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Globelics Academy
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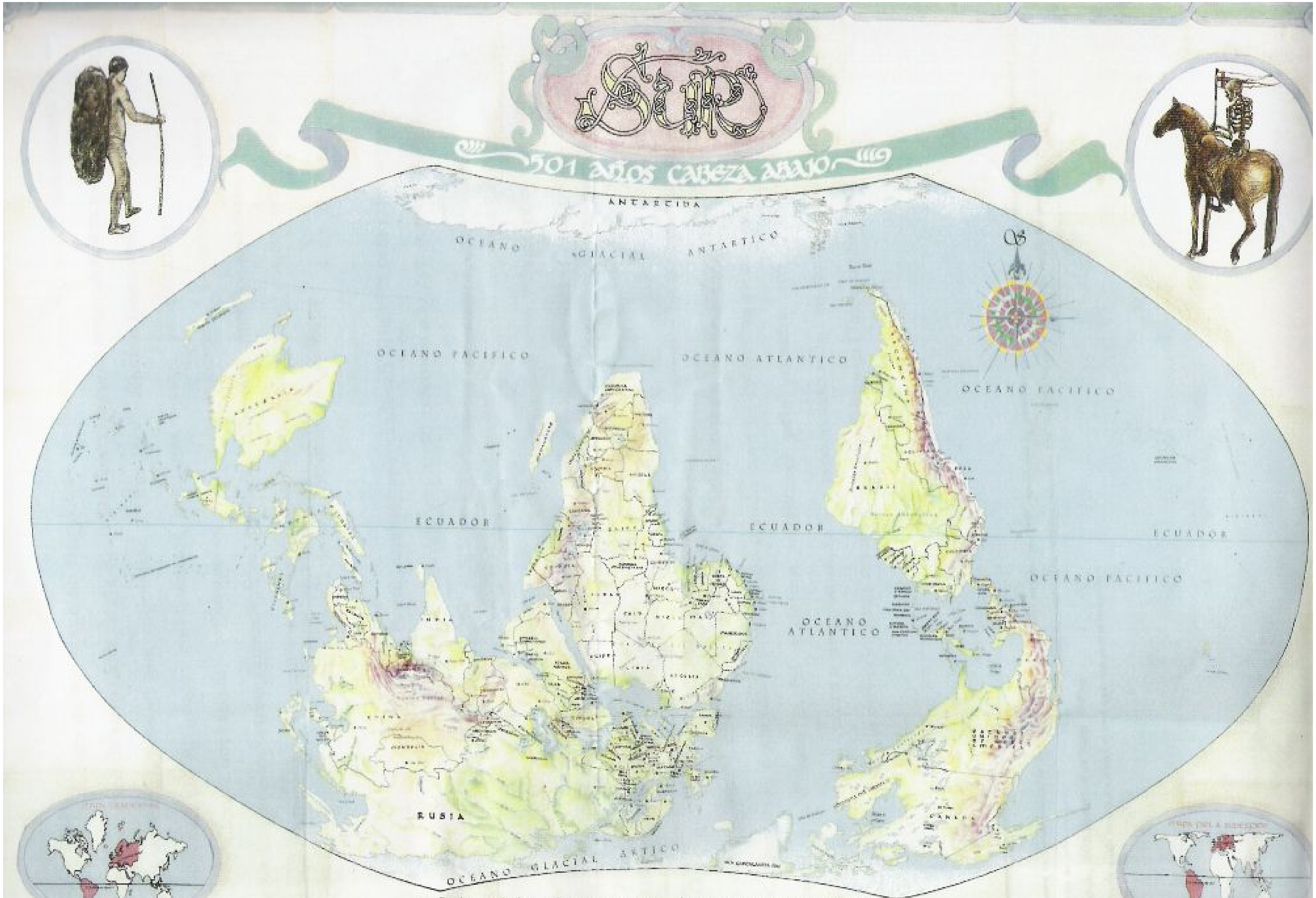
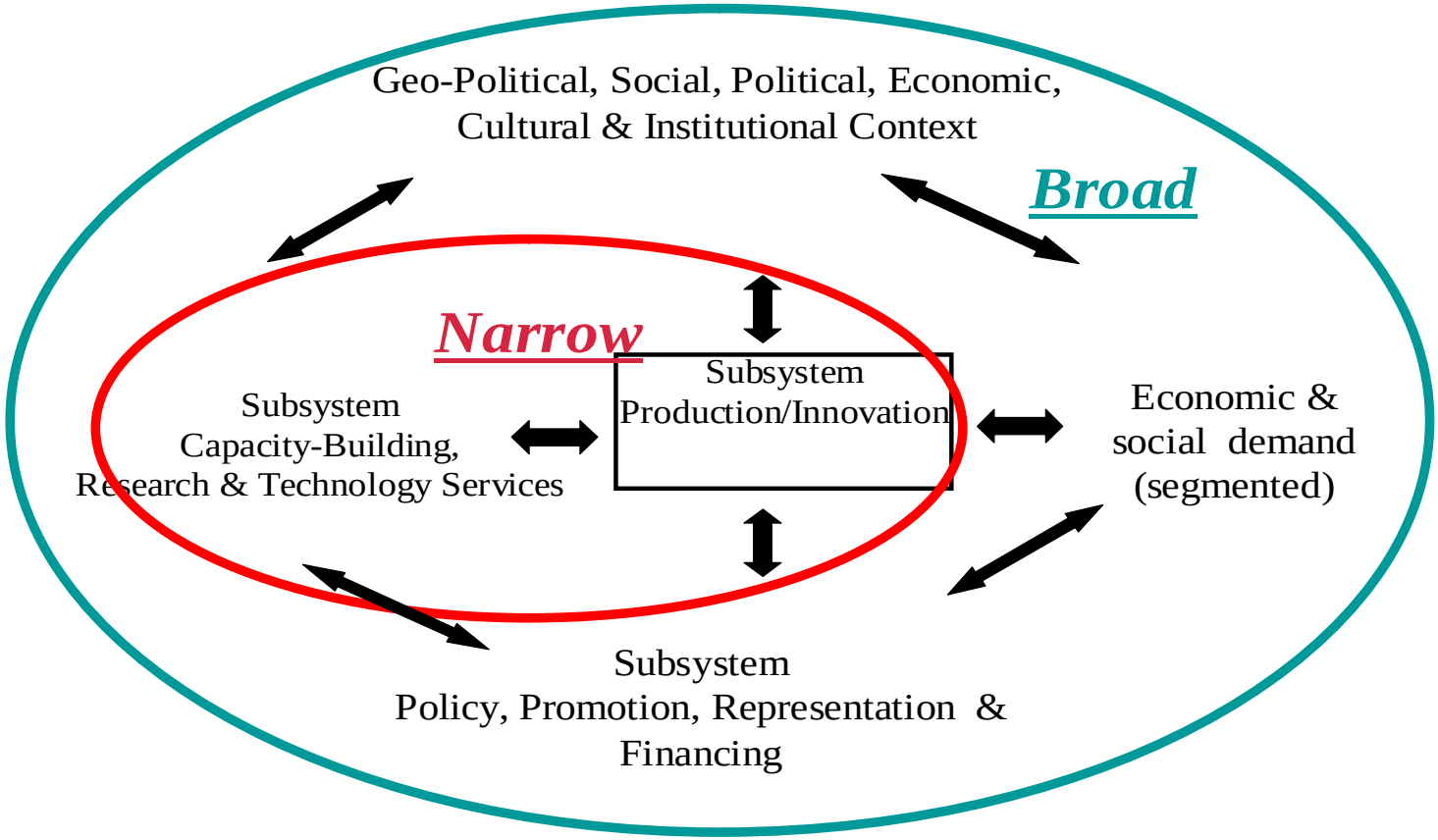


Hasta el mapa miente. Aprendemos la geografía del mundo en un mapa que no muestra el mundo tal cual es, sino tal como sus dueños mandan que sea. En el planisferio tradicional, el que se usa en las escuelas y en todas partes, el Ecuador no está en el centro, el norte ocupa dos tercios y el sur, uno. América Latina abarca en el mapamundi menos espacio que Europa y mucho menos que la suma de Estados Unidos y Canadá, cuando en realidad América Latina es dos veces más grande que Europa y bastante mayor que Estados Unidos y Canadá. El mapa, que nos achica, simboliza todo lo demás. Geografía robada, economía saqueada, historia falsificada, usurpación cotidiana de la realidad: el llamado Tercer Mundo, habitado por gente de tercera, abarca menos, come menos, recuerda menos, vive menos, dice menos.

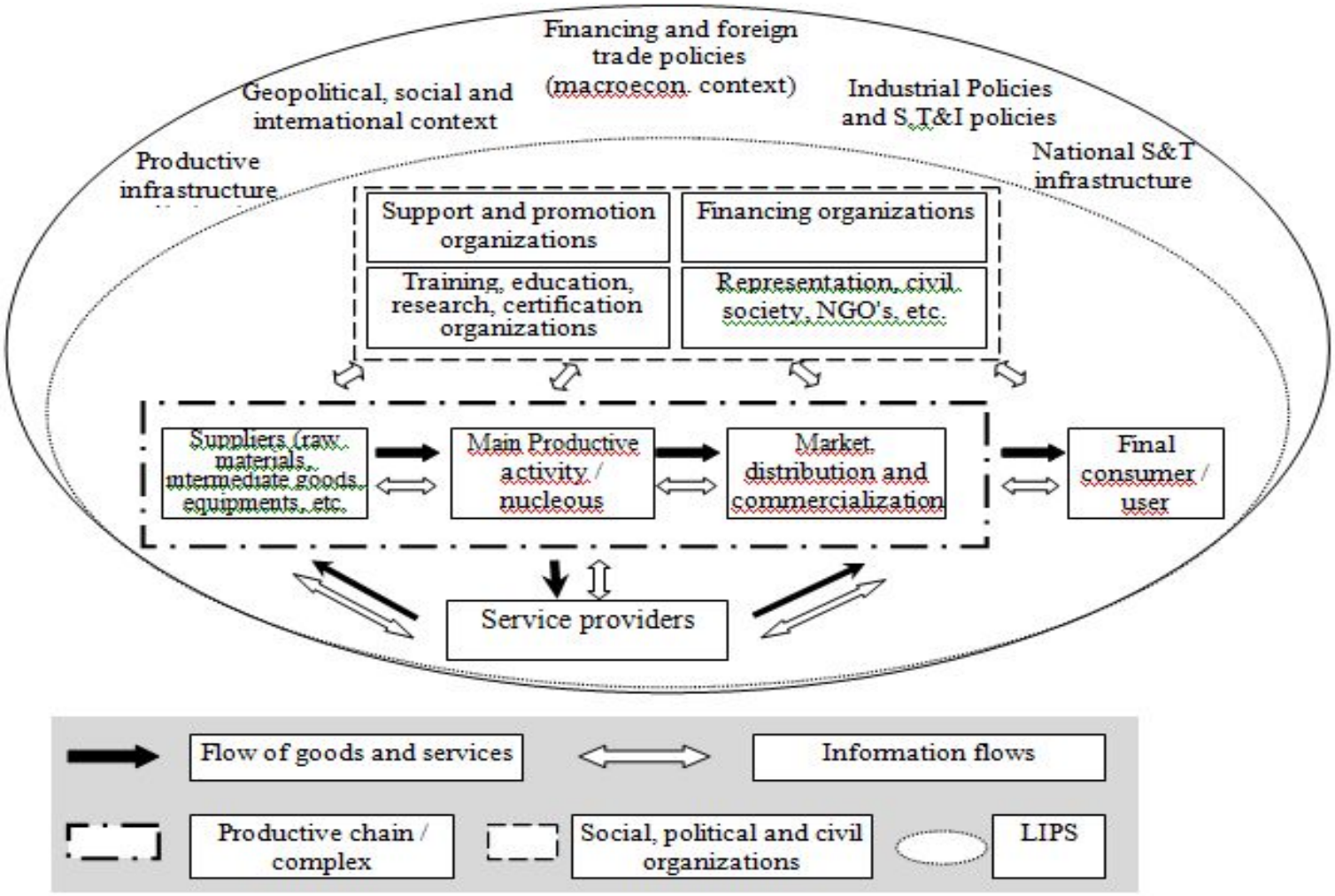
Eduardo Galeano

The Broad NSI



Analysing the System of Innovation

Territory and activity



Sectoral Systems of Innovation

- What are sectors?
- supply : same technical base
- demand: same characteristics of goods

Innovation systems and knowledge bases

Smith, K. (2000) **What is the 'knowledge economy'? Knowledge-intensive industries and distributed knowledge bases.**

Figure 4. Activities, technology/knowledge areas and knowledge network in the Norwegian food processing industry

Activity	Technology/Knowledge-area	Knowledge suppliers
Selection and preparation of raw materials	Filtering-, centrifugal-, washing technology; steaming (thermic treatment); sensorics; molecular biology and micro biology; chemistry and biochemistry	Matforsk, Norconserv, NLH, NVH
Processing	Process lines (engineering); IT and informatics; logistics; heating and refrigerating technology; sensorics; molecular biology, micro-biology, bacteriology; chemistry, biochemistry; analytical chemistry; gastronomical skills	Norconserv, Matforsk., NLH, NVH, NTNU (kkt); SINTEF, Norske Meierier, Potetindustriens Laboratorium
Preservation and storing	Cooling/freezing technology; vacuum; hermetics and modified atmosfere packing; sterilisation; pasteurisation and homogeinisation; biological preservation (f.ex. fermentation); bio-technology; bio-chemistry; bacteriology and micro-biology; analytical chemistry	NLH, NVH (ins. fmn), Matforsk (avd. pros.), Norconserv, SINTEF (knt), NTNU (kkt), Norsk Kjøtt, NTH (ins. kt)
Packing/wrapping and coating	Disposal technology and environmental issues; materials technology; process lines (engineering, informatics); design; consumer preferences and merketing; micro-biology and bacteriology; bio-chemistry and analytical chemistry; cooling/freezing technology; vacuum; hermetics and modified atmosfere packing	NVH (ins. fmn; ins.bfe), Norske Meierier, Matforsk (avd.kval.), Norconserv, NLH
Hygiene and safety	Micro-biology; bacteriology; bio-chemistry; analytical chemistry	Norsk Kjøtt, Norske Meierier, Potetindustriens Laboratorium, NVH (ins. fmn), Matforsk (avd.kval.), NLH, SSF
Quality and nutrition	Chemistry; micro-biology; additives; texture; sensoric analysis and evaluation	Matforsk, Norconserv, NLH, UiO NVH (ins. fmn; ins.bfe), Norsk Kjøtt, Norske Meierier, Fisk.dir. Ernær.inst.
Quality control and quality documentation	Testing/measurement technology; spectroscopology; sensorics; micro-biology and bacteriology; bio-chemistry and analytical chemistry	Norske Meierier, Kontroll inst. f. meierlprodukter; Norconserv; NVH (ins. fmn; ins.bfe),NLH, Matforsk (avd. kval.)
Transport and distribution	Logistics; IT and informatics; general transport technology; cooling/freezing technology; micro-biology and bacteriology; bio-chemistry and analytical chemistry	SINTEF (knt), NTNU (ikt), NLH, Matforsk, NVH (ins. fmn), UiO (informatics and logistics).
Trading/marketing/ sales	Sociology (consumer preferences and trends); economy (price elasticities etc.)	BI, NLH, SIFO

Source: Trine Bendix Knudsen, Arne Isaksen and Keith Smith, 'Innovation and Knowledge Bases in the Norwegian Food Processing Industry' in O.J. Borch (ed) **The Food Industry: between business and politics** (Oslo: Tano Aschehoug), p. 196 [in Norwegian]; Thor Egil Braadland and Johan Hauknes, **Innovation in the Norwegian Food Cluster**, STEP Group, Oslo, 2000.

Innovation policy

- In the 1990s: the co-evolution of innovation policy and theory (innovation systems)
- The 2000s: the Lisbon Strategy and the new OECD, World Bank Model
  - focus on Schumpeter 1 – the role of the entrepreneur
  - the university should go to industry (the generalization of the US model)
- The exceptions: China, India, Korea, etc

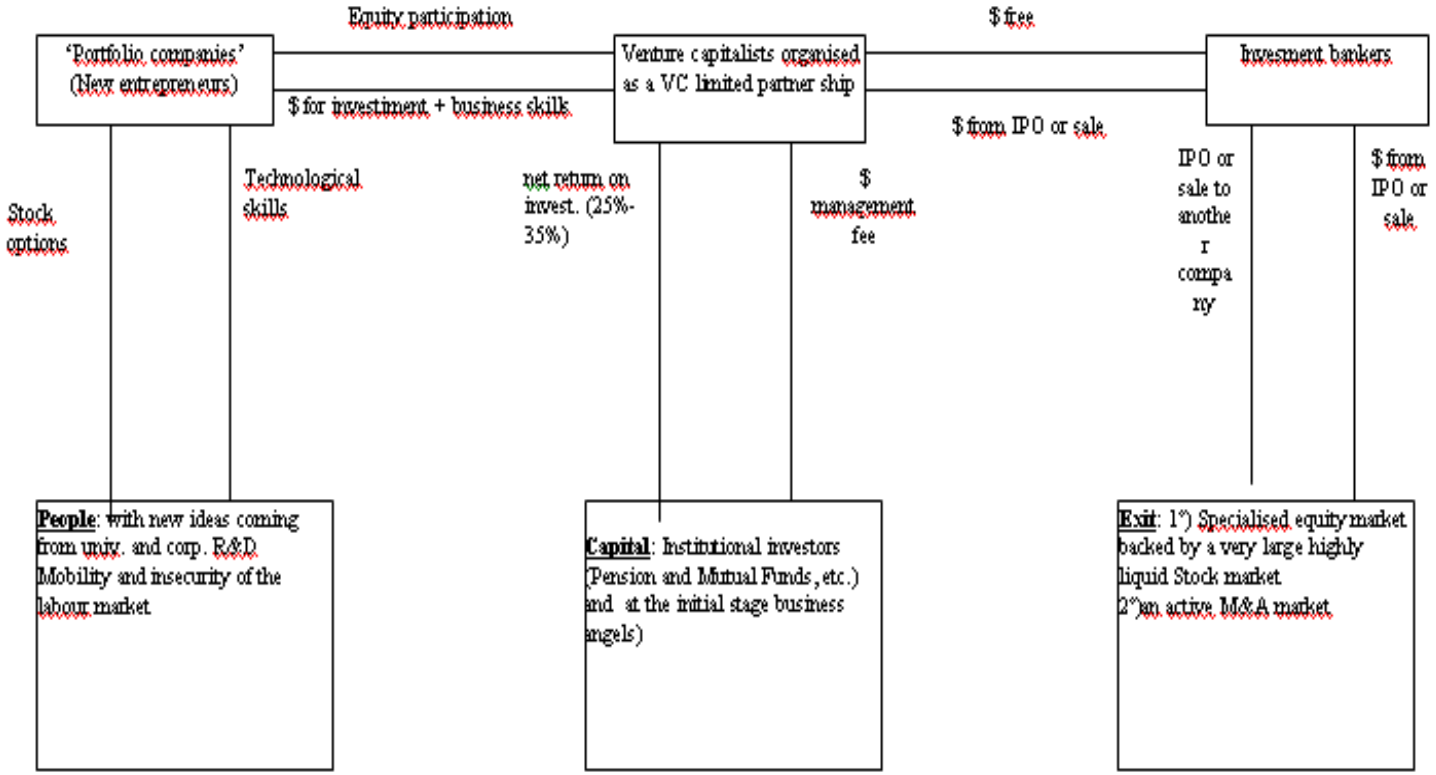
Poverty of S&T (and innovation!!!) policy & its close subordination to finance: OECD recommendations (Policy section of *Science Technology & Industry Scoreboard 2007*):

- **The European Paradox and the Linear Policies**
  - **Give firms tax subsidies (write-off of current R&D spending, tax relief, allowances on taxable income) = now a "major" policy tool)**
  - **Encourage public research organisations to commercialise their inventions**
  - **Improve conditions for venture capital**

One example of inapropriateness

Source: Chesnais (2003)

Figure 3.3: USA - [The socio-economic and institutional conditions for an efficient venture capital market



The specificities of the US venture K market (a US institution)

- For a venture capital industry to emerge
  - strong and regular flow of talented and mobile individuals leaving their positions within an established organisation to set up their own company in the expectation of future large financial rewards (combination between genuine risk-taking and the particularities of the US high skill labour market).
  - exit conditions provided the US financial and corporate system. Since venture capitalists are not long term investors at any given moment in their relationship with the entrepreneurs in their 'portfolio', they need to be able to hand the firms over easily to other investors in the stock market or large corporations. This requires an active stock market and also an active M&As market with large companies interested in acquiring venture-backed firms in order to implement the new technologies the latter have developed.
  - relationships that the financial firms specialised in the 'venture industry' develop with the investors that entrust them with funds, the entrepreneurs they finance and the investment bankers who organise the termination of the venture capital operation.

Incentives to innovation are incentives to R&D?

- … firms should be barely receptive to subsidies directed at R&D alone, any more than people buying cars would respond to a reasonable subsidy on the tyres

- Comments by an Australian entrepreneur quoted in:

- Australia - Productivity Commission (2007b) Public Support for Science and Innovation, Research Report, Productivity Commission, Canberra. p. 35).

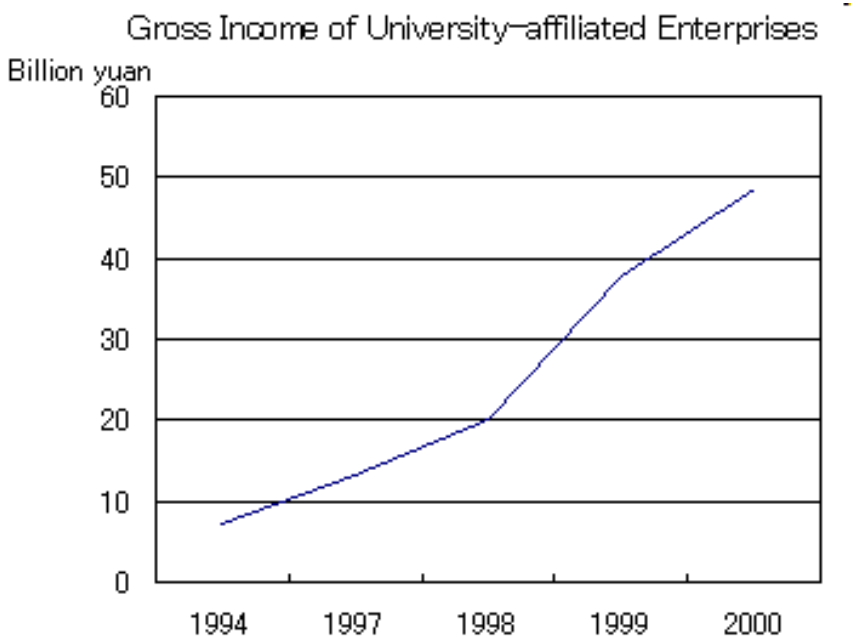
University – Industry Linkages

China - University's spin-off

	Number of spin-off	revenue（billion RMB）	Profit（billion RMB）	净利润（亿元）	上缴税金（亿元）	对学校的回报（亿元）
1999	2137	26.7	2.2	18.04	10.96	13.92
2000	2097	36.8	3.5	28.03	18.79	8.46
2001	1993	44.8	3.1	23.98	20.09	7.78
2002	2216	53.9	2.5	18.63	25.92	7.61
2003	2447	66.8	2.8	14.73	29.40	7.74
2004	2355	80.7	4.1	23.86	38.48	8.25

资料来源:《2004中国高等学校校办产业统计报告》，教育部科技发展中心，中国高校校办产业协会。

China – Universities hi-tech firms



China - Venture Capital

- 4 categories:
  - Controled by local government
  - Controled by Universities
  - Controled by large corporations
  - Controled by foreign capital
- VC Sources of Funds – 2004:
  - Chinese corporations 35 %
  - SOEs 22 %
  - Government 17 %
  - Foreign firms 17 %
  - Financial sector 6 %
  - Others– 3%
  - Fonte: Gao *et al*,. 2006.

China – Wind Energy Sector
Local Firms X TNC Subsidiaries

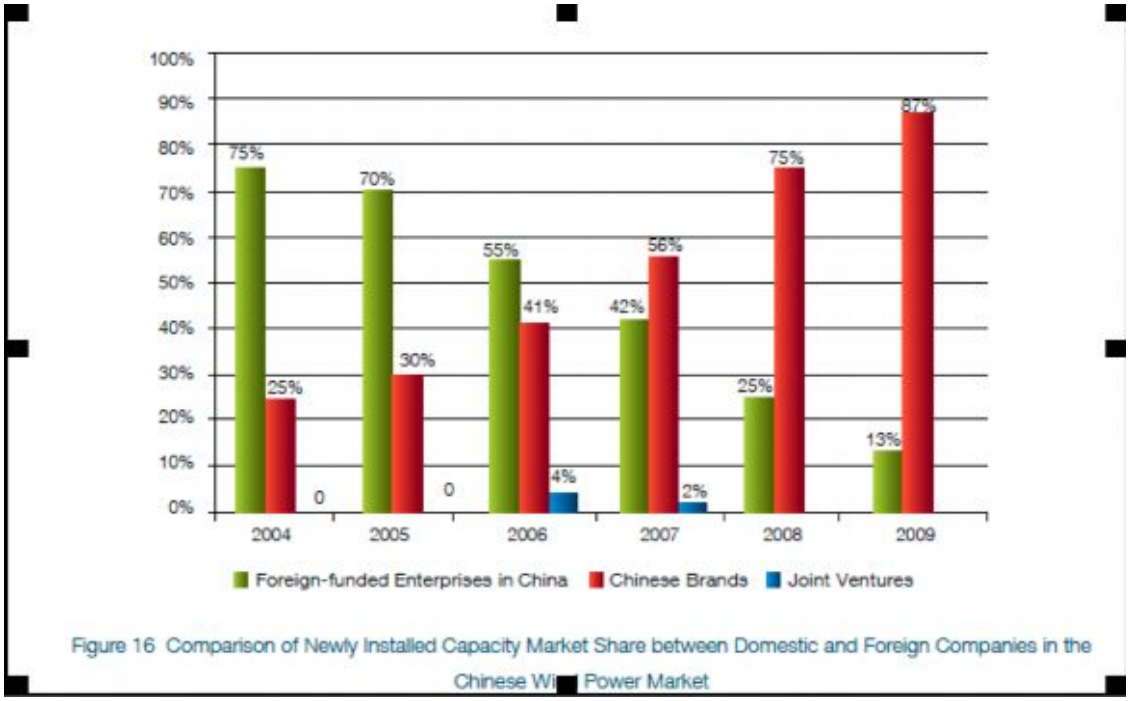


Figure 16 Comparison of Newly Installed Capacity Market Share between Domestic and Foreign Companies in the Chinese Wi[redacted] Power Market

TNCs R&D in China

- ***Productive technology spillovers***
  - There are positive productivity spillovers from foreign firms to their local suppliers in upstream sectors in China (e.g. Buck, Liu, Wei, & Liu, 2007; Buckley, Clegg, & Wang, 2002; Kueh, 1992; Li, Lam, Karakowsky, & Qian, 2003; Wu, 1999; Zheng, Siler, & Giorgioni, 2004; Zhu & Tan, 2000).
  - But Local firms have improved and expanded production capabilities rather than innovation capabilities.
- ***Negative effects***
  - Technology spillover is unsatisfactory
  - Cooperation between TNCs and other parts of NIS is limited
  - Technical linkages between TNCs and local suppliers are limited

Systemic Indicators

The Problem of Indicators

"It will always be essential to use STI statistics in full awareness of the "footnote" problems which arise in the differences across countries in definition, classification and measurement of most STI indicators. Otherwise, STI indicators may easily be abused. And whereas in the world of economic statistics abuse often meets its ghost – admittedly often only years later – in the world of STI statistics the possibilities for abuse given the often endogenous impact of such statistics on public S&T spending itself, are more numerous and much more oblivious. This holds not only for STI performance assessment at the level of individuals or organisations, but also at the level of countries. One might e.g. remember how the comparisons made in the 70's and 80's between the so-called socialist economies and the OECD countries ignored many of the substantial differences in definitions between R&D in the West and in the East. **Today, it could be argued that there are similar major problems in making comparisons between the developed, emerging and other developing countries in comparing STI indicators**."

FREEMAM, C.; SOETE, L. "Developing science, technology and innovation indicators: what we can learn from the past". Working Paper Series/UNU-Merit – January 2007.

Input & output indicators

• Indicators used to capture the output dimension: publications and patents of inventions;

• Publications → bibliometric indicators: counting scientific work published in academic magazines or in other means, registering data on each publication;

• Patents → systematic information on applications or granted patents.

Criticism to input and output indicators

- They assume the linear model of innovation;
- Technology considered more or less as a commodity;
- S&T policy implications
  - belief that the results of efforts centered in research institutions and in human resources formation would be almost enough to generate technological progresses.

Criticism to the input and output indicators

- R&D expenditures:
  - What is really R&D???
  - Results of the activity are not evaluated;
  - Other important domains of R&D activities are left out – adoption or adaptation of new equipments and the informal learning activities;
  - The very concept : R&D today is different from R&D in the time of Frascati Manual
- Indicatores based on bibliographic production → self-selection problems, predominance of anglo-saxon journals in the existing databases;
- Indicators of Patents:
  - They express only the existence of an invention; pronounced inter-sectoral variance of the propensity to patent;
  - Difficulty for obtaining a patent varies a lot from country to country;
  - Patent requests have little to do with the protection of the innovation.

What is so great about R&D expenditures as an indicator of innovation input ?????

- The main theoretical criterion for the Frascati scheme of separation of the R&D function from related scientific activities was the distinction between **novelty** and **routine**.
- What became distinctive about modern, industrial R&D and justified the focus in the Frascati Manual on this concept was its scale, its scientific content and the extent of its professional specialisation.
- A much greater part of technological progress appeared attributable to research and development work performed in specialised laboratories or pilot plants by full-time qualified staff. (Freeman and Soete Developing science, technology and innovation indicators: what we can learn from the past, Working Paper Series, 2007-001, UNU - Maastricht ESRTCIT 2007).

What is so great about R&D expenditures as an indicator of innovation input ???

- Innovation capability became now seen less in terms of the ability to discover new technological principles, but more in terms of the ability to exploit systematically the effects produced by new combinations and use of pieces in the existing stock of knowledge(**David, P. and D. Foray** 1995) “Accessing and Expanding the Science and Technology Knowledge Base”, *STI Review*, no.16, pp. 16-38).
- Not surprisingly the new model appears closely associated with the emergence of various new sorts of knowledge “service” activities, implying to some extent, and in contrast to the Frascati R&D focus, much more **routine** use of a technological base allowing for innovation without the need for particular leaps in science and technology, something which has also been referred to as “innovation without research” (Freeman and Soete 2007)

Innovation indicators

• Derive from the criticism of the linear model of innovation;

• Chain link model (Kline e Rosemberg, 1986) → emphasizes the concept that the innovation results from an interactive process;

• The company is not a simple technology buyer;

• The innovation is not a sequential process;

• The innovation doesn't depend on the invention process and such processes tend to be accomplished for the solution of problems during the innovation process, instead of being its starting point

Innovation indicators

• The approaches focus on the object (the innovations properly said) and / or on the subject (the company and other actors);

• The object approach seeks to identify important types of innovations;

• In relation to the subject approach emphasis is given to the “Manual of OSLO” and to the European surveys (in Latin America the Manual of Bogota);

Criticism to the Indicators of Innovation

• Object approach → it doesn't allow to differentiate the economical relevance of different innovations; tends to focus on product innovations in detriment of process innovations;

• Subject approach → complexity of the research;

• Because of the innovation concept adopted by the "OSLO Manual" results of innovation surveys need to be analyzed carefully;

•Some problems of Innovation surveys:

- Different methodologies, different concepts used in different countries;
- Time delay;
- Use of sample and not panel data.

Brics Project: Systems of innovation indicators

- Derive from the consolidation of the National Systems of Innovation approach;
- Processes of the production, diffusion and use of ST&I should consider the simultaneous influence of organizational, institutional, economic, cultural and local specific factors;
- Stress the fact that firms do not innovate separately;
- The indicators of ST&I seek to identify the characteristics of operation of each National Systems of Innovation;

Systems of innovation indicators

- Need of indicators centered on the measurement of :
  - Flows of information and knowledge (codified or tacit);
  - Flows of human resources;
  - Institutional landscape of the national systems of innovation;
  - Innovative behavior of the companies;
  - Integration of indicators of ST&I with economic indicators.

Most of these indicators – concepts, collection methodologies and applications – are still in a very immature stage (for ex. Blue Sky, Nesta).

Evidences in the use of systemic indicators: the experience of *RedeSist and BRICS Project*

• Learning-by-interaction is fundamental for RedeSist's definition of LIPS and for the proposal of learning and innovation indicators;

• Innovation, production and value generation activities require several forms of interaction among economic agents, who in turn interact with institutions;

• The proposal of indicators detailed below are an attempt to go beyond the conventional input indicators (R&D expenditures, financial resources and workforce engaged in S&T activity) and output indicators (bibliometric indicators and patents) normally used as proxies for innovation;

• The suggested indicators could be grouped into three categories: learning indicators, cooperative practices**;** indicators of technological effort and innovation indicators.

Evidences in the use of the indicators in Brazil: the experience of *RedeSist*

1 - Learning activities
In-hose learning (APRINT)
Learning from productive links(APRAGPR)
Learning from S&T links (APRC&T)
Learning from other agents(APRDMAG)
2 - Innovative efforts
Internal training efforts (ESFTRE)
Efforts to contract qualified people externally (ESFABS)
Constancy of innovative activities(COATIN)
Constancy of R&D efforts(CONP&D)
Constancy of the acquisition of new technologies (CONOUTC)
Constancy of marketing efforts(COFORCOM)
3 - Cooperative Practices
Vertical cooperation(COPVER)
Horizontal cooperation (COPHOR)
Cooperation with services suppliers (COPSRESP)
Cooperation with other agents (COPDMAG)
4 - Innovative performance
Radical Innovations in products (INPD1)
Radical Innovations in processes (INPC1)
Incremental Innovations in products(INPD2)
Incremental Innovations in processes (INPC2)
Organizational innovations (INORG)

Crisis, innovation systems

What crisis?

- What we know about the global financial crisis is that we don’t know that much
  - Paul Samuelson, 2009
- Risk asset prices have risen too much, too soon and two fast compared with the improvement in economic fundamentals
  - Nouriel Roubini, FT 03/11/2009

Financial crisis or Model crisis?

- **Present economic crisis**
  - **expression in a specific historical context of the internally created limits (“internal barriers”) that capital runs up against**
  - **these barriers manifest themselves in an interconnected manner**
    - **by the fall in the rate of profit and**
    - **in periodic crises of massive overproduction**
      - **Great disagreement on the measurement of the rate of profit**
      - **The rate of investment (nearest approximation to the accumulation of physical capital) provides an expression of capitalists’ propensity to accumulate in real capital and so gives an indication of the way they view the profitability of such investment**
      - **Capital devises ways to offset the fall in the rate of profit and also to defer the moment commodities (goods) become impossible to sell and overproduction is manifest**

- **Main mechanisms used by “advanced economies” for offsetting fall in profit and deferring overproduction :**
  - **High foreign investment in “emerging economies”, notably China**
  - **Strong increase in the rate of exploitation from the 1980s onwards**
    - **extension of the working year (in the USA in manufacturing nearly two weeks more in 2002 than in 1982).**
    - **Containment and fall of real wages**
  - **Massive accumulation in financial services**
  - **Massive recourse to debt**

Innovation Systems and the Challenges of a new global framework

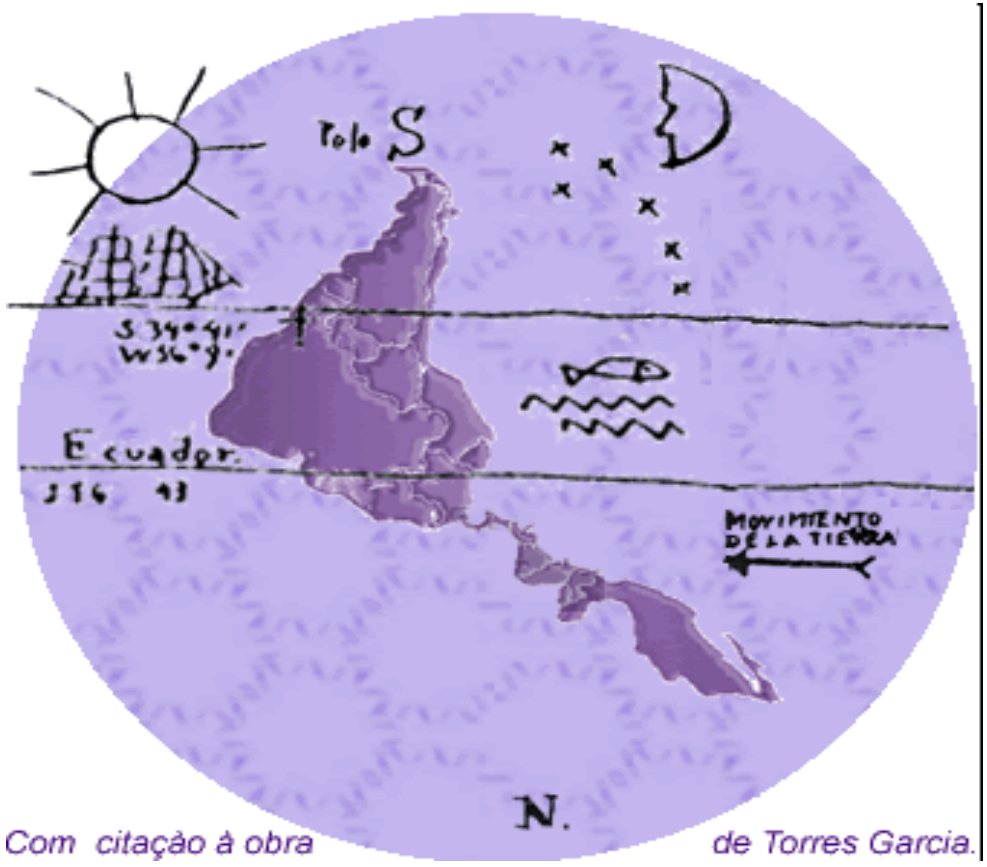
- **Transformations in the global production (and innovation) system**
  - The casino has limits !!! And the world will not be the same ...
  - Changes on the main axis of the global economy
  - The relative exaustion of markets in advanced countries and the importance of markets in the developing world (the Chinese strategy of innovations for local markets and sustainability)
  - The unemployment problem ....
  - The State is back and the importance of policies

“Green”Component of stimulus packages

Country	Fund US$ bil	Period years	Gren comp USSD bil	% green comp.
Ásia				
Austrália	26.7	2009-12	2.5	9.3%
China	586.1	2009-10	221.3	37.8%
Índia	13.7	2009	0.0	0.0%
Japan	485.9	From 2009	12.4	2.6%
Korea	38.1	2009-12	30.7	80.5%
Thailand	3.3	2009	0.0	0.0%.
Sub-total Ásia	*1.153.8*		*286.9*	*23.1%*
Europa				
EU	38.8	2009-10	22.8	58.7%
Germany	104.8	2009-10	13.8	13.2%
France	33.7	2009-10	7.1	21.2%
Italy	103.5		1.3	1.3%
Spain	14.2	2099	0.8	5.8%
UK	30.4	2009-12	2.1	6.9%
Others EU	308.7	2009	6.2.	2.0%
Sub-total Europa	*325.5*		54.2	*16.7%*
Américas				
Canada	31.8	2009-13	2.6	8.3%
Chile	4.0	2009	0.0	0.0%
USA	185.0	10 Years	18.2	9.8%
	787.0	10 Years	94.1	12.0%
Sub-total Américas	*1.007.8*		*114.9*	*11.4%*
Total	**2.796**		**436**	**15.6%**

Source: HSBC report on Climate Change (2009)

Thank you



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