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# Technological Catch-up and Global Value Chains

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# Agenda

- **Global Value Chain framework:**
  - **Focus** on the role of leading firms and inter-firm networks in upgrading;
  - **Limitation:** little attention on the understanding of the upgrading itself. How is knowledge accessed? How firms in GVC learn and innovate?
- **GVC & Innovation:**
  - **Focus** on how firm level efforts and the interactions among enterprises, institutions, research bodies and policy making agencies within innovation systems contribute to learning and innovation in firms involved in GVCs;
- **Conclusions and policy implications.**

# Learning and innovation in LDCs

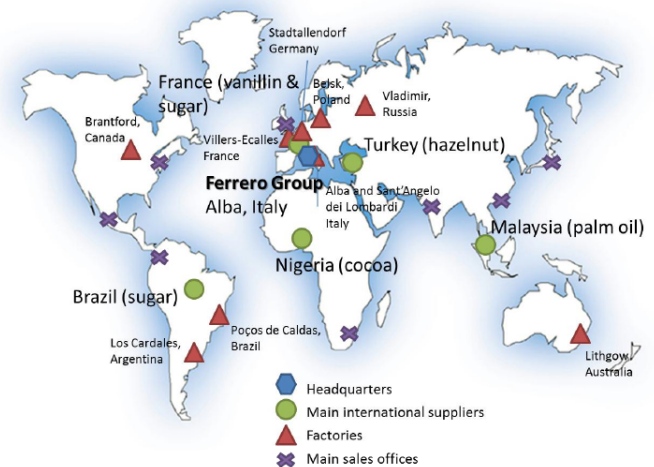
- In less developed countries (LDCs), the extra-national influences on the innovation process are particularly crucial given that linkages with foreign firms and organizations play a central role;
- Different strands of literature have analysed the impact of foreign sources in the process of innovation and learning in LDCs:
  - Learning from Exporting (see Wagner, 2007 for a survey);
  - Foreign Direct Investments (FDI) through spillovers, imitation and direct innovation efforts (Barba Navaretti and Venables, 2004);
  - **Global Value Chains (GVCs)**, which according to UNCTAD (2013) account for some 80 % of global trade.

# Breakfast Time!

## Let us start with the Nutella GVC



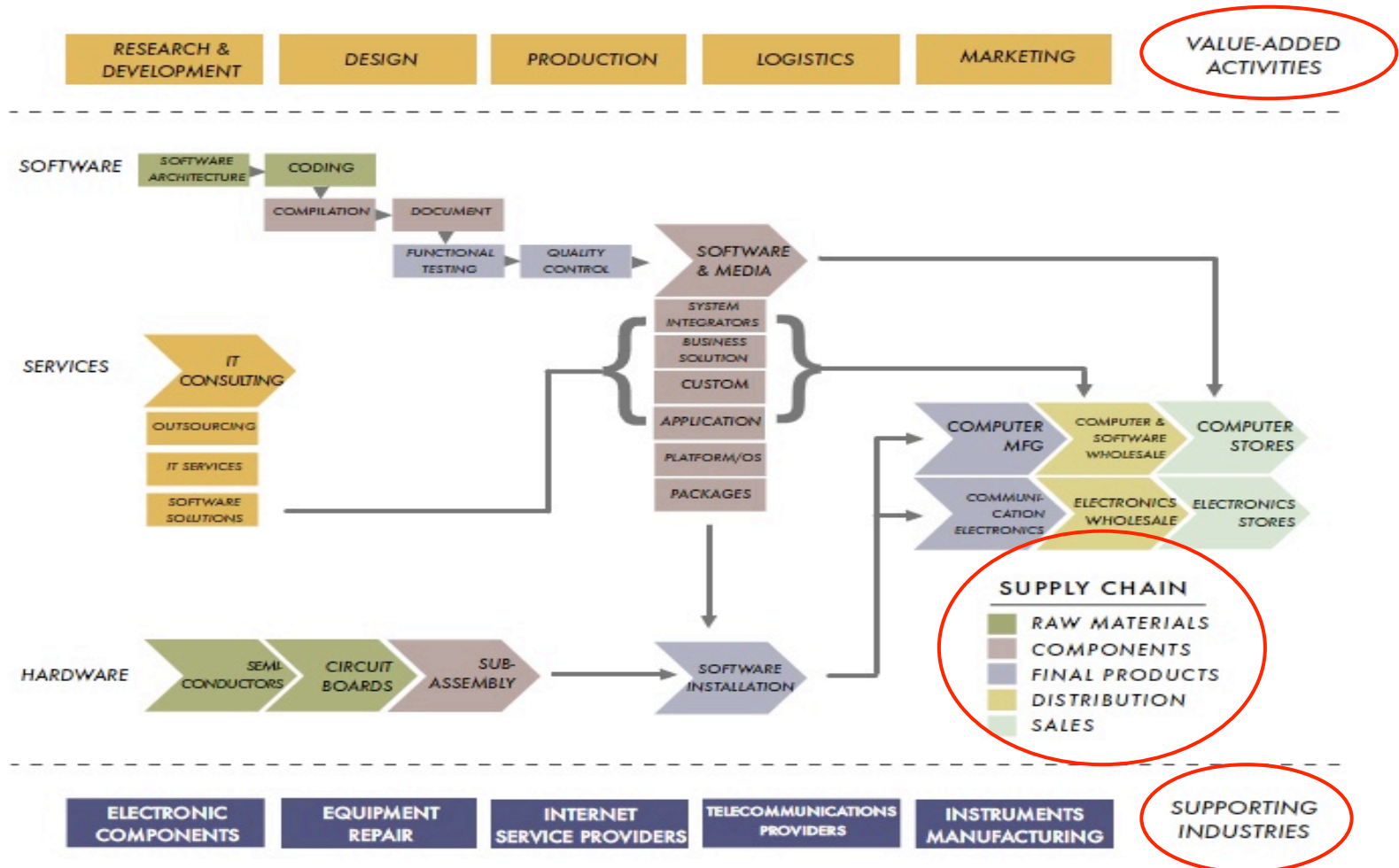
Figure 6. The Nutella® global value chain



Source: Ferrero, Sourcemap and various on-line sources.

# What is a value chain?

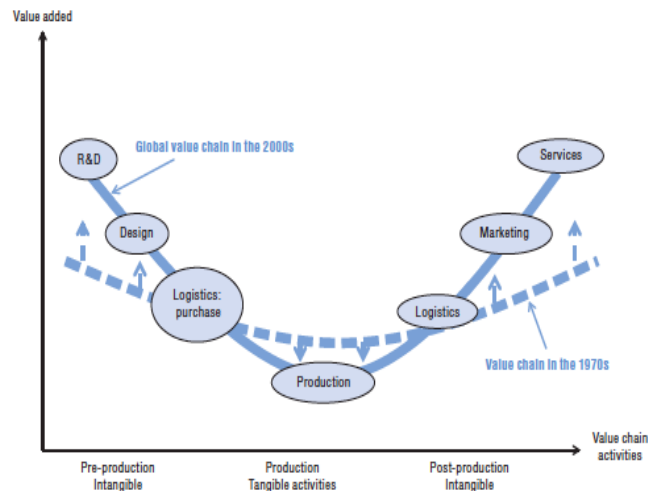
A value chain describes the full range of activities that firms and workers carry out to bring a product from its conception to its end use and beyond.



# GVCs in LDCs

- The participation in GVCs is a key opportunity for firms in developing countries to reach international markets;
- What role the GVC lead firms do play in fostering and supporting this innovation/upgrading process depends on the **governance patterns and on the power relations characterizing the GVC**;
- A central concern of the GVC analysis is to “unpack” the relationships between **global lead firms and local producers** to investigate the opportunities and constraints that result from entering such relationships.

# Value Added along the GVC: The Smiling Curve



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

- The point is **which activities along the GVC are more lucrative than others?**
- In GVC the most value creation is generally found in:
  - **upstream activities** such as design, product development, R&D and manufacturing of key parts and components;
  - **downstream activities** such as marketing, branding and customer service;
- **Assembly**, often offshored, to LDCs, represents only a small part of value generation.

# Economic Upgrading

- Economic upgrading is **moving up the value chain;**
  - ① **Process upgrading** implies reduction in costs, productivity and flexibility increases by reorganizing the production system or investing in new or better equipment/technology;
  - ② **Product upgrading** involves a shift to more sophisticated, complex, better quality products as well as producing a larger range of products;
  - ③ **Functional upgrading** is changing the mix of activities and acquiring new skill intensive functions (i.e. from manufacturing to design);
  - ④ **Inter-sectorial/Inter-chain upgrading** is applying competences acquired in one function of a chain and using them in a different sector/chain.



# Upgrading in GVC is conditioned by governance

GVC governance depends on:

- The **complexity of the information** exchanged between actors in the chain;
- The **codification of the the information** into clearly defined rules, norms and standards;
- The level of **suppliers competence**.

Governance Type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	<div>Low</div> <div>↑</div> <div>↓</div> <div>High</div>
Modular	High	High	High	
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	Low	Low	

# What is missing in the GVC framework?

- General positive expectation that firms coordinating the GVC (i.e. the lead firms) **produce a positive impact on suppliers by transferring them valuable knowledge to compete in global end-markets**;
- GVC studies tend to overlook the wide **heterogeneity existing at the local level**, as local suppliers in developing countries are very different in terms of their capacity to absorb, master, and change knowledge and capabilities that lead firms in GVCs can potentially transfer to them;
- They are also heterogeneous in terms of their openness to sources of knowledge other than the GVC, and they are embedded in very diverse local innovations systems, some being more advanced and mature than others;
- Domestic technological capabilities **at the firm** (Morrison, Pietrobelli & Rabellotti, 2008), **industry, cluster/region** (Pietrobelli & Rabellotti, 2007) and **innovation system levels** (Pietrobelli & Rabellotti, 2011) do also need to be taken into account.

# GVC & Innovation

- In a recent literature survey (De Marchi, Giuliani & Rabelloiti, 2015), based on Scopus and grey literature, we have found **only 50 GVCs** dealing with GVC & Innovation since 2005;
- In these 50 GVC cases we have searched for empirical evidence on:
  - a) The *local firms' degree of innovativeness* taking into account the extent to which different types of innovations (product, process, market and organizational) have been undertaken at the level of the local firms that are part of the GVCs;
  - b) The *learning mechanisms* adopted considering the extent to which local firms use:
    1. **GVC learning sources** (e.g. technology transfer from lead firms);
    2. **Learning sources internal to the firms**;
    3. **External learning sources from non-GVC actors** (e.g. local universities).

# ① GVC learning sources


**Table IV.9. Learning mechanisms within GVCs**

Governance type	Technology/knowledge-related determinants of governance types			Predominant learning mechanisms
	Complexity of transactions	Codification of transactions	Competence of suppliers	
FDI (ownership hierarchy)	High	Low	Low	<ul style="list-style-type: none"> <li>• Imitation</li> <li>• Turnover of skilled managers and workers</li> <li>• Training by foreign leader/owner</li> <li>• Knowledge spillovers</li> </ul>
NEMs:				
- Modular	High	High	High	<ul style="list-style-type: none"> <li>• Learning through pressure to accomplish international standards</li> <li>• Transfer of knowledge embodied in standards, codes, technical definitions</li> </ul>
- Relational	High	Low	High	<ul style="list-style-type: none"> <li>• Mutual learning from face-to-face interactions</li> </ul>
- Captive	High	High	Low	<ul style="list-style-type: none"> <li>• Learning through deliberate knowledge transfer from lead firms; confined to a narrow range of tasks – e.g. simple assembly</li> </ul>
Trade (market)	Low	High	High	<ul style="list-style-type: none"> <li>• Learning from exporting or importing</li> <li>• Imitation</li> </ul>

Source: Adapted from Pietrobelli, C. and R. Rabellotti (2011) "Global Value Chains Meet Innovation Systems: Are There Learning Opportunities for Developing Countries?", *World Development*, 39:1261-9.

# How can policy support upgrading within GVC?

## The role of innovation systems (ISs)

	Governance Type	Determinants	Innovation Systems	
1	Market	Low complexity		<p>A well-structured, complete, smooth system makes <b>1-2-3</b> more likely to occur. <b>4-5</b> may prevail also with ‘poorer’, fragmented systems. The chain leader may compensate system weaknesses, but upgrading is restricted.</p> <p><b>Possible Dynamics</b></p>  <ul style="list-style-type: none"> <li>▪ <b>From 5 and 4 to 2:</b> thanks to improvement in MSTQ</li> <li>▪ <b>From 5 and 4 to 3:</b> thanks to improvement in “local” systems</li> <li>▪ <b>From 5 and 4 to 2 and 3:</b> thanks to IS supporting the co-evolution of suppliers and GVC competences</li> </ul>
		High codification	MSTQ organizations matter	
		High supplier competence	Education, training organizations matter	
2	Modular	High complexity		
		High codification	MSTQ organizations matter	
		High supplier competence	Education, training organizations matter	
3	Relational	High complexity	“Local” systems and complementary knowledge matter	
		Low codification	MSTQ are perhaps less crucial	
		High supplier competence	Education, training organizations matter	
4	Captive	High complexity		
		High codification	MSTQ organizations matter	
		Low supplier competence		
5	Hierarchy	High complexity	Local R&D organizations may benefit from interaction	
		Low codification		
		Low supplier competence	GVC is expected to improve human technical skills	

Source: authors' elaboration

# Well functioning ISs facilitate relational forms of governance

- **Active technical bodies** where the chain leaders and their local partners can meet, ease the exchange of knowledge and reduce the complexity of transactions. **This is common in SMEs clusters;**
- **Electronics in Jalisco (Mexico):** the development of an efficient IS has supported the transition from hierarchy and captive chains led by foreign leaders to the creation of a local innovation capacity and functional upgrading undertaken by domestic firms;
  - **Policy instruments:** training programs, high tech incubators, Science and Technology program co-developed by the State and the private sector.

# Codification of transactions & IS

- Well functioning standards and metrology organizations facilitate the handling of complex transactions and modular chains are more likely to prevail;
- **Salmon in Chile:** learning to comply with standards it has achieved the involvement of local firms both as value chain leaders and qualified suppliers in foreign-led chains.
  - **Policy implications:** a meso-level institution, the Association of Salmon Industries, has played a crucial role in supporting local firms to upgrade their capabilities (Pietrobelli and Rabellotti, 2007).

# Suppliers' competence & IS

- Increasing capabilities in the supply-base help to push the architecture of GVC away from hierarchy and captive networks and towards more relational and modular chains;
- **Wine in Chile and South Africa** (Giuliani, Morrison and Rabellotti, 2011): successful catch up in the highly competitive global wine market;
  - **Policy implications:**
    - **Public-private partnership** in research consortia involving companies, business associations and universities have facilitated the upgrade of the local wine producers;
    - In SA, WINETECH has implemented a **participatory mechanism** to set up the research agenda.



# Learning mechanisms outside the GVC

## ② Firm-level learning efforts:

- Internal R&D efforts
- Hiring of skilled managers or workers
- Learning through acquisitions/joint venture, licensing;

## ③ Other external channels unrelated to GVCs:

- Collective learning at the local level
- Learning from suppliers, universities, etc.
- Imitation from competitors.

**Table 4: Learning mechanisms in GVCs**

		#	%
<b>Within GVC</b>	Mutual learning from face-to-face interactions	17	34.0
	Training by GVC lead companies	11	22.0
	Knowledge transfer from lead firms confined to a narrow range of tasks	18	36.0
	GVC pressure to adopt international standards	17	34.0
<b>Outside GVC</b>			
<b>Firm</b>	Internal R&D effort	24	48.0
	Hiring of skilled managers and workers	13	26.0
	Learning through acquisition/joint venture/licensing	10	20.0
<b>Collective</b>	Collective learning at the local level	12	24.0
<b>Other</b>	Learning from actors such as suppliers, universities	15	30.0
	Imitation from competitors	13	26.0

# Cluster analysis

- The variables used for the cluster analysis are the following:
  - *Innovation* measured on a scale ranging from 0 (no innovation) to 1 (high innovation) based on the types of innovation performed (product, process, organizational and market), plus one whether product innovation was new-to-the-world;
  - *Learning within the GVC* measured summing the number of the GVC channels used by the firm on the total possible cases (codified on a 0-1 scale);
  - *Learning outside the GVC* measured summing the number of channels used by the firm outside the GVC on the total possible cases (codified on a 0-1 scale).

# 3 types of GVCs

- ① *GVC-led Innovators*: innovative local firms, which intensively use knowledge sources from within the GVC (e.g. Coffee GVC in Brazil lead by Illycaffè);
- ② *Independent Innovators* also innovative firms, but whose learning sources mainly come from outside the GVC (e.g. Chinese wind GVC);
- ③ *Weak Innovators*: a large group of scarcely innovative firms, drawing selectively on some of the knowledge sources available within the GVC but poorly using other forms of learning (e.g. Kenyan clothing GVC to the US market).

**Table 5: A GVC Typology**

	<i><b>GVC-led Innovators</b></i>	<i><b>Independent Innovators</b></i>	<i><b>Weak Innovators</b></i>
<b>Innovation</b>	Strong	Strong	Weak
<b>Within GVC learning</b>	Strong use of GVC: Face to face Training Transfer of knowledge on narrow tasks Standard pressure	Selected use of GVC: Face to face Knowledge transfer on narrow tasks	Limited use of GVC: Face to face Transfer of knowledge on narrow tasks Standard pressure
<b>Outside GVC learning</b>	Selected use of extra-GVC: In-house R&D Imitation Learning from local actors	Strong use of extra-GVC: In-house R&D Hiring skilled employees	Very weak use of extra-GVC
<b>GVC governance patterns</b>	Multi-chain governance	Multi-chain governance Relational Hierarchical	Exclusively Captive Exclusively Hierarchical

# Innovation in GVC: a virtuous *liaison*? not always...

- In developing countries in spite of being part of one or more GVCs, local suppliers do not always use the GVC as a privileged source of knowledge and technologies;
- In most of the observed cases, **GVC-related knowledge is exploited only as a complementary source to other channels of knowledge** (e.g. firm level efforts, collective learning at the local level, imitation, learning from other non-GVC actors, etc.);
- About half of our empirical observations are GVCs where **innovation is hardly taking place**, a condition that coexists with local firms' relative closure to both GVC-related and other kinds of knowledge sources, as well as with local firms' poor skills and knowledge creation efforts;
- Therefore, local heterogeneity – at the level of firms, clusters, regional or national system of innovation – strongly conditions the extent to which suppliers in developing countries take advantage of GVC-related knowledge.

# GVC Policy Interventions

- GVC programs are widespread among international organizations and donors because they offer a practical way of working with the private sector;
- GVC initiatives are mainly aimed at:
  - a) strengthening the weakest links in the chain (e.g. by improving the capabilities of local small suppliers);
  - b) strengthening the linkages between firms (e.g. by improving knowledge flows between the local firms and the lead firms);
  - c) creating new links in the chain for connecting local firms with new lead firms and/or end markets.
- Need of more systematic assessment of the impact in terms of innovation of the existing GVCs initiatives.

# Policy Implications

- Our survey of the GVC literature shows that the areas of policy interventions are all potentially relevant in terms of enhancing local innovation opportunities;
- Nonetheless, there is no systematic assessment of the impact in terms of innovation of the existing GVCs initiatives;
- More evaluation studies in that direction would therefore be a welcome effort to be undertaken by the numerous organizations and donors involved.



# The way ahead

- More empirical research about learning and innovation heterogeneity at level of firms, clusters, regions and countries at the Southern-end of the GVCs;
- More empirical research about the relationship between innovation and upgrading in GVC, and in particular about social and environmental upgrading;
- More empirical research on GVCs led by lead firms from the South.

# Thank you

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<http://robertarabellotti.it>

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I'm an economist. My areas of expertise are the economics of innovation, economic development and regional economics.

I am Professor of Economics in the Department of Political and Social Sciences at the Università di Pavia in Italy. I am currently working on a research project on multinationals from emerging countries investing in Europe funded by Riskbankens Jubilæumsfond. I regularly advise international

## PRESENTATIONS

*Technology-Driven FDI by Emerging Multinationals in Europe*

10 - 08 - 2015



Technology-Driven FDI by Emerging Multinationals in Europe – School of Business D'Amore McKim – Northeastern University

On September 9th Roberta Rabellotti will give a talk at Nardone Speaker Series presented by the Center for Emerging Markets – NEU in Boston. [Here](#) are the details.

## PUBLICATIONS

*Local innovation and global value chains in developing countries*

16 - 07 - 2015



UNU-MERIT Working Papers #2015-022

with Valentina De Marchi and Elias Giuliani

This working paper is part of a collaborative research effort of UNIDO and UNU-MERIT. It has been commissioned as a background paper for the UNIDO Industrial Development Report 2016. In this study we undertake a systematic review of the