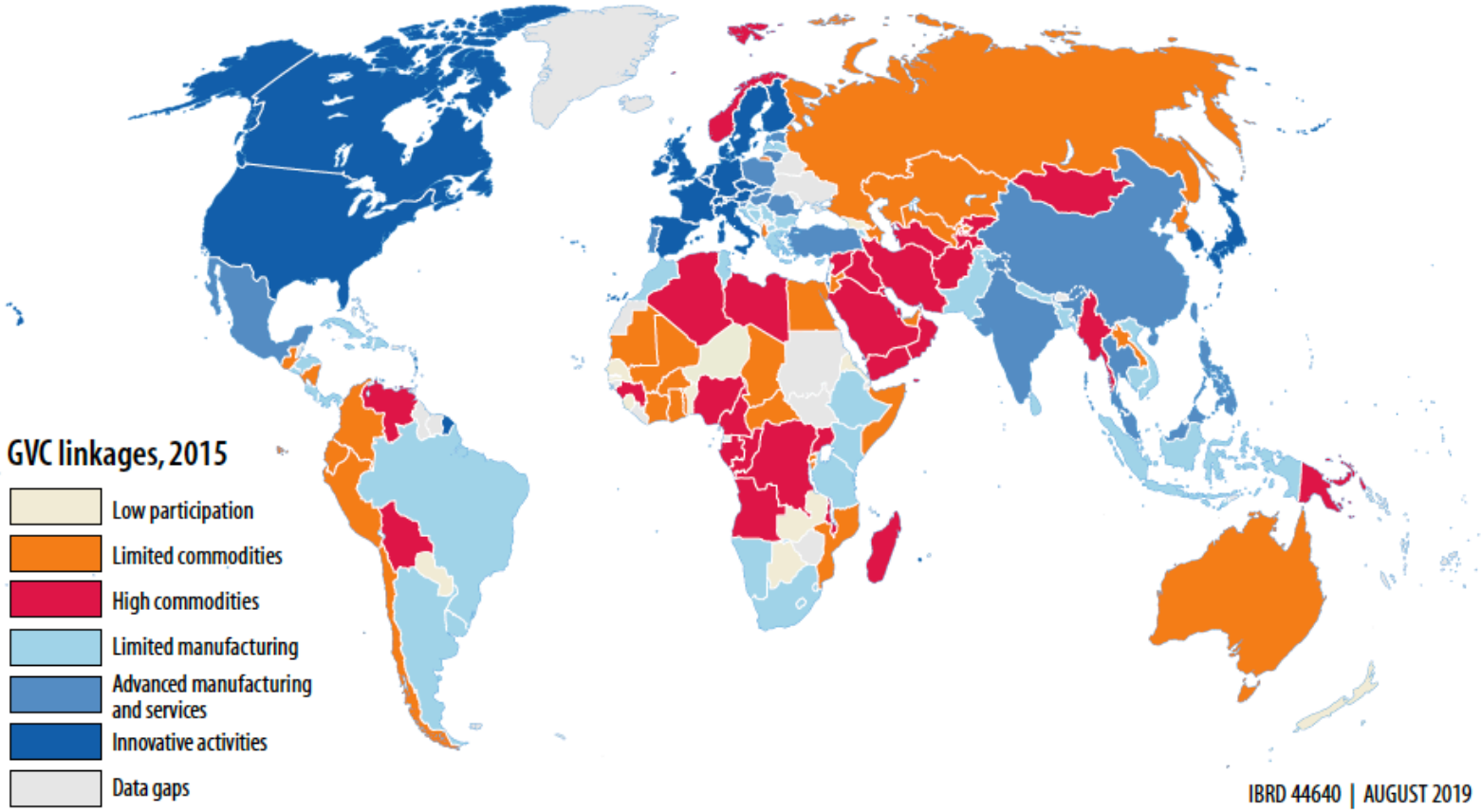
Where does value added lie in GVCs? The Smiling Curve



Source: Based on Shih (1992), Dedrick and Kraemer (1999), and Baldwin (2012).

- **Along the GVC there are activities that aggregate more value than others;**
  - Developing countries enter the GVC in **assembly,** which represents only a very small part of value generation;
  - Developed countries specialize in activities where most value creation is generally found:
    - **upstream activities** (design, product development, R&D and manufacturing of key parts and components)
    - **downstream activities** (marketing, branding and customer services);

Map O.1 All countries participate in GVCs—but not in the same way



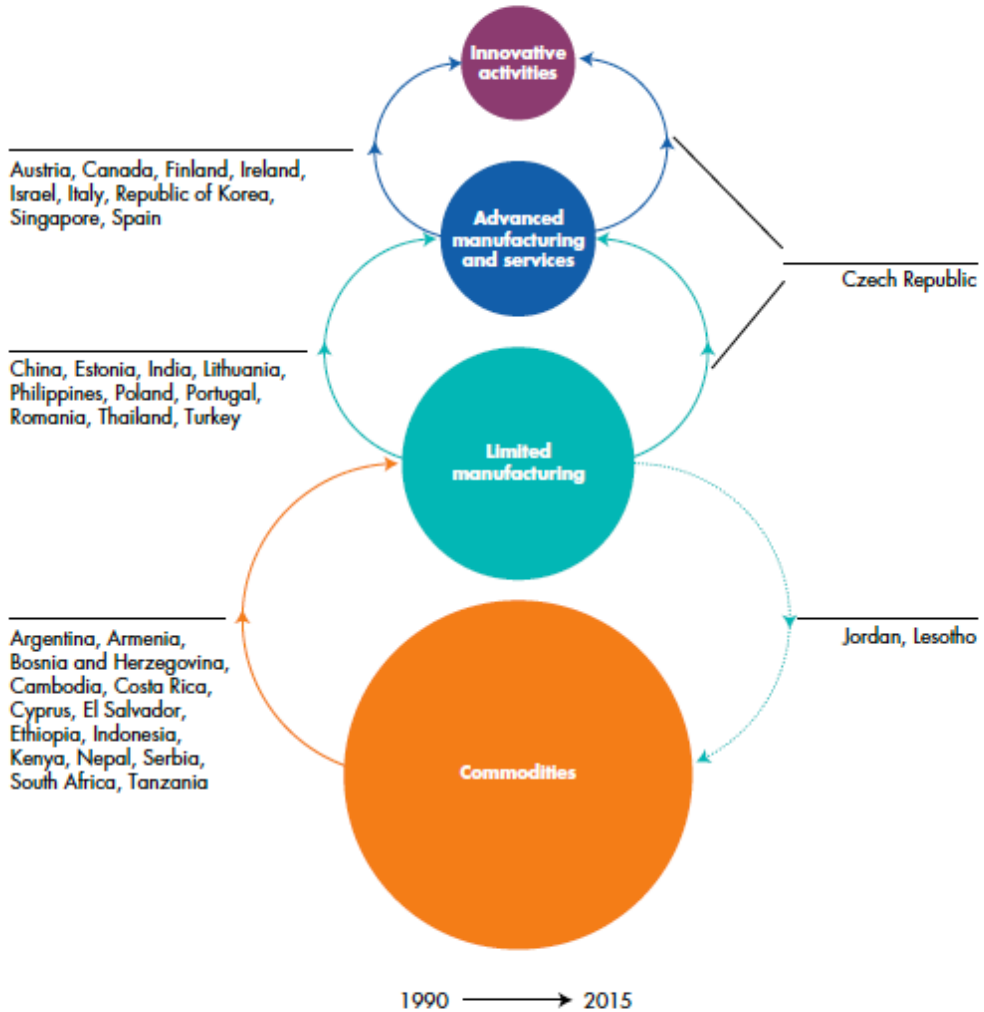
Source: WDR 2020 team, based on the GVC taxonomy for 2015 (see box 1.3 in chapter 1).

Note: The type of a country's GVC linkages is based on (1) the extent of its GVC participation, (2) its sectoral specialization in trade, and (3) its engagement in innovation. Details are provided in figure 1.6 in chapter 1.

How do countries (and firms) move up in GVCs?

- Product upgrading: moving into more sophisticated products;
- Process upgrading: transforming inputs into outputs more efficiently by reorganizing the production system or introducing superior technology;
- Functional upgrading: acquiring new functions (or abandoning existing ones) to increase value added of activities (OEM➢ODM ➢OBM);
- Intersectoral (chain) upgrading: entry into new value chains, leveraging knowledge and skills acquired in another chain (i.e. from textile to high tech textile).

Figure 1.5 Country transitions between different types of GVC participation, 1990–2015



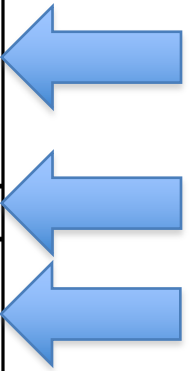
Innovation in GVCs

- Upgrading and innovation often used as interchangeable concepts;
  - Innovation is rarely investigated;
- GVC governance patterns shape opportunities, direction and speed for building innovative capabilities:
  - Learning can be facilitated by direct involvement of the value chain leaders or be the result of pressure to match international standards (Pietrobelli & Rabellotti, WD 2011).

Learning mechanisms within GCV vary according to the form of GVC governance (Pietrobelli & Rabellotti WD 2011)

Governance Type	Complexity of transactions	Codification of transactions	Competence of suppliers	Learning mechanisms within GVC
Market	Low	High	High	▪ Knowledge spillovers ▪ Imitation
Modular	High	High	High	▪ Learning through pressure to accomplish international standards. ▪ Transfer of knowledge embodied in standards, codes, technical definitions
Relational	High	Low	High	▪ Mutual learning from face-to-face interactions
Captive	High	High	Low	▪ Learning via deliberate knowledge transfer from lead firms confined to a narrow range of tasks – e.g. simple assembly.
Hierarchy	High	Low	Low	▪ Imitation ▪ Turnover of skilled managers and workers ▪ Training by foreign leader/owner ▪ Knowledge spillovers

Network org. forms

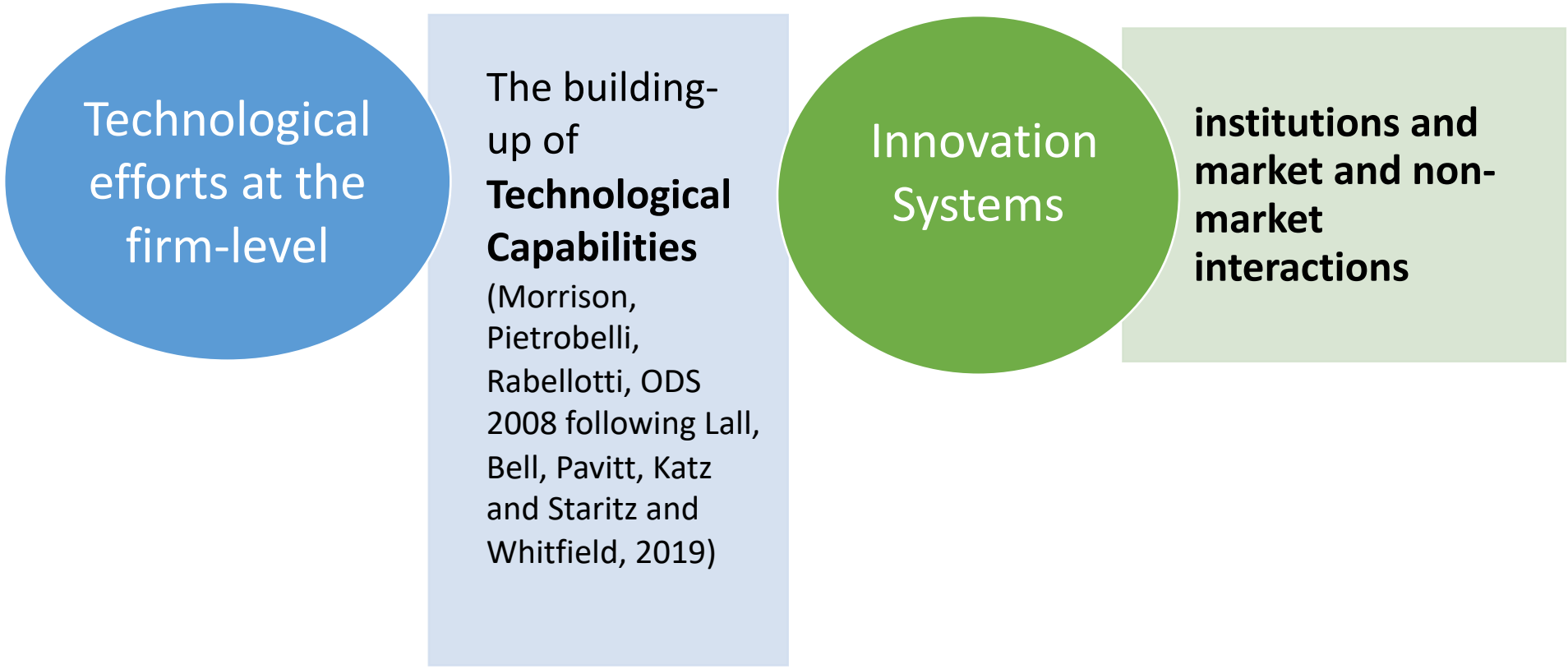


Source: adapted from Gereffi *et al.*, 2005

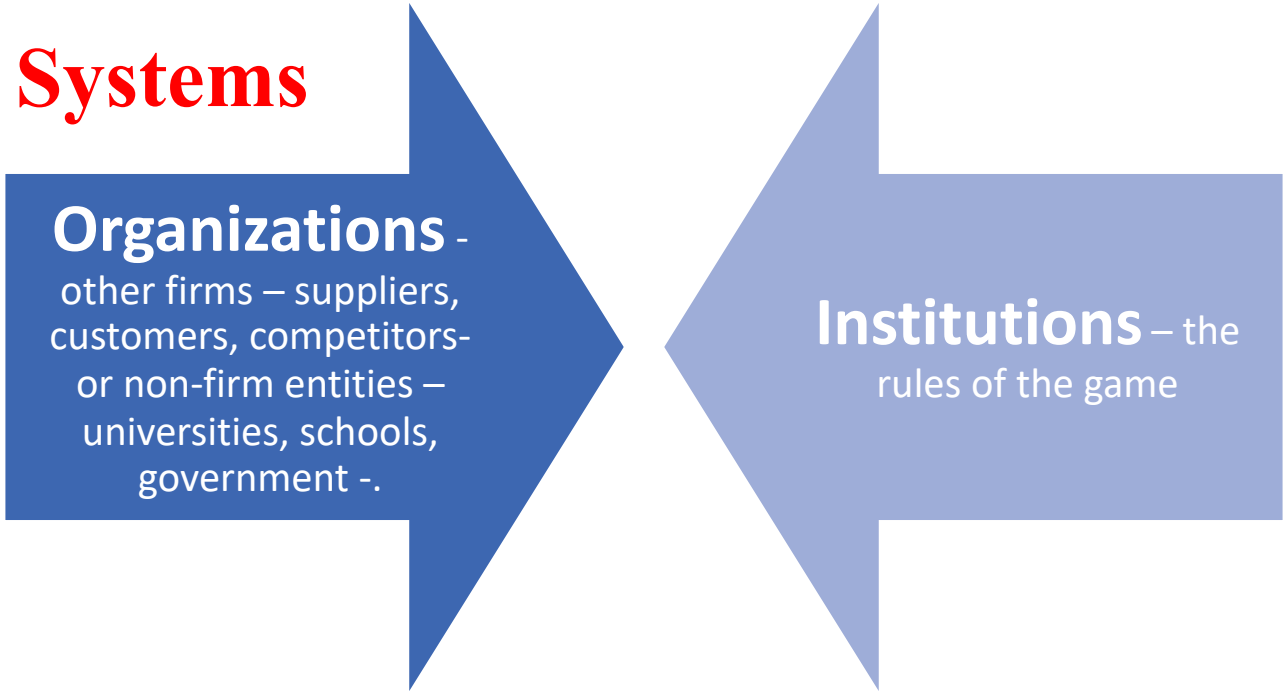
Main limitations of GVC approach

- No evidence on **micro knowledge mechanisms** at firm level: how do firms learn and innovate in GVCs ? how is knowledge accessed by firms involved in GVCs?
- Limited attention on how institutional frameworks (i.e. Innovation Systems) contribute to shape innovative capabilities in firms involved in GVC.

Innovation in GVC does also depend on



Innovation Systems



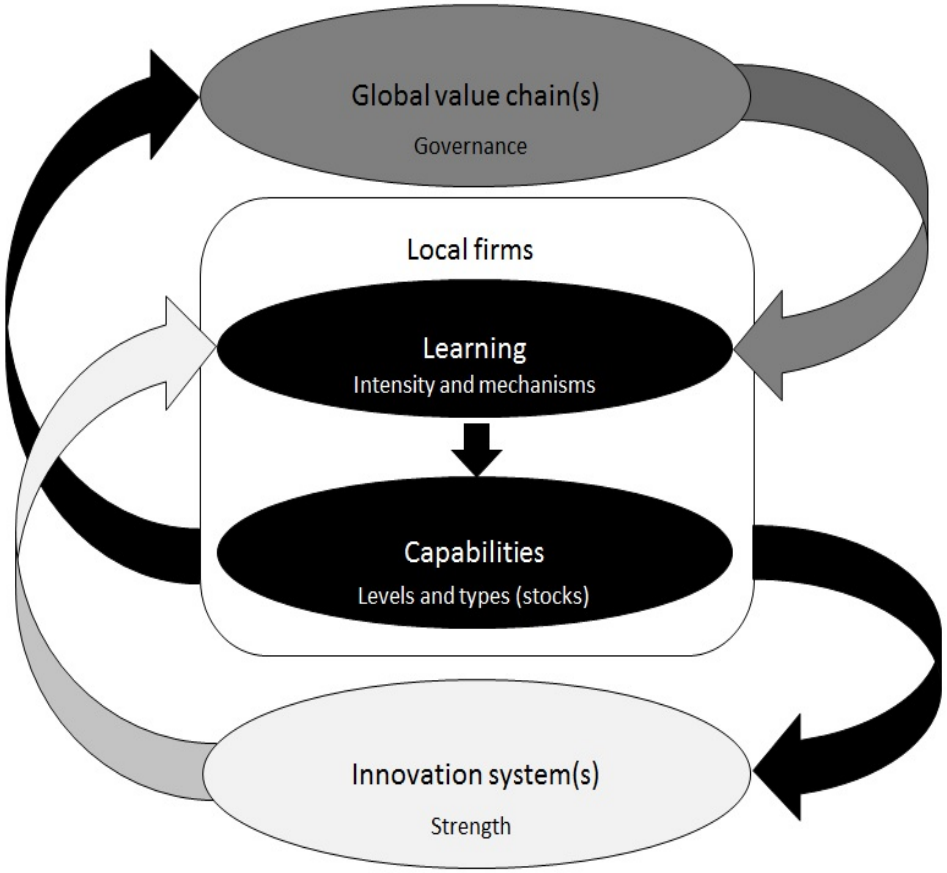
- Firms do not innovate in isolation, but in collaboration and in interdependence with other organizations.
- Main components: **organizations** and **institutions**.
- Organizations are formal structures that are consciously created and have an explicit purpose. Examples are: universities, research centers, venture capital funds, certification institutions; business associations.
- Institutions are sets of common habits, norms, routines, established practices, rules, or laws that regulate the relations and interactions between individuals, groups, and organizations. They are the rules of the game. Examples are: patent laws, university-industry laws.

Main limitations of IS approach

- Little understanding of systems building and dynamism (changes over time);
- Limited attention to external linkages in the generation and diffusion of knowledge and innovation.

Co-evolution of IS and GVC

- Both IS and GVC contribute to *firm's* learning processes and innovation capability building and co-evolve because of changes in firms' capabilities ;
- Forward-feeding linkages (grey arrows); Feedback linkages (black arrows):
  - GVCs: changes in firms' capabilities influence whether and how lead firms interact with domestic suppliers and can influence GVC governance patterns;
  - ISs: changes in firms' capabilities generate demand for different types of knowledge, resources, services (i.e. international certifications; specific training programs)
  - ISs: spillover effects such as demonstration and imitation, labour turnover etc.



Some illustrative trajectories of firms' innovative capabilities

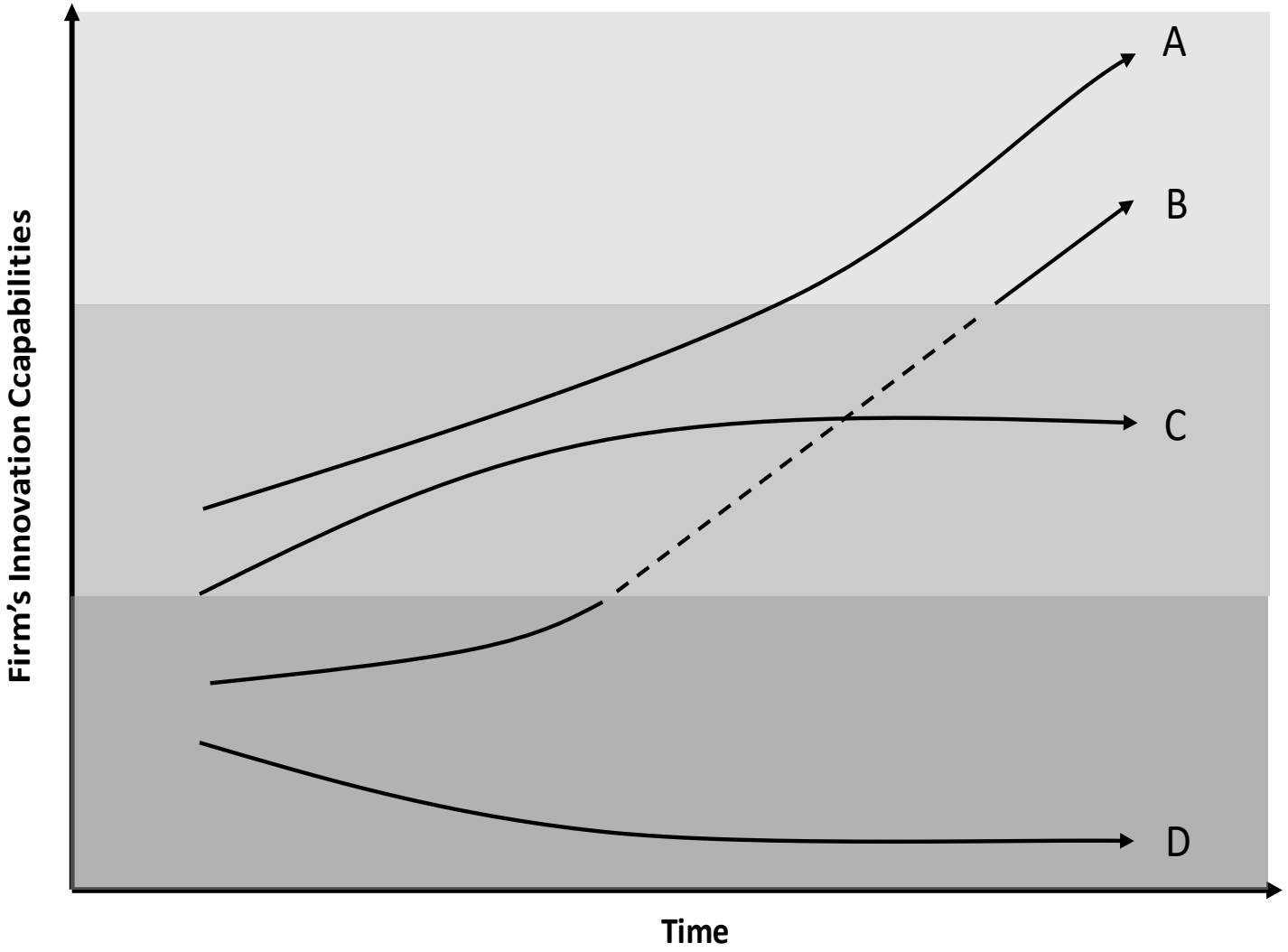
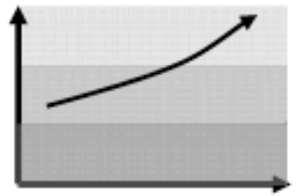
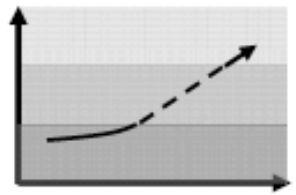
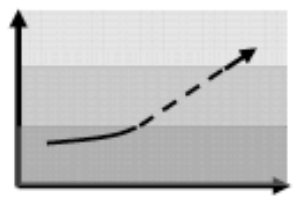
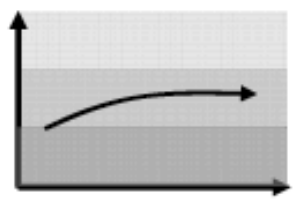
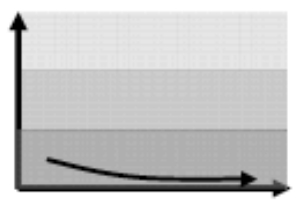


Table 1: Illustrative trajectories of innovation capabilities

	Trajectory	Firms' capabilities	ISs	GVCs	GVC–IS co-evolution
Gradually increasing trajectory (A) *Chile*: salmon *China and India*: electronics, cars, space technologies *China*: mobile phones and electric two-wheelers		Firms' capabilities gradually and cumulatively strengthen.	IS strengthens sufficiently due to GVC involvement.	Value chains play a learning-intensive role.	GVC and IS exhibit complementarity and positive interactions.
Leap-wise increasing trajectory (B1) *Brazil*: footwear *India*: pharmaceuticals *Korea*: toys, musical instruments, and helmets		Firms' capabilities strengthen in successive jumps; firms oscillate between GVC and IS as alternate sources of knowledge and capability building.	Initially weak IS eventually develops to support value-chain development.	GVCs provide initial learning opportunities; local firms exit the chain; and the value chains move from local to global.	IS and GVC have sequential one-way relationships (each playing the stronger role in turn).
(B2) *India*: software *East Asia*: apparel		Firms' capabilities increase but are biased towards export-demand preferences until IS grows.	Absent or weak IS fails to support enterprise capabilities.	GVCs provide sustained learning opportunities that eventually feed back into IS development.	A one-way relationship is followed by a two-way interaction.
Stagnating trajectory (C) *Bangladesh*: aquaculture *Kenya, Lesotho and Swaziland*: textiles		Firms' capabilities remain unchanged (stagnant) or develop only marginally.	IS becomes fragmented and thus cannot support value-chain development, leading to limited absorptive capacity.	Value-chain participation remains stagnant, leading to limited learning in key tasks.	Initial efforts at mutual support are followed by disjunction or ineffective interaction.
Declining trajectory (D) *Gabon*: timber *Thailand*: cassava		Firms shift to lower-value-added stages or exit from the value chain.	Absent or very weak IS fails to support value-chain development.	Lead firms with strong bargaining power play a negative role.	GVC and IS have disjointed and/or negative interactions.

Source: Adapted from Lema et al. (2018)

The leap-wise trajectory
(Lee, Szapiro and Mao, EJDR 2018)

- GVC & IS as alternate sources for building knowledge and capabilities in firms (IN-OUT-IN strategy):
  - **IN**: in the **preliminary development** stage GVC participation is necessary to acquire foreign knowledge and production skills;
  - **OUT**: in the **intermediate stage** separation and independence from existing foreign-dominated GVCs and a strong IS are required for functional upgrading (i.e. building capabilities in design, R&D, marketing);
  - **IN**: in the **maturity stage the** latecomer firms build and lead their own GVC, different from the one they started from.

Case illustrations of the leap-wise trajectory

- **South Korea:** From OEM to ODM to OBM (*Aurora World, Shimro Musical Instruments, HJC Helmets, Hyundai Motors)*

- **Brazil:** *Footwear industry in Rio Grande do Sul cluster*
  - From 1970s to mid-80s growth through integration in GVC led by US buyers (IN);
  - In mid-1990s some firms (i.e. *Arezzo, Alpargatas, Grendene*) step OUT from the US GVC and target domestic (and then regional) markets, developing local learning mechanisms in design and creating their own GVCs (IN);
  - Other firms remain in the US GVC with low price products, passive learning, low interactions with other actors and only product upgrading.

Other illustrative trajectories

- *Gradually increasing trajectory*: GVC and IS exhibit positive complementarities
  - Salmon industry in Chile, where involvement in the GVC created a demand for technicians with knowledge in biochemistry and engineering, successfully addressed by the local IS.
  - A key policy role was also played by the government to address an environmental crisis occurring in the industry;
  - Bicycle industry in Taiwan (Hsieh; 2019);
- *Stagnating trajectory:* IS is weak and fragmented and GVC does not provide access to key knowledge, so local firms fail to increase their innovation capacities (aquaculture in Bangladesh);
- *Declining trajectory:* IS is too weak to maintain previously attained competitiveness in GVCs when changes in GVCs and global demand arise
  - Timber industry in Gabon from exporting processed logs to the EU to shipping of unprocessed logs to China.

Final takeaways

- **GVCs and IS co-evolution** has implications on the speed and direction of innovative capability accumulation at firm level;
- More macro and micro level evidence is needed for enriching the list of trajectories in different sectors, local contexts and countries at different levels of development;
- **GVC policies** are popular, especially, in developing countries. Besides attracting GVC leaders they should aim at **capturing value** within GVCs with measures aimed at **strengthening and deepening IS** (e.g. matching-grant programs to support collaborative innovation involving firms and universities; training programs to create skills needed for integration of local firms in GVCs; technology services in the areas of standards, metrology, testing, and certification).

Thank you

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