

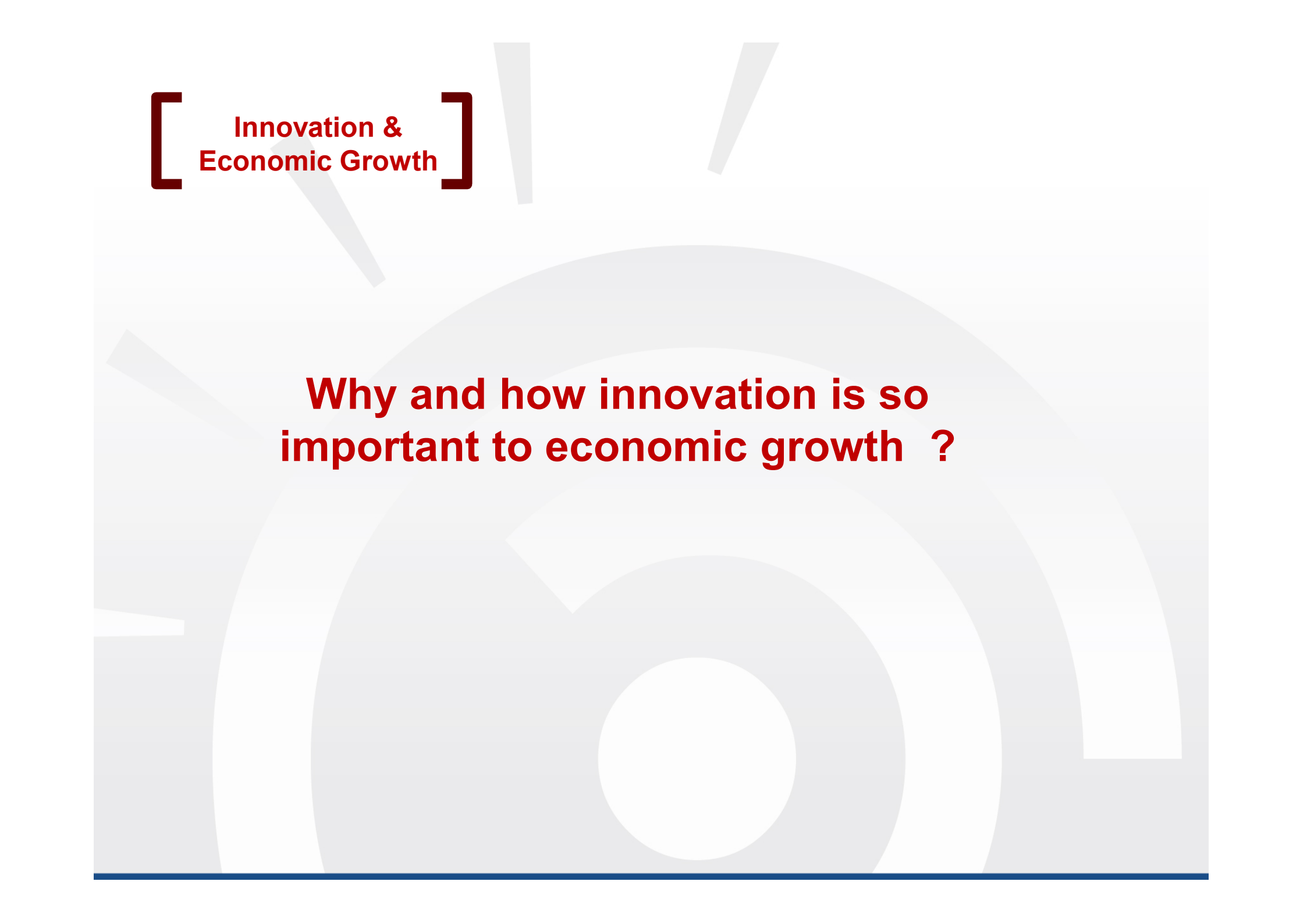
***CHARACTERISTICS AND SECTORAL PATTERNS OF
INNOVATION. LESSONS LEARNED FROM SUCCESSFUL
CATCHING-UP ECONOMIES***

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CNRST. Morocco

Date : 25-26 May 2016
Cairo-EGYPT

[Relevant issues to innovation]

- I. INNOVATION AND DEVELOPMENT
- II. SECTORAL INNOVATION SYSTEMS
- III. LESSONS FROM CATCHING-UP COUNTRIES
- IV. MOROCCAN CONTEXT



[Innovation & Economic Growth]

**Why and how innovation is so
important to economic growth ?**

[Innovation & Economic Growth]

- I. WHY SHOULD WE BE INTERESTED IN ECONOMIC GROWTH ?**
- II. HOW ECONOMIES GROW? AND WHY WITHOUT INNOVATION, GROWTH STOPS?**
- III. HOW INNOVATION COULD HAVE A MULTIPLIER EFFECT ON ECONOMIC GROWTH?**

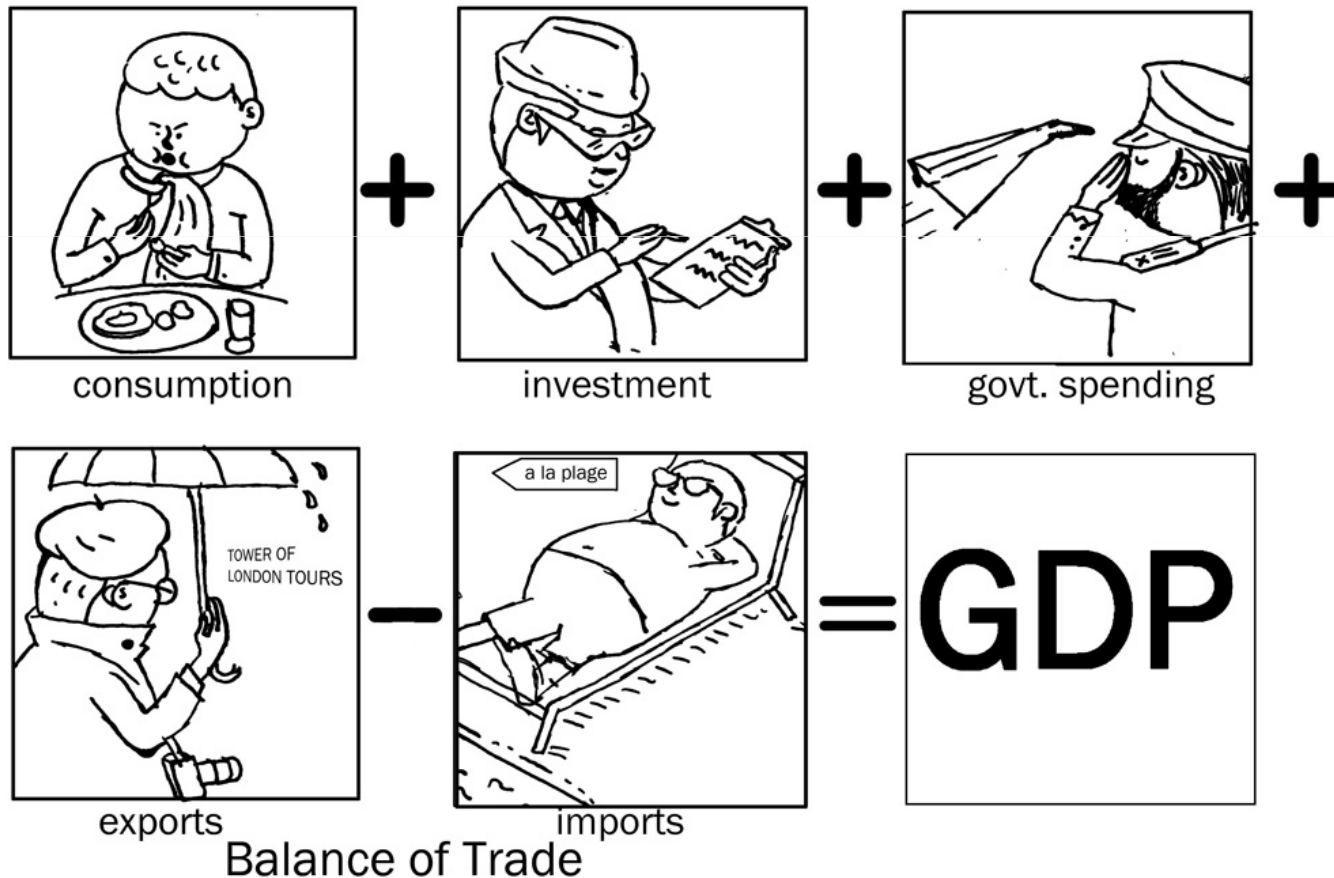
Innovation & Economic Growth

Why economic growth ?



Innovation & Economic Growth

Why economic growth ?

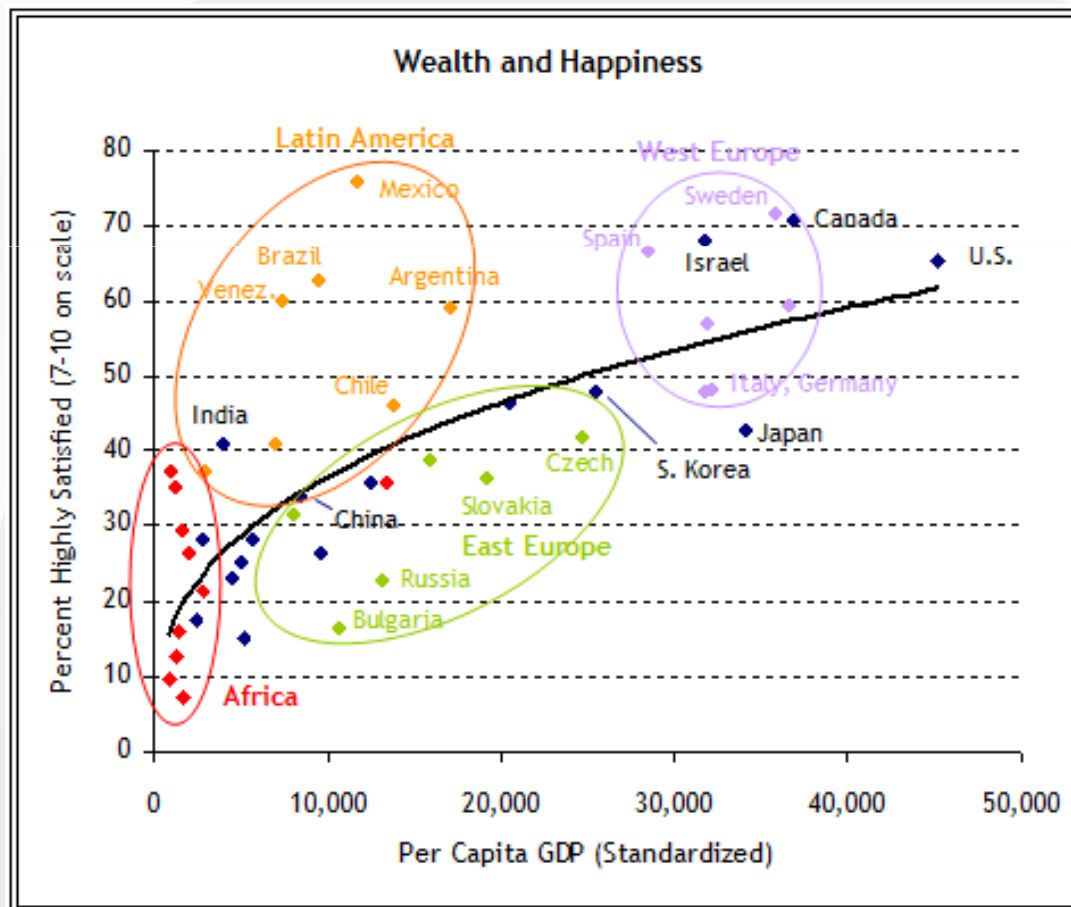
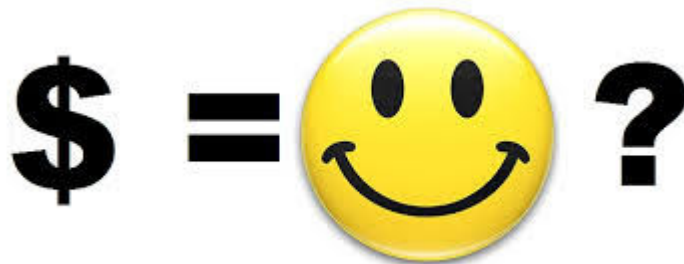


Innovation & Economic Growth

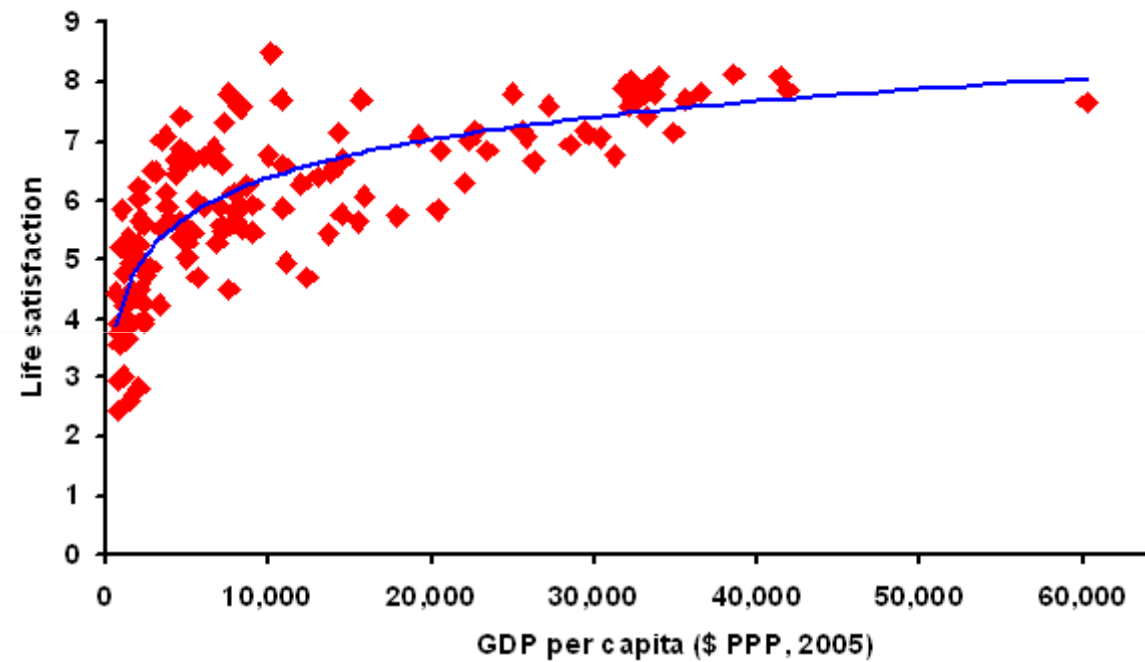
Why economic growth ?



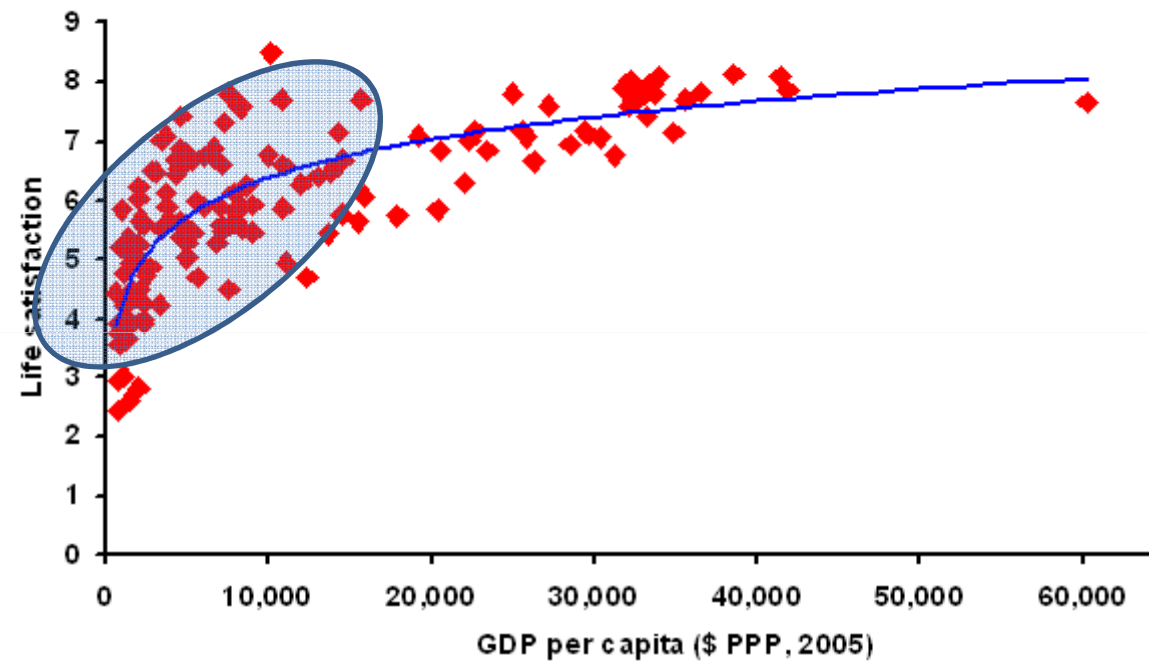
Innovation & Economic Growth



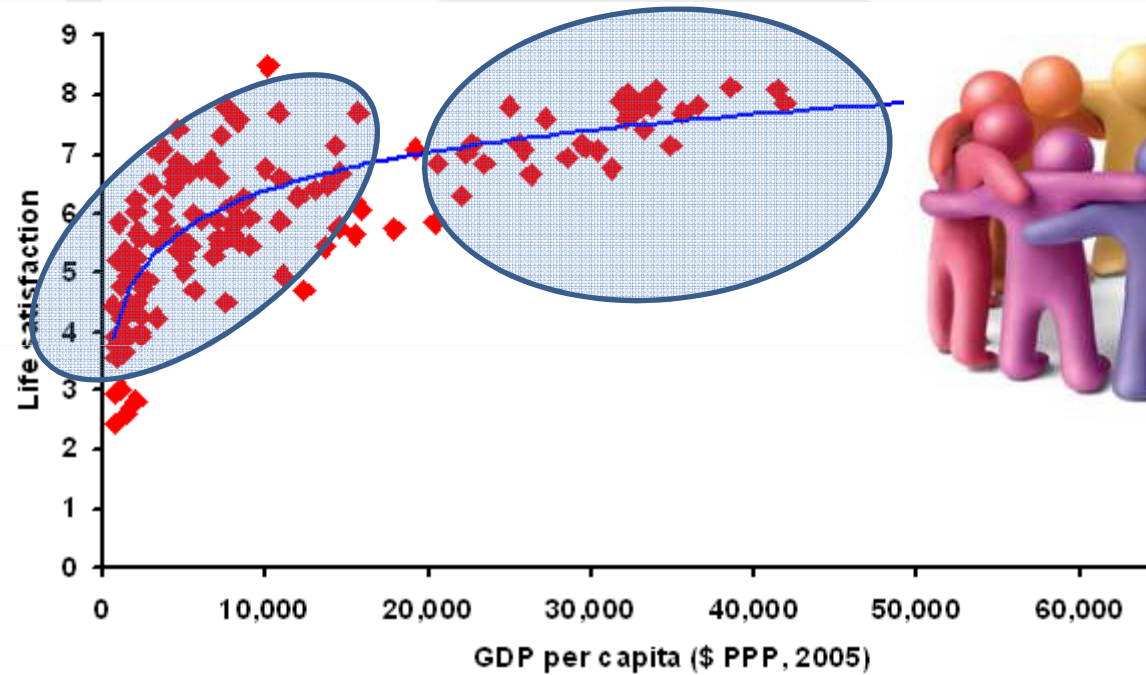
[Innovation & Economic Growth]



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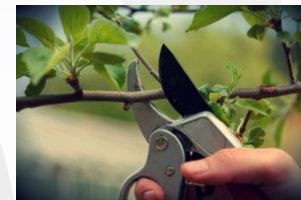
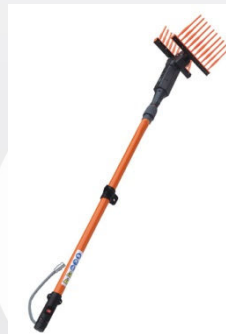
Country: OLIVESTAN

Workers

Olives

Machines

Machines wear out (depreciation)



Innovation & Economic Growth

L_t = Workers at time t



Innovation & Economic Growth

L_t = Workers at time t

M_t = Machines at time t



Innovation & Economic Growth

L_t = Workers at time t

M_t = Machines at time t

O_t = Output of Olives at time t (GDP/PIB)



[Innovation & Economic Growth]

L_t = Workers at time t

M_t = Machines at time t

O_t = Output of Olives at time t (GDP/PIB)

C_t = Number consumed at time t



[Innovation & Economic Growth]

L_t = Workers at time t

M_t = Machines at time t

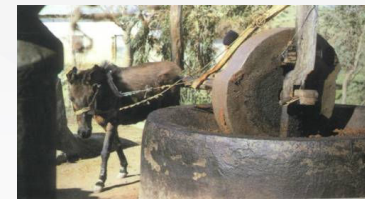
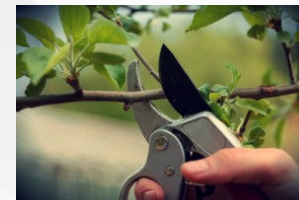
O_t = Output of Olives at time t (GDP/PIB)

C_t = Number consumed at time t

I_t = Number invested at time t

S = savings rate

D = Depreciation rate

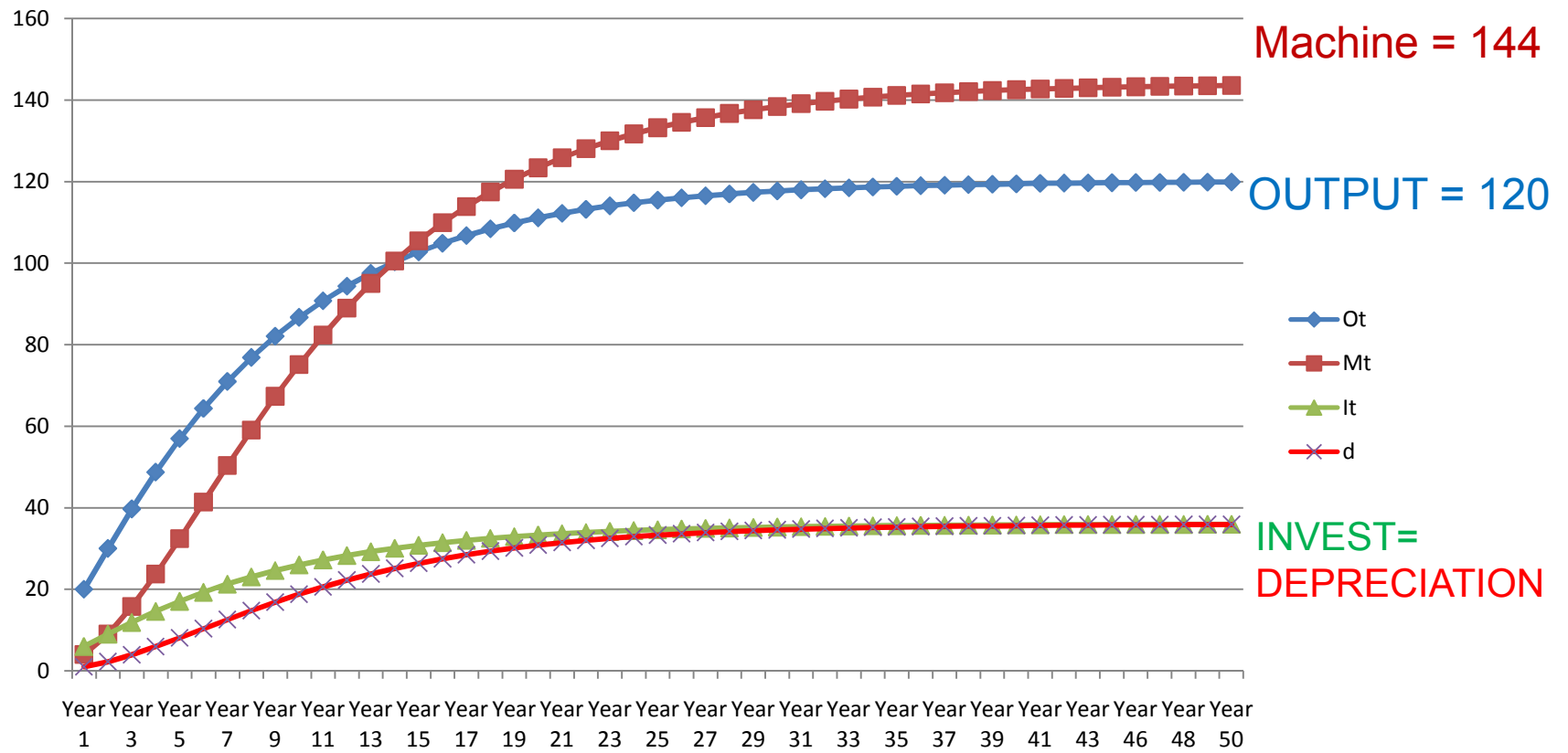


[Innovation & Economic Growth]

$$O_t = \sqrt{L_t} * \sqrt{M_t}$$



Innovation & Economic Growth



[Innovation & Economic Growth]

L_t = labor at time t

K_t = Capital at time t

A_t = Technology at time t

O_t = Output

$$O_t = A_t K_t^\beta L_t^{1-\beta}$$

If $\beta = \frac{1}{2}$ then this is just the square root function.

Innovation & Economic Growth

SOLOW GROWTH MODEL



[Innovation & Economic Growth]

Introduction of an innovation that would multiply the productivity by 2

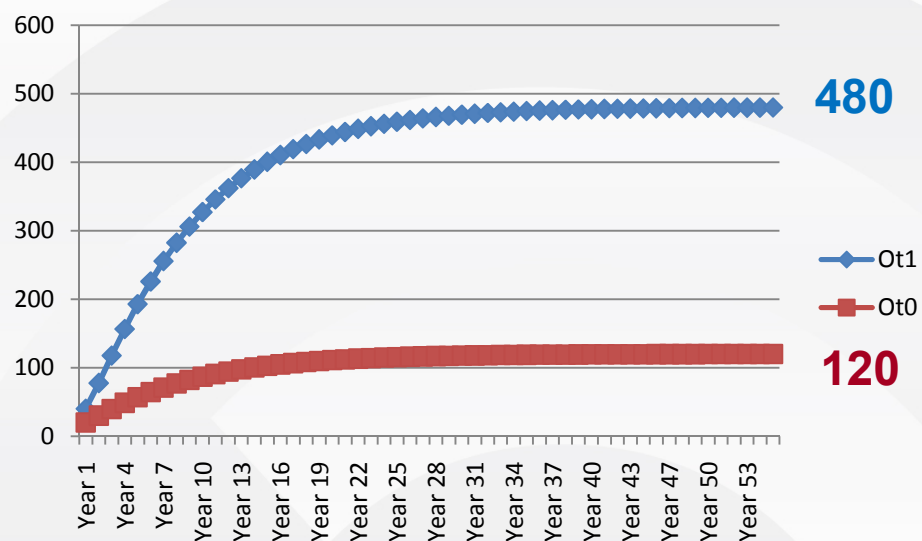
$$O_t = A_t K_t^\beta L_t^{1-\beta}$$

$$O_t = 2 K_t^\beta L_t^{1-\beta}$$



Innovation & Economic Growth

$$480 = 4 \times 120$$



Productivity: 2X

Long Run GDP: 4X



The Innovation Multiplier

Labor and capital more productive
Incentives to invest in more capital.

Additive or Multiplicative?

$$2+2 = 4 \quad ; \quad 2^2=4$$

[Innovation & Economic Growth]

Introduction of an innovation that would multiply the productivity by **3**

Harvest by Vibration



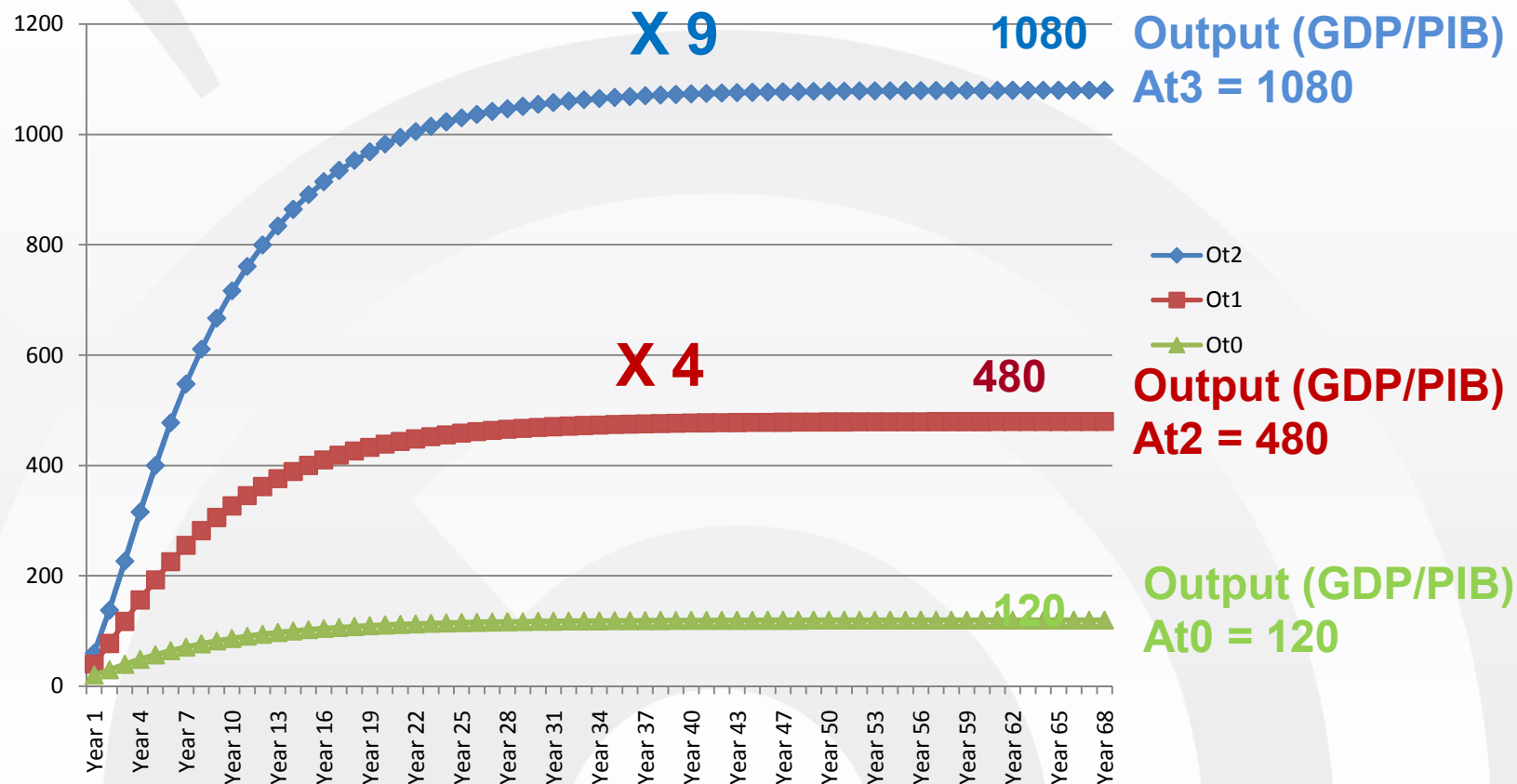
Olive trees have been cultivated for centuries in Mediterranean climates, including California's Central Valley (shown). New super-high-density hedgerow systems allow for mechanical harvesting, greatly reducing labor costs.

Intensive Vs
Extensive



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Innovation & Economic Growth



History & precision of concepts

- ❑ **National Innovation System (NIS)** first coined by **Chris Freeman (1987)** it was known by a handful of scholars (Lundvall, Nelson)
- ❑ A decade later there was a **rapid dissemination of the concept among innovation stakeholders** and scholars from various fields of knowledge particularly economic geographers when they study innovation and competence building phenomena.
- ❑ this rapid **dissemination was accompanied by an alteration and misuse** by policymakers and many academics **of the concept as compared to the original versions** developed by the early scholars : **Focus on science based innovation** with “innovation policies” predominantly aiming at the promotion of R&D and R&D infrastructure in high-tech sectors.
- ❑ Empirical evidences show that a double emphasis is needed not only on R&D and science infrastructure but also on **institutions and organizations supporting learning and competences building** at national as well as regional levels

[History & precision of concepts]

- ❑ This neglect stems first from the **dominance of standards economics** mindset (Neo-classical) in international organizations and among policymakers + It's not easy to measure
- ❑ Another factor that contributed to this narrow understanding of innovation is **the wide misuse of the Triple Helix Model** (overemphasize the role of universities in innovation) **not as a tool to analyze a subsystem of innovation** but as **an equal alternative to the NIS approach**.
- ❑ This rapid dissemination was accompanied by an **alteration and misuse by policymakers** and many academics of the concept as compared to the original versions developed by the early scholars : **Focus on science based innovation** with **"innovation policies"** predominantly aiming at the **promotion of R&D and R&D infrastructure in high-tech sectors**.

[History & precision of concepts]

- ❑ All the **definitions of innovation** highlight the aspect of “a **successful exploitation**” of the innovative idea **in the Market**.
- ❑ **Bringing an innovation to the Market** - whether is it science based or not- would **require organizational learning, industrial networks, employees contribution and competences building**. These processes are referred to as experienced-based learning or **DUI learning: learning by Doing, Using and Interacting**
- ❑ **Triple Helix Model** approaches might be suitable for capturing processes **linking science and technology to innovation** referred to as **STI learning** they fail to take properly into account experience based learning (DUI learning).

[How to use NIS ?]

- ❑ Some critics might say that **NIS is a just concept and not a theory** in a sense that it does **not stipulate general laws of cause and effect**.
- ❑ In fact, **NIS perspective** does what a theory should do: ***It provides a framework for organizing and focusing the analysis, it helps explaining what has happened and foreseeing what is going to happen and offers a rational for action.***

[Knowledge at the heart of Innovation]

National Innovation System or National Learning System?

- ❑ “The most fundamental **resource** in the modern economy is **knowledge** and, accordingly, **the most important process is learning**”. In a knowledge based economy, **capacity to learn is the most critical factor for economic success** of individuals, regions and countries.
- ❑ **Knowledge** comes in two forms: **explicit** (easily codified in letters, words, videos,) and **tacit/implicit** (non-codified).
- ❑ Lundvall and Johnson (1994) introduced a distinction between **four categories** of knowledge critical to innovation:
 - ✓ **Know what** : refers to access to information (usually explicit);
 - ✓ **Know Why**: refers to understanding laws and principals usually through R&D and training;
 - ✓ **Know How**: refers to the experience based knowledge (tacit) learnt through doing, using and interacting;
 - ✓ **Know Who**: to the social capital of the enterprise and the degree of its integration in knowledge based networks.

Challenges in studying NIS

- ❑ **US at the top of performance** together with the **small Nordic countries**. But **their system is fundamentally different** in terms of institutions and characteristics (population size, size of the public sector, degree of inequality, culture, industrial structure and mode of innovation). there is **no reason to assume** that the **mechanism linking R&D effort to innovation** and economic performance **is the same** in the two countries
- ❑ It is important to **develop and use analytical techniques** that make it possible to study **how different factors interact in a systemic context**. 'population' is so small and heterogeneous.
- ❑ **Clustering procedures** in statistical analysis are more effective dividing the population into different 'sub-species' or 'families' with common characteristics (level of development, size, continental belonging etc.) and second in **looking for patterns of interdependency** for each of the different families and **finally** relating this to multidimensional indicators of economic performance.

Challenges in studying NIS

- ❑ *Understanding knowledge and learning.* how different kinds of knowledge are created and used in the process of innovation. Different sectors in the economy and in society make use of different mixes of local and global knowledge, tacit and explicit, etc.
- ❑ .

[Types of learning]

Box 7: National patterns in Work Organisation¹⁷

Table 1 below originates from paper by Lorenz and Valeyre (2006). The four organisational models were constructed on the basis of factor analysis of responses to surveys addressed to employees in 15 European countries.

Table 1: National Differences in Organisational Models (percent of employees by organisational class)

	Discretionary learning	Lean production learning	Taylorist organisation	Simple organisation
North				
Netherlands	64,0	17,2	5,3	13,5
Denmark	60,0	21,9	6,8	11,3
Sweden	52,6	18,5	7,1	21,7
Finland	47,8	27,6	12,5	12,1
Austria	47,5	21,5	13,1	18,0
Centre				
Germany	44,3	19,6	14,3	21,9
Luxemb.	42,8	25,4	11,9	20,0
Belgium	38,9	25,1	13,9	22,1
France	38,0	33,3	11,1	17,7
West				
UK	34,8	40,6	10,9	13,7
Ireland	24,0	37,8	20,7	17,6
South				
Italy	30,0	23,6	20,9	25,4
Portugal	26,1	28,1	23,0	22,8
Spain	20,1	38,8	18,5	22,5
Greece	18,7	25,6	28,0	27,7
EU-15	39,1	28,2	13,6	19,1

Source : Lorenz and Valeyre (2006)

[STI & DUI impact]

Table 2: The probability that firms develop a new product or a new service

<i>Variables</i>	Odds estimate	ratio Coefficient estimate	Odds estimate	ratio Coefficient estimate
STI Cluster	3.529	1.2611**	2.355	0.8564**
DUI Cluster	2.487	0.9109**	2.218	0.7967**
DUI/STI Cluster	7.843	2.0596**	5.064	1.6222**
Business services			1.433	0.3599
Construction			0.491	-0.7120*
Manuf. (high tech)			1.805	0.5905*
Manuf.(low and med. tech)			1.250	0.2229
Other services			0.747	-0.2923
100 and more employees			1.757	0.5635*
50-99 employees			0.862	-0.1481
Danish group			0.859	-0.1524
Single firm			0.521	-0.6526*
Customised product			1.378	0.3203
Pseudo R ²	0.1247	0.1247	0.1775	0.1775
N	692	692	692	692

** = significant at the .01 level

* = significant at the .05 level

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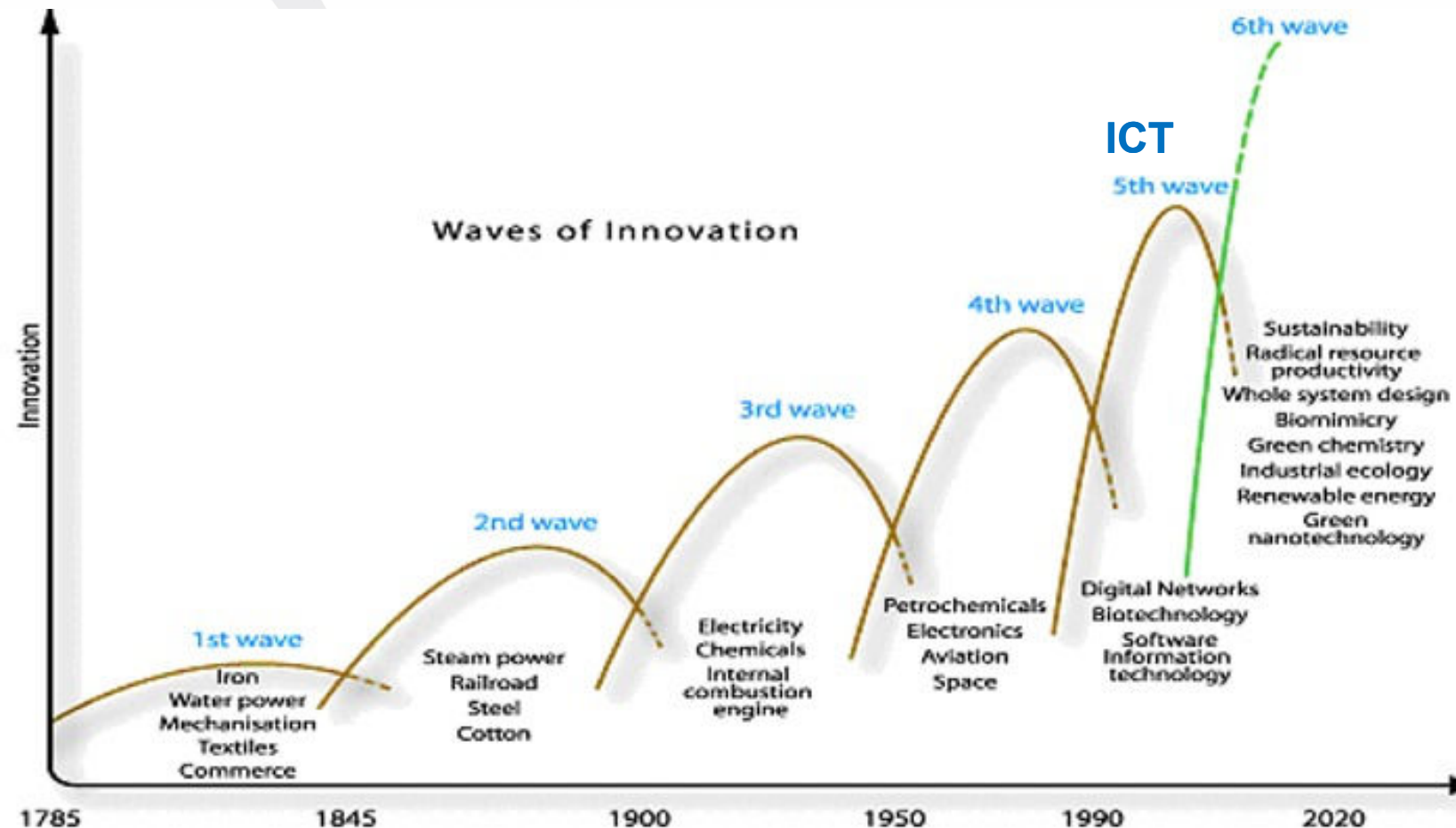
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[Relevant issues to innovation]

- Why we need to innovate?
- How can we promote it?
- What **linkages** are there between **research and innovation**?
- **Is it the same story across sectors**(software, Auto, Agro-food, etc.)?

[Relevant issues to innovation]



*As Time Goes By: From the **Industrial Revolutions** to the **Information Revolution*** (Chris Freeman & Francisco Louçã)

[Sectoral Patterns of Innovation]

Attempts to classify sectoral patterns of innovation & technological change

- **High R&D intensity** (electronics, pharmaceuticals) and **low R&D intensity** (textiles, shoes) (EC, OECD)
- Schumpeter **Mark 1** 'creative destruction' easy entry, entrepreneurial role, innovation (machine, biotech), Schumpeter **Mark 2** 'creative accumulation' large firms, barriers to entry (semiconductors 1990s, mainframes 1950-1990s)
- **Nature of knowledge and learning** (Malerba and Orsenigo 1996/7): technological opportunities, appropriability conditions, cumulativeness
- **Sources of R&D for other sectors** (computers, instruments), **users of technology** (textiles, steel) (Scherer 1982)
- **Nucleus sectors** (electronics, machinery, instruments, chemicals) that generate innovations, **secondary sectors** in generating innovation (auto, steel), **user sectors** (services) (Robson et al 1988)

[Sectoral Patterns of Innovation]

Why sectoral innovation systems ?

Innovation in sectors is the result of **different learning processes**, of the **use of different knowledge** and of the **interaction of different actors**

Major differences across sectors exist in the relative importance of product and process innovations, size and diversification of innovating firms

Sector regularities: in *some sectors* the **source of technology is suppliers of equipment** (**textiles, construction**), other contribute to their **process or product technology** (**chemicals**). Firms in **assembly** and **continuous process industries** (**autos or steels**) concentrate on **process innovation**, mechanical and electrical engineering (**machinery**) concentrate on **product innovation**

[Sectoral Patterns of Innovation]

Attempts to classify sectoral patterns of innovation & technological change

- In the face of a such diversity there are **two opposite dangers** :
 1. **To generalise** about the **nature, source, directions and strategic implications of innovation on the basis of one firm or in one sector.**
 2. To **say that all firms and sectors are different** and that **no generalisations can be made.** In this case, **there can be no cumulative development of useful knowledge.**

Sectoral Patterns of Innovation

Pavitt's (1984) taxonomy of sectoral patterns of innovation

Category of firm	Typical core sectors	Determinants of technological Trajectories			Technological trajectories	Measured characteristics				
		Sources of technology	Type of user	Means of appropriation		Source of process technology	Relative balance between product and process innovation	Relative size of innovating firms	Intensity and direction of technological diversification	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
Supplier dominated	Agriculture; housing; Private services traditional manufacture	Suppliers Research extension services; big users	Price sensitive	Non-technical (e.g. trade-marks, marketing, advertising, aesthetic design)	Cost-cutting	Suppliers	Process	Small	Low vertical	
Production intensive	Scale Intensive	Bulk materials (steel, glass); assembly (consumer durables & autos)	PE; suppliers; R&D	Price sensitive	Process secrecy and know-how; technical lags; patents; dynamic learning economies; design know-how; knowledge of users; patents	Cost-cutting (product design)	In-house; suppliers	Process	Large	High vertical
	Specialised Suppliers	Machinery; instruments	Design and development users	Performance sensitive		Product design	In-house; customers	Product	Small	Low concentric
Science based	Electronics/ electrical; chemicals	R&D Public science; PE	Mixed	R&D know-how; patents; process secrecy and know-how; dynamic learning economies	Mixed	In-house; suppliers	Mixed	Large	Low vertical High concentric	

Note: PE = Production Engineering Department

Source: Pavitt (1984)

[Sectoral Patterns of Innovation]

Supplier Dominated

Production Intensive
Scale Intensive

Production Intensive
Specialized Suppliers

Science Based

Typical Sectors: Agriculture; housing; **services**, construction, traditional manufacturing

Sources of technology and innovation : Minor contribution to their process or product technology ((Weak in-house R&D and engineering). Most **process innovations** come from suppliers of equipment and materials (IT-intensive design) Research extension services; big users.

Type of user: Price sensitive

Means of appropriation : Non-technical (e.g. trademarks, marketing, advertising, aesthetic design, skills)

Technological trajectories: Cost-cutting through Process innovation.

Size of innovating firms: Small

[Sectoral Patterns of Innovation]

Supplier Dominated

Production Intensive
Scale Intensive

Production Intensive
Specialized Suppliers

Science Based

Typical Sectors: Firms producing **Bulk materials** (steel, glass, food industry) and **durable consumer goods & vehicles**. Technological skills are used to exploit scale economies.

Sources of technology and innovation : Production & Engineering Dept (**Process Innovation**), **In-house R&D (product design)**, **specialized Suppliers** of equipment and instrumentation.

Type of user: Price sensitive

Means of appropriation : Process **secrecy** and **know-how**; **technical lags**; **patents**; dynamic learning economies; design know-how; knowledge of users;

Technological trajectories: Cost-cutting

Size of innovating firms: Large

[Sectoral Patterns of Innovation]

Supplier Dominated

Production Intensive
Scale Intensive

Production Intensive
Specialized Suppliers

Science Based

Typical Sectors: Machinery; Equipment & instruments.

Sources of technology and innovation : Design and development, users,

Type of user: Performance sensitive

Means of appropriation : firm-specific skills reflected in continuous improvements in product design and the ability to respond sensitively & quickly to users' needs;

Technological trajectories: Product-design

Size of innovating firms: Small

[Sectoral Patterns of Innovation]

Supplier Dominated

Production Intensive
Scale Intensive

Production Intensive
Specialized Suppliers

Science Based

Typical Sectors: Pharmaceutical, Chemical and the Electronic/Electrical sectors.

Sources of technology and innovation : in house R&D and engineering departments, Public R&D,

Type of user: Performance and Price sensitive

Means of appropriation : Patents (esp. Chemistry) secrecy, technical lags, firm-specific skills and ability to operate large scale assembly);

Technological trajectories: Mixed (cost cutting + Product-design)

Size of innovating firms: Large

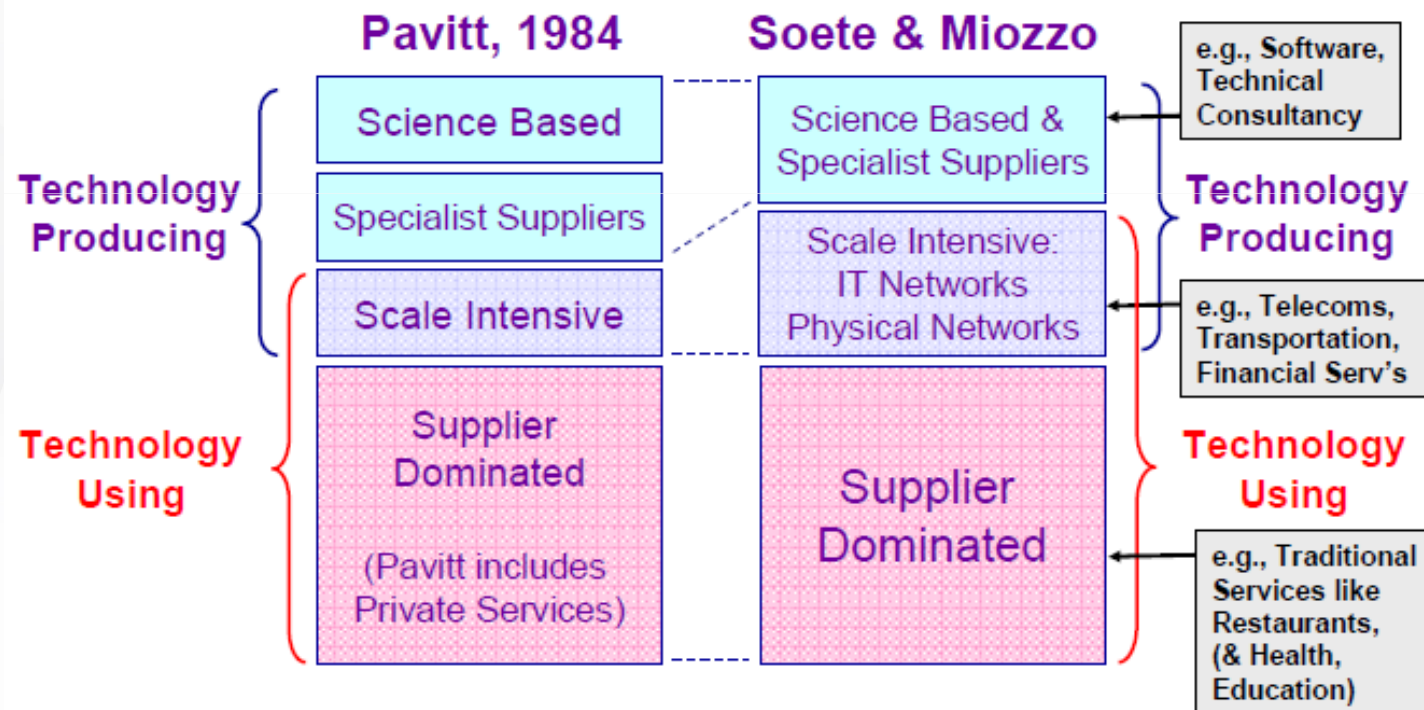
[Sectoral Patterns of Innovation]

Pavitt's (1984) taxonomy was an important leap forward in understanding sectoral innovation patterns but:

- Most of **understanding of innovation derived** from studies of **manufacturing and product** innovation;
- Provides a **poor understanding of service Innovation** although **services account for more than 70% of Added Value and Employment** in the industrialised economies;
- Neglects the **pervasive and disruptive impact** that had **ICT** after the 80s on both sectors **manufacturing & services** + the transmission of IT from **capital goods sector to services**: from (back office) **process improvements** (efficiency of delivery of existing services), to **process innovations** (service quality), to **product innovations** (new services),

[Sectoral Patterns of Innovation]

Pavitt's & Soete-Miozzo's Taxonomies



[Sectoral Patterns of Innovation]

Supplier Dominated

Scale Intensive
physical networks

Scale Intensive
Information networks

Science Based

Typical Sectors:

1. Personal Services (Restaurants, Laundry, Beauty).
2. Public and Social Services (Health, Education)

Sources of technology and innovation : weak in-house R&D, engineering capability & software expertise. **Most of the innovations are coming from suppliers of materials, information, equipment and ICT** sector.

Type of user: 1) Performance sensitive 2) quality sensitive

Means of appropriation : 1) Non-technical (e.g. trade-marks, marketing, advertising, aesthetic design, skills)
2) not allowed, public,

Technological trajectories: **Mixed** 1) Product-design 2) Performance improvement,

Size of innovating firms: 1) Small 2) Large

[Sectoral Patterns of Innovation]

Supplier Dominated

Scale Intensive
physical networks

Scale Intensive
Information networks

Science Based

Typical Sectors: Services involving large back office administrative tasks that are **suitable for** the application of **ICT to reduce costs** (Transport & travel, Wholesale, distribution)

Sources of technology and innovation : Manufacturers and **Software** companies .

Type of user: Price sensitive

Means of appropriation : Standards and norms

Technological trajectories: cost cutting and networking,

Size of innovating firms: Large

[Sectoral Patterns of Innovation]

Supplier Dominated

Scale Intensive
physical networks

Scale Intensive
Information networks

Science Based

Typical Sectors: Firms dependent on elaborate information networks (e.g., **banks, insurance, telecom & broadcasting**), Public utilities such as **electricity, water & gas supply** might be included.

Sources of technology and innovation : Manufacturers (ATMs for banks) Software companies, in house.

Type of user: Price sensitive

Means of appropriation : Standards and norms

Technological trajectories: cost cutting and networking,

Size of innovating firms: Large

[Sectoral Patterns of Innovation]

Supplier Dominated

Scale Intensive
physical networks

Scale Intensive
Information networks

Science Based

Typical Sectors: Since late 80s Emergence of an increasing nb **Business services** closely linked to **R&D**, **software** and DL of **IT applications**.

Sources of technology and innovation : in-house R&D and engineering capabilities, customers, suppliers.

Type of user: Performance sensitive

Means of appropriation : R&D Know How , skills
Copyright, product differentiation,

Technological trajectories: System design,

Size of innovating firms: Small & medium

Catching up in different sectoral systems

What can we learn from the story of catch-up in six different sectors in emerging Countries (Taiwan, Korea, Brazil, India, China, and others)?

1. **Pharmaceuticals** (Science based),
2. **Autos** (scale intensive),
3. **Software** (specialized supplier and service sectors),
4. **Semiconductors** and **Telecom** (design and engineering is important),
5. **Agro-food** (traditional sectors).

« **Catching-up in different sectoral systems: evidence from six industries** »

Franco Malerba & Richard Nelson (2010)

Catching up in different sectoral systems

Common features affecting catch-up in 6 sectors

Firms Learning

Access to foreign
Knowledge

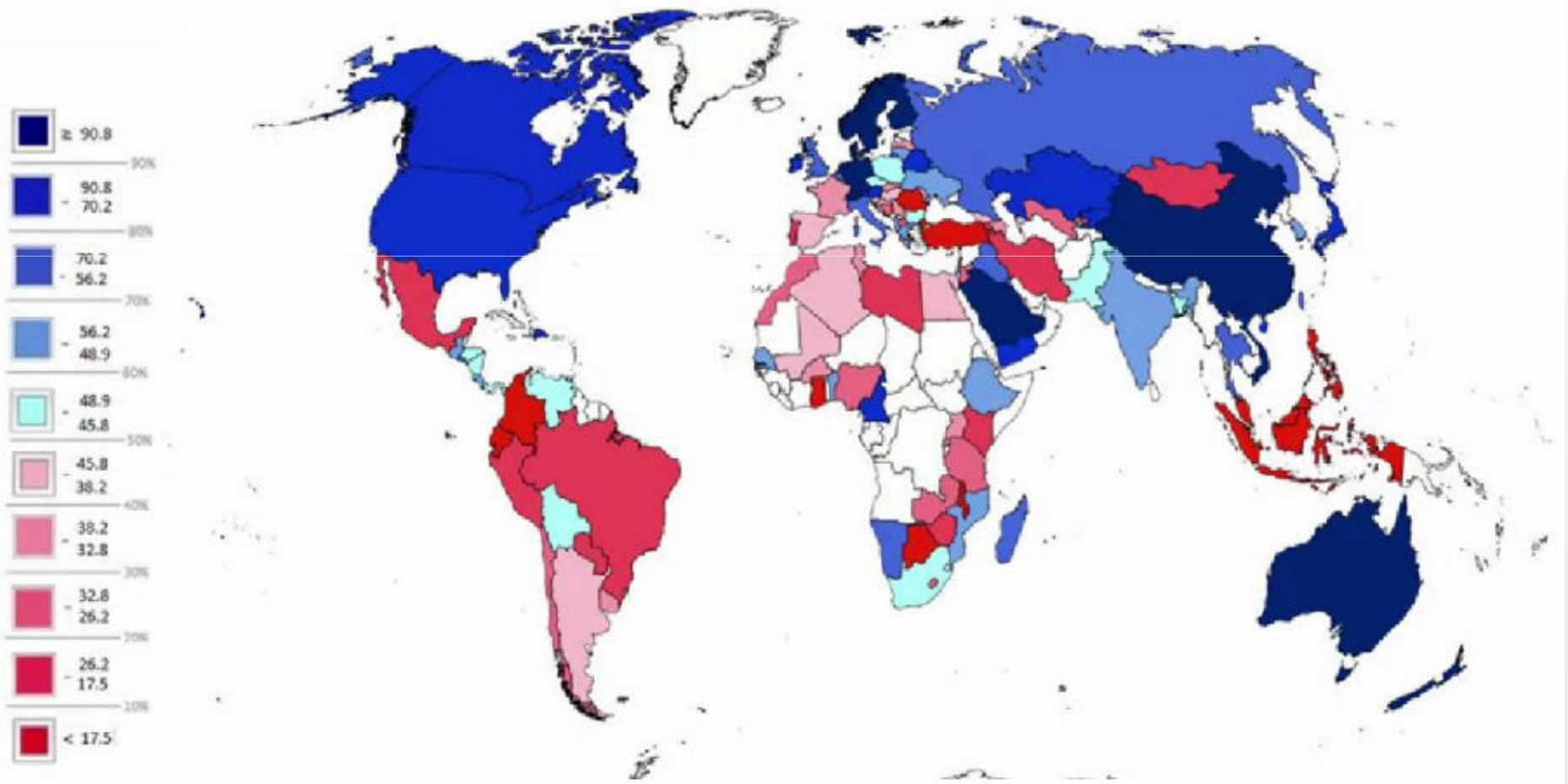
Skilled Human Capital

Active Government
Policy

- *firms are the key actors in catch-up , Learning and Capabilities development of domestic firms is a necessary condition for catch up because they provide the catching up country with the ability of absorbing foreign knowledge & technology and adapting and modifying them to generate new knowledge and products.*
- **Learning** comes in 4 forms:
 - Learning by **Interacting** (building trust among stakeholders)
 - Learning by **Searching**
 - Learning by **Doing**
 - Learning by **Using**

Catching up in different sectoral systems

World Map of Trust



Catching up in different sectoral systems

Common features affecting catch-up in 6 sectors

Firms Learning

Access to foreign
Knowledge

Skilled Human Capital

Active Government
Policy

- the channels to which this access took place have differed (sector & country). from vertical networks with suppliers and users, to local networks, collaborative R&D or production agreements, to participation to the global value chain or just outsourcing;
- When access to foreign knowledge did not take place, as in telecommunications in India and Brazil, the catch-up process has been seriously unpaired

Catching up in different sectoral systems

Common features affecting catch-up in 6 sectors

Firms Learning

Access to foreign
Knowledge

Skilled Human Capital

Active Government
Policy

- Important **inward mobility from advanced countries of highly skilled** human capital (scientists, engineers, technopreneurs) Diasporas and foreigners (consultants) were critical to the catch-up)

Catching up in different sectoral systems

Common features affecting catch-up in 6 sectors

Firms Learning

Access to foreign
Knowledge

Skilled Human Capital

Active Government
Policy

- In our 6 sectors government policy has indeed stimulated and fostered the learning processes and the capability formation of domestic firms with different intensity and tools.

Catching up in different sectoral systems

Industry Structure

Demand and vertical
links

Gov Policies

Other elements

Differences across sectoral systems

- In **automobile** and **telecom** large firms have been major actors in the catch-up process
- in **software** and **agro-food** small firms have driven sectoral growth
- **New entrepreneurial firms**, SMEs or large size, characterize the **pharmaceutical** and the **semiconductor firms**
- **local networks** important for the catch-up process in **semiconductors** (**Taiwan**) , formal and informal interaction, knowledge sharing
- Advent of **technological** and **market discontinuities** may favour either totally newcomers or established domestic companies. (**Software** in India Vs **Telecom & Pharmaceuticals** where knowledge is cumulative and strongly science based)

Catching up in different sectoral systems

Industry Structure

Demand and vertical
links

Gov Policies

Other elements

Differences across sectoral systems

➤ Multinational companies played different roles :

1. **software, pharmaceuticals and semiconductors:** catching up countries had to **specialize in some product range in the global value chain** and eventually move up the learning ladder to more advanced stages of production or research.
2. **Telecom and Autos:** the use of **license** from multinationals or from foreign firms, or **joint ventures and alliances** have been extensively used by domestic firms to learn and accumulate capabilities.

Catching up in different sectoral systems

Differences across sectoral systems

Industry Structure

Demand and vertical
links

Gov Policies

Other elements

- Demand has entered catch-up in two ways:
 1. **Exports:** have been the drivers of catch-up, for both small firms and large firms. This is the case of **semiconductors, telecom, pharmaceuticals, software and auto.**
 2. **Domestic Market:** has been a major driver of the learning process and the accumulation of capability by domestic firms in Large countries such as **China, India and Brazil;**

Catching up in different sectoral systems

Differences across sectoral systems

Industry Structure

Demand and vertical
links

Gov Policies

Other elements

- Government policy has differed in the use of tools and measures
 1. Telecom (Korea and China) - public policy used R&D support, R&D consortia and public research organizations to help firms to move into new generations of telecom technologies and products
 2. In software governments have used different policies and tools, ranging from public procurement, to R&D support for SMEs, favourable companies tax rates and incentives to attract foreign direct investments

Catching up in different sectoral systems

Differences across sectoral systems

Industry Structure

Demand and vertical
links

Gov Policies

Other elements

- **Standards, regulations and norms** : for relax IP laws were important for the catch-up of **Pharmaceutical** industry in **India and Brazil**
- **Finance: VC** (Private equity) critical for the development of **Software industry**

**Catching up in
different sectoral
systems**

Differences across sectoral systems

Universities & Public Research Laboratories

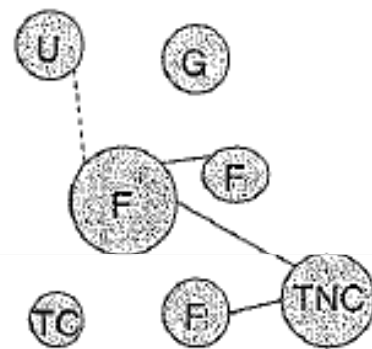
- In some sectors such as **Agriculture, health and Telecom** Public research proved quite relevant to domestic firms
- In the other sectors the main role of universities was to provide advanced training for advanced human capital in the scientific, engineering and managerial fields. So they increase the absorptive capacity of the human capital for foreign cutting edge knowledge.

[Innovation Policy in a developing country]

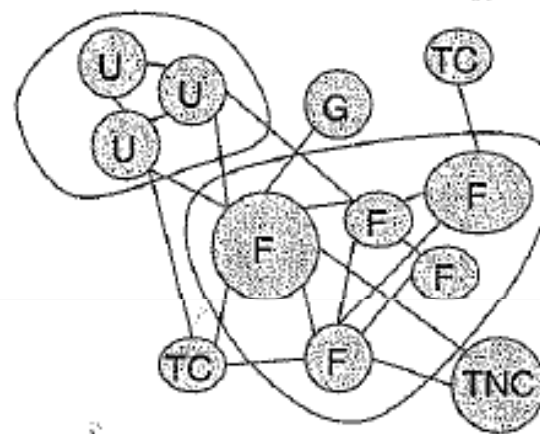
- ❑ **Why innovation policy for developing countries ?** because innovation and learning, understood in a broad sense are fundamental for growth and industrial competitiveness and thus for catching-up.
- ❑ What should be the **rational for innovation policy**? For Whom, when, where and how we should intervene in the system?
 - ✓ **Neo-classical approach:** when there is **a Market Failure**
 - ✓ **NIS approach:** Whenever and wherever there is **a systemic problem** within the NIS
- ❑ **Systemic problems:** systemic problem is broadly defined as the inability of the system to support the creation, absorption, retention, use and dissemination of economically useful knowledge through interactive learning or in-house R&D investments.

Innovation Policy in a developing country

Emerging IS



Mature (well functioning) IS



Time

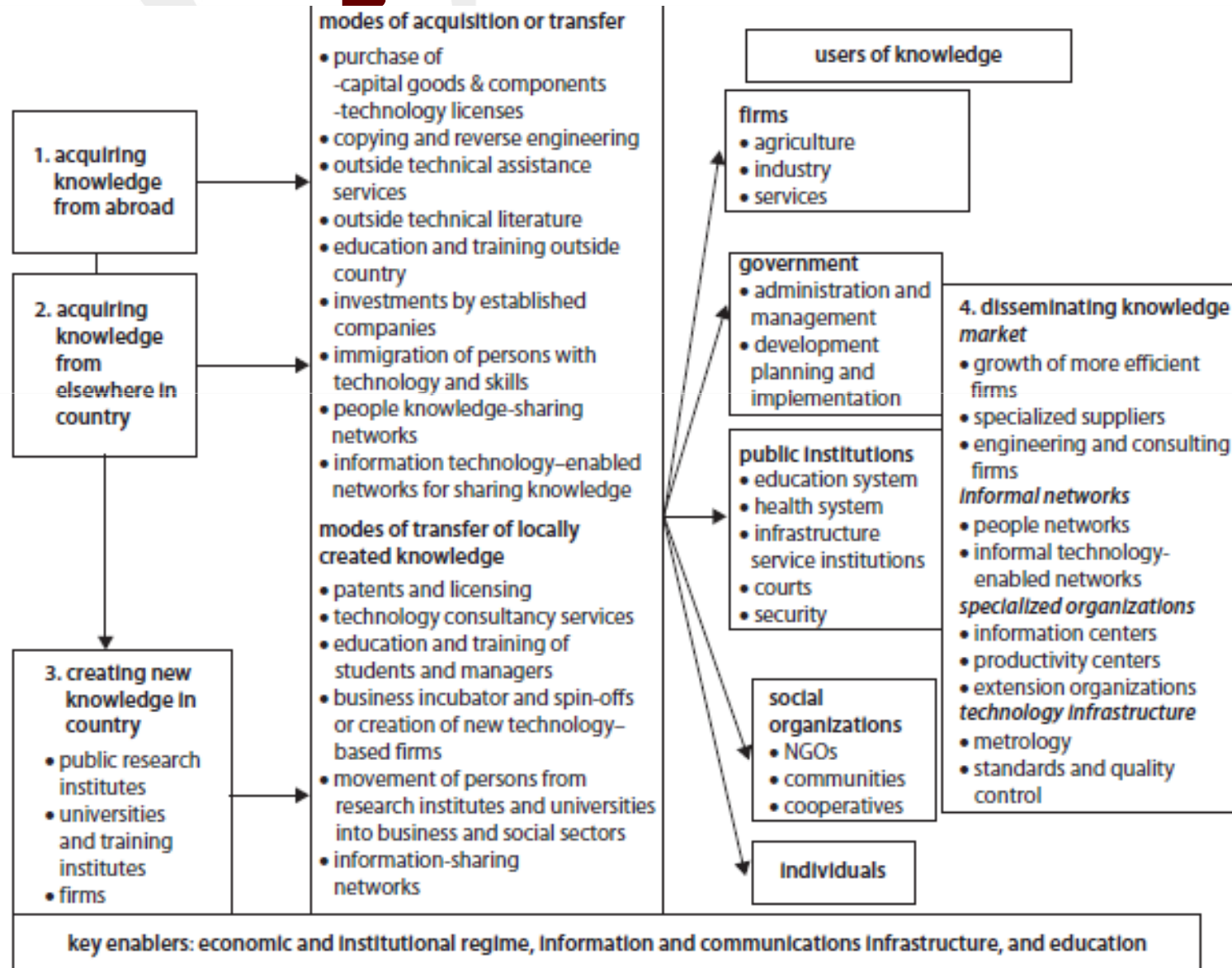
(F) Indigenous firms
(U) Universities
(TC) Technological centres

(G) Government
(TNC) Transnational corporations

Innovation Policy in a developing country

- ❑ There are **systemic problems** that are related to the **components of the system** and others related to the **functioning of the system**:
 1. the **system might be deficient in some types of organizations**, like research institutions, learning firms or intermediate organizations (infrastructure problems)
 2. the organizations might be there, but they might be **lacking sufficient competences** (human, organizational, technological and so forth) reflected in a **limited capacity to learn, adopt or produce** new technologies over time
 3. The lack of competences might also constrain their ability to engage in **interactive learning** with other organizations of the system, thus causing **network problems**.
 4. The **interaction** might also be limited by, for example, the **absence of trust** between the agents (**informal institutional problems**) or for example, a deficient regulation (**formal institutional problems**).

Conclusion





get your idea
moving!

Thanks for your attention !

شكراً لإصغائكم !

[Research Commercialization]

