



Systems of Innovation and Development: Connecting the SI framework with LA structuralist school

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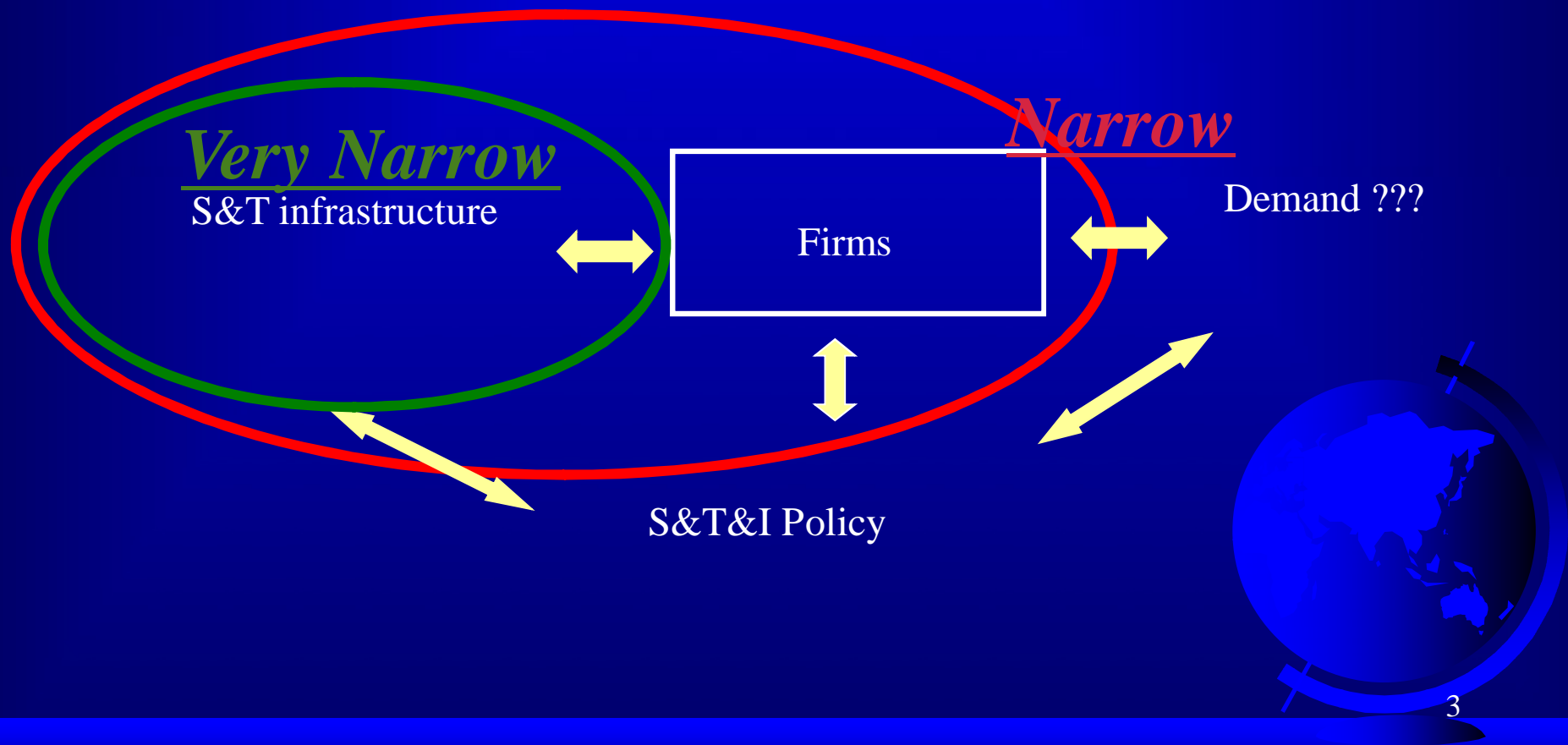
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Diffusion of the IS concept

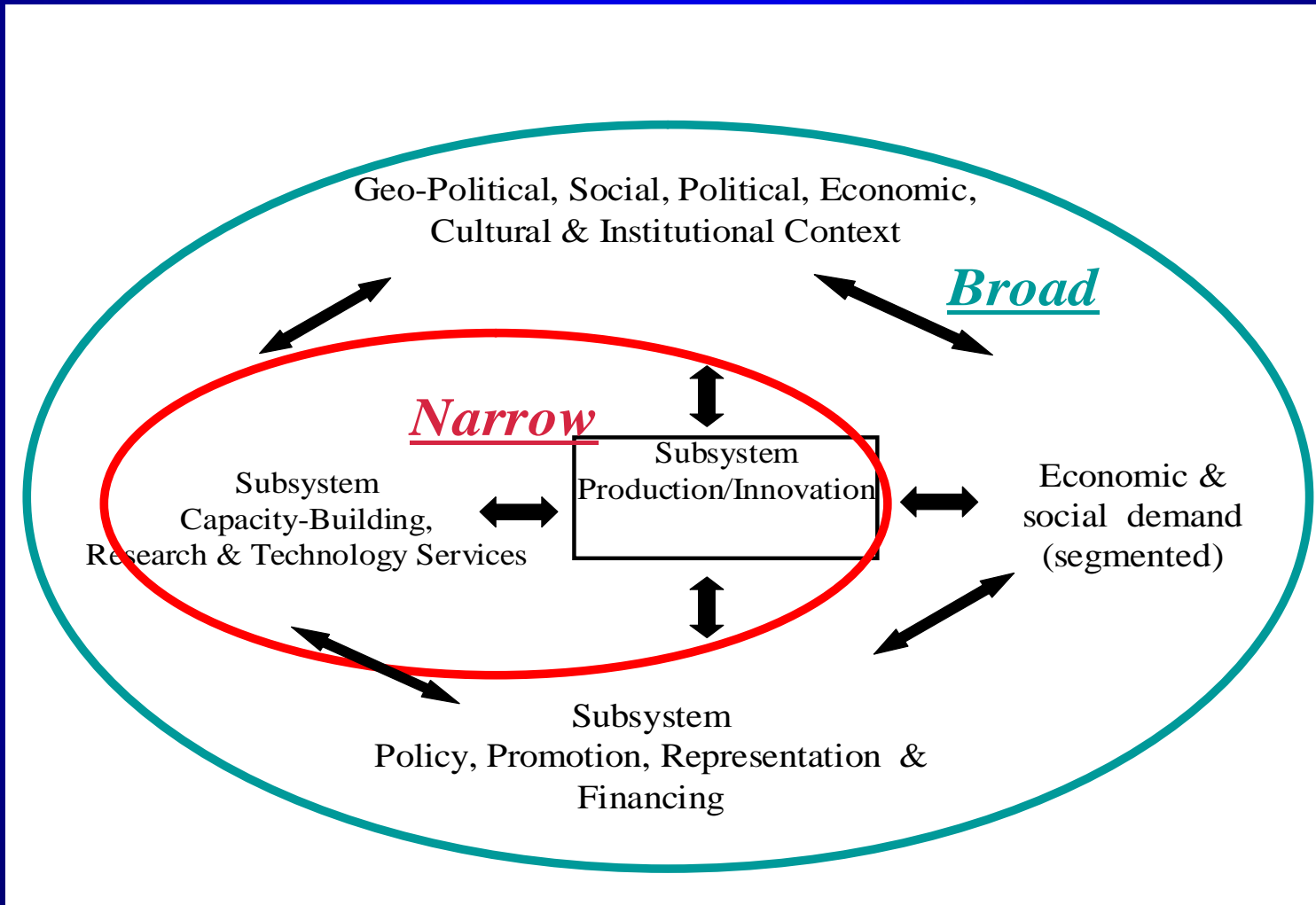
- National innovation system – historical roots List (1841)
 - A critical response to Adam Smith
 - Innovation as important as allocation - Active state to promote 'mental capital'
- Freeman 1983 and 1987
 - Unpublished OECD-paper 1983
 - Book on Japan 1987
- Today Googles gives more than 5000 hits in all kinds of countries
 - Policy makers (president of China)
 - Scholars (economic geographers)
- Handy, dialectical and useful concept – and a synthesis of modern innovation research



SI: The Narrow Version



The Broad SI



Different delimitations of innovation systems

☞ The narrow version:

- ☞ Extended R&D-systems – linking knowledge institutions to production (Nelson and Mowery).

☞ The broad version:

- ☞ Extended production systems – focus on learning by doing, using and interaction in the production system (Freeman and Aalborg).
- ☞ Extended production and competence building systems
 - - + linking education and labour market systems to innovation.
 - - introducing other elements that affect Si (such as power relations, income disparities, etc.).



Theoretical perspective on innovation and learning: as socially embedded

- ☞ Innovation is a process that is:
 - ☞ Cumulative - From Babbage to
 - ☞ Path dependent - Making electronics components smaller
 - ☞ Context dependent - Different innovation styles in UK and Japan and between sectors and regions
 - ☞ Interactive - Firms do seldom innovate alone
- ☞ Innovation and learning
 - ☞ You learn from what you do
 - ☞ Innovation as joint production of innovation and competence
 - ☞ Learning is a socially embedded process - social capital matters!!



Historical evolution of Leaders - NSI from X Century to XXI Century

- ➔ From China (Sung dynasty) to
- ➔ To Genoa - Venice
- ➔ To Portugal
- ➔ To Holand
- ➔ To UK
- ➔ To USA
- ➔ To ?????



Advantages of the IS framework for development

- ✓ Main building blocks— focus on diversity of social, economic and political actors; on context specificities; on micro, meso & macro relationships etc. – allow for local specificities to be considered.
- ✓ Complement – with advantages – the focus on sectors and production chains.
- ✓ Emphasis on historical, political, national & local trajectories.
- ✓ Treatment of innovation as cumulative, context specific and socially determined process
- ✓ Contextualization of the analysis of learning and capacity building processes (the context matters)



The (N)SI concept

☞ The context of its creation

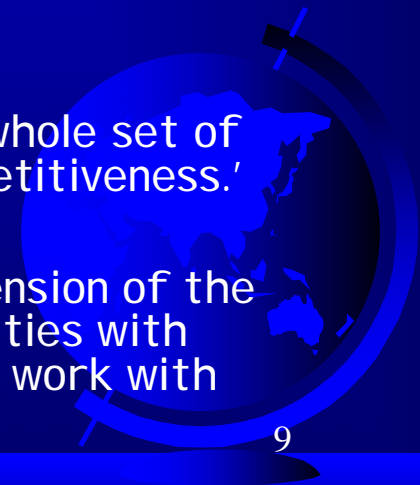
- ☞ We were fighting neo-liberalism. We were doing this at the start of the Uruguay round [of trade talks]. We were doing this in spite of Margaret Thatcher and Ronald Reagan so we were saying 'national' when the trend was already saying governments must bow out . . . the importance was political, really, and it became one of the rallying flags for people who continued to say that national economic systems are not just markets, they are institutions, there are systemic relations, there are linkages (Chesnais)
- ☞ "in that [TEP report] I coordinated, we really did everything to muster all the possible intellectual approaches to say that [building] nations and societies—societies are people and institutions. Technological accumulation is a long and very difficult process, and market forces can disrupt and destroy them extraordinarily quickly" (Chesnais).

☞ The concept of competitiveness

- ☞ basically a holistic social phenomenon, it's based on a whole set of things which we ended up by dubbing 'structural competitiveness.'

☞ The national dimension

- ☞ 'national' domain better accommodates the policy dimension of the concept. As long as nation states exist as political entities with their own agendas related to innovation, it is useful to work with national systems as analytical objects.



The focus of the (N) SI concept

☞ The focus

- ☞ The NSI concept was introduced explicitly to compete with, indeed to replace, traditional neoclassical *macroeconomic* theory.
- ☞ most of the people working on innovation systems prefer to work at the micro level and they are a bit frightened still of the strength of the neoclassical paradigm at the macroeconomic level, and I think that's where they have to work. You have to have an attack on the central core of macroeconomic theory. It is happening but not happening enough, not strongly enough argued." (Freeman)



- The history of national innovation systems has already been traced back to the work of Friedrich List (Lundvall 1992: 16; Freeman and Soete 1997: 295-299), but its intellectual roots reach much deeper into the history of economic thought.
- It is clear that List [1789-1846] and Wilhelm Roscher [1817-1894], the person who put increasing returns back in the economists' toolbox, both relied on a much older tradition of political economy for many of the more synergistic aspects of their theories.
- Both List and Roscher quoted and referred to a certain Antonio Serra, a Neapolitan Mercantilist whom Schumpeter claims was "the first to compose a scientific treatise... on Economic Principles and Policy" (Schumpeter 1954: 195), as an authority when arguing that Germany should follow England's path to industrialization (List 1841; Roscher 1881: 191).



Problems with concept of SI and its use

- One of the greatest challenges facing the theory today, however, is that much of the work done on national systems of innovation is post facto, in the sense that most research is done on systems that are already mature, already diversified and successful (Lundvall et al. 2002: 226).
- Theories and concepts that work wonders in countries with an industrial tradition dating back centuries, may, however, become much less productive—if not downright destructive—in the context of developing countries unless filtered through a historical lens.
- Identifying the necessary conditions for the successful implementation of innovation systems in impoverished nations is a project distinct from understanding how to stimulate long-industrialized economies.

➤ Reinert & Reinert



Problems with concept of SI and its use

'By integrating some Schumpeterian variable to mainstream economics, we may not arrive at the root causes of development, we risk applying a thin Schumpeterian icing on what is essentially a profoundly neo-classical way of thinking'

(Reinert & Reinert, Globelics, Rio, Brazil, 2003)

'The problem with SI is that practically all work using it as an analytical tool end up with a very traditional view of innovation (linear, sectoral, etc.)'

(Gillian Marcelle – Globelics, Tshwane, South Africa, 2005)



Problems with concept of SI and its use

- ❑ difficulties to work with new concepts
 - ❑ particularly those aiming at capturing and evaluating **intangibles** (resources and processes)
 - ❑ in environments with **high levels of inequality and informality** (knowledge, work, organizations and institutions) and where the survival of firms is a daily challenge

➔ Main challenges involve

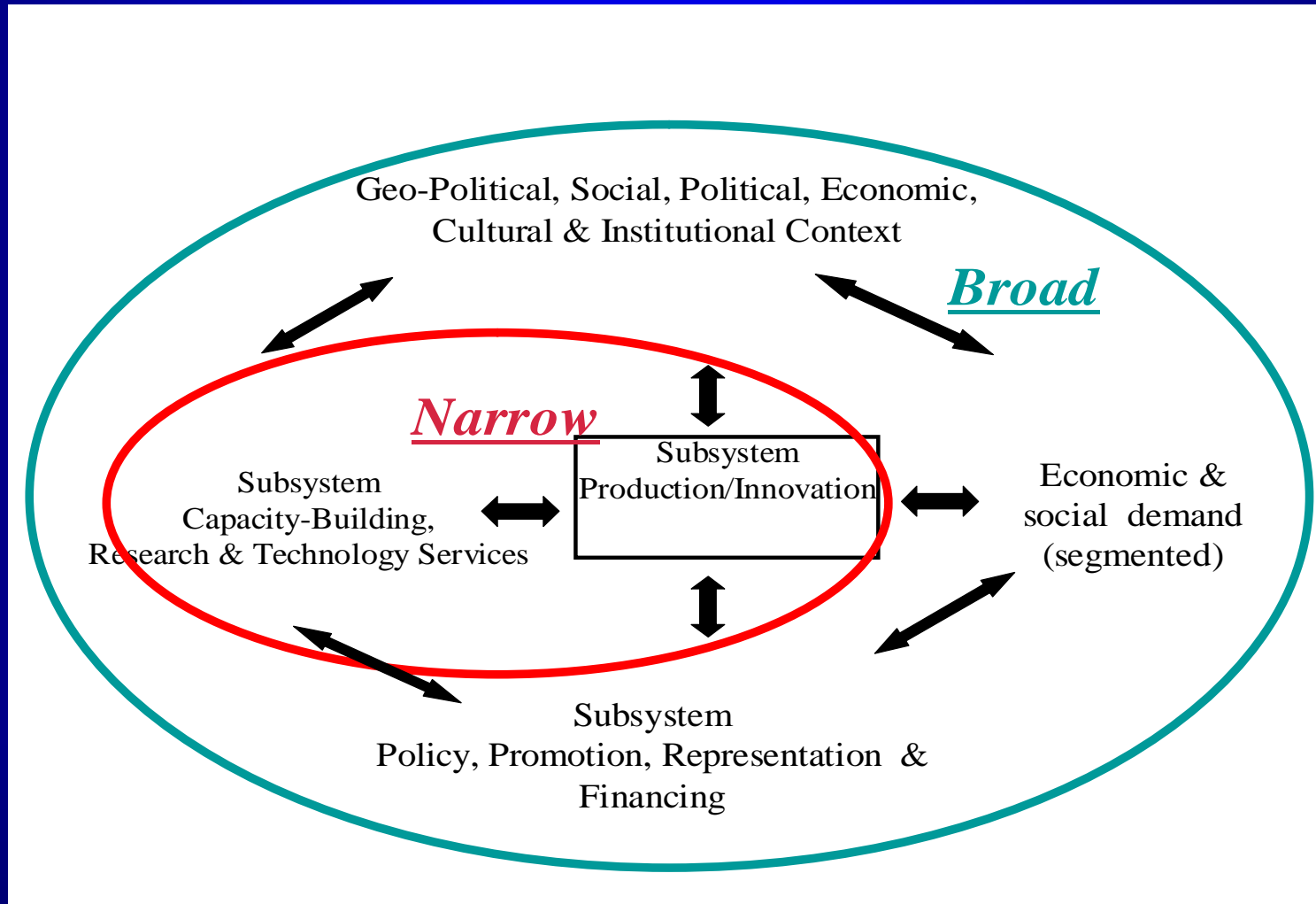


Advantages of the SI approach for development

- Recognition of the importance of policies and that the promotion of Learning, Innovation and Competence building Systems (LICSS) becomes even more challenging when knowledge
 - is seen as the 'main resource and learning the main process' of development (Lundvall, 1990)
 - cannot be taken in isolation from issues of economic, social and political power (Parayil, Globelics, 2004)



The Broad SI



Post war development the ECLA school

- ☞ The role of technology was an important part of the post-war debate on development.
- ☞ Schumpeter's (1934; 1950) concept of development contributed two central ideas to this debate
 - ☞ connecting technology with production generating new products, new processes or the establishment of new markets.
 - ☞ the emphasis on the disruptive character of development.
- ☞ These two notions shaped subsequent contributions, particularly in the UN, of Prebisch's (1949), Singer's (1950) and Myrdal's (1958) analyses
 - ☞ of the long-term deterioration of terms of trade for primary products and
 - ☞ of the distribution of gains between developed and developing countries



- Development theory and policy shaped mostly by the analysis of the economic and social processes of production and knowledge creation.
- It followed a long standing tradition that advocated that wealth originates from immaterial forces (creativity and knowledge) and that the accumulation of assets occurs through the incorporation of new technologies and innovation (Reinert and Daastøl 2004).
- Structural change and the connection between technical change and structural change were central to such developmental line of argument.



S&T in LA in the 50 - 80

- Structuralism and the technological question
 - Underdevelopment
 - As a specific question
 - As a result of North's industrialization
 - Not as a stage of something to be achieved (no catching up)
 - Technological dependence, transfer technology (Sagasti, Herrera, etc.)
 - Learning (Katz, etc.)



Convergencies between the SI framework and the LA structuralist school

- Rejection of neo-classical and physiocrat hypotheses and conceptions
- Relevance of technical progress and innovation (as the engine of accumulation) to the development process and pre-eminence of non-economic factors
- Systemic, historical and territorial vision
- Asymetries in the process of development and its dual character - Recognition of asymetries in
 - Development processes
 - Learning
- Important of policy for Structural Change –
 - Role of the State and public policies
- Financial dimension



- ☞ Two other contributions of LA structuralists are coherent and complimentary to SI framework
 - ☞ Understand the world as a whole unity and not only part os of it
 - ☞ Understand development as a specific process, non linear and non sequential
- ☞ Backwardness is qualified and the hypothesis of development via "*catch-up*" "proceses is criticized
 - ☞ Development could not be understood as if economi histories of all countries followes common and similar development trajectories
 - ☞ Underdevelopment should be regarded as a specific pattern of functioning and evolution of some economies and societies



"Underdevelopment could not be studied as a phase of the development process that tends to be overcome always that certain factors work together".

"Underdevelopment and development should be considered as two aspects of the same historical process, connected to the creation and to the diffusion of modern technology"

(Furtado, 1961, 2003)



2 -Relevance of technical progress and innovation (as the engine of accumulation) to the development process and pre-eminence of non-economic factors

For both visions

- Advancements in the production and commercialization,, organizational practices, etc. Resulting from innovation processes in the setting up of patterns of transformation of the economy, as well as long run development
- Processes of accumulation and development are characterized by structural change that occur from discontinuities generally of technological character
- The dynamics of these processes depends on the endogeneization of technical progress and of the creation of production and innovation capabilities



2 – Relevance of technical progress and innovation (as the engine of accumulation) to the development process and pre-eminence of non-economic factors

For both visions

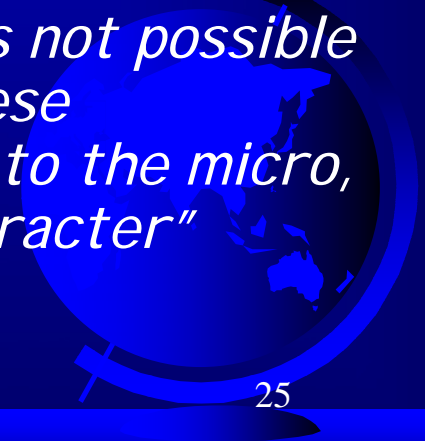
- ☞ Changes in techno-economic paradigms are essential to explain periods of growth and crises
- ☞ From these are established and consolidated division lines between those that acquired the capacity to actively participate of processes of generation and use of knowledge and innovation and those countries and regions that were deslocated and marginalized

“The analysis of the main structuralists have strongly schumpeterian influence, insofar as innovation and diffusion have a central role in the periodization of capitalist history and in the determination of the historical process of hierarchization or dualization of the capitalist system “
(Fiori, 2001)

3 – Systemic, historical and territorial vision

Both visions argue that:

- The behaviour of economic variables depend on non economic parameters, which are defined and evolve in a historical context
- It is not possible to isolate the study of economic phenomena from its historical and socio-political context (e.g. Freeman 1987 on Japan)
 - *"Behind technical progress complex social modifications are aligned, the logics of which should be understood as a previous step in any development study... It is not possible to capture the nature (and the impact) of these modifications if technical progress is limited to the micro, or macro level, isolating it from its social character"* (Furtado, 1983)



"Most of the more significant manifestations of technical change can only be totally captured through a global vision of the national system that includes the perception of the relations of this system with the environment that controls and influences it"

""

(Furtado, 1983)



In a similar vein, neo-schumpeterians understand **innovation** as

- **A systemic and cumulative process** generated and sustained by a **complex inter-firm and inter-institutional network**
- Dependent on their **socio-economic-institutional environment**

*At the most original contribution of LA structuralist theory was its **systemic vision of capitalism development, mostly on a global scale** (Fiori, 2001)*



4 – Recognition of asymmetries

Contrary to a tendency towards convergence, in both visions, processes of generation and diffusion of technological progress are characterized by a concentration in few firms, regions and countries

*“The diffusion of technical progress from its original countries to the rest of the world has been slow and irregular; the new production forms have benefitted only a reduced proportion of the world’s population and technological progress. In this way **large industrial centers of the world** of the world have been established, around which **periphery** of the new system is formed” (Prebisch, 1949)*



The process of “dualization” between nations is
fed by

- Technological gap
- Difficulties to access knowledge
- Constant increase on the limits of the technological knowledge frontier

➔ Freeman (1987 e 1998) points out that according to neo-schumpeterians the temporal gap between innovators and imitators is positively related to

- sustainability of innovation flows by innovators
- fragility of the conditions needed to innovate in imitating



Learning assymetries

- ☞ *“here we are confronted, once more, with another of the suggested contrasts of the very unequal degree of development. In large developed countries the ... aptitudes and abilities of workers developed progressively, as production techniques evolved. Aptitudes, dexterity and techniques were, in fact, the manifestation of the same general phenomenon that ... was being prepared throughout centuries of artisan work and of a growing development of the trade experience,” (Prebisch 1949a)*



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5 – Role of the state and public policies

Both schools support the idea of an active role of the State and argue that different local and national conditions demand specific policies.

Such vision contrasts with “common” policies based on notions that ignore the importance of history and geography for accumulation processes, as in the case of exemplary cases (*bench-marks e best practice*)

For neo-schumpeterians,

- Policies fulfil a key role for the development of nations, mainly for fostering their SI
- Actions ns focused on strenghtening productive relationships, on estimating learning processes, in mobilizing innovative capabilities and endogeneizing knowledge accumulation



In a converging and complementary way LA structuralists point out

- The importance of policies specially
 - In supporting industrial restructuring
 - In endogenizing the acumulation of capabilities and knowledge
- Central focus of policies should be more dinamyc activities and diffusors of technical progress, leading technological transformation.
- Given problems of savings and capital accumulation, these investments should be coordinated by the State



The financial dimension

- Schumpeter (1912) recognized that for entrepreneurs to become the driving force in a process of innovation, they should be able to convince banks to provide the credit to finance innovation.
- Pérez assigns to the financial dimension a key role for production and innovation and for development policies, stressing that any discussion about technical change and innovation systems has to include the financial dimension.



Conclusions

"we argue that that the SI approach can broaden and strengthen its role - as a tool in understanding and orienting the processes of innovation and capacity building - by exploring and **assimilating** its convergence with other analytical and normative frameworks, and particularly those coming from the South. With such a combination it may **become useful in** a wider set of cases and countries. This could provide novel findings from specific empirical and comparative analysis and, therefore, could help to foster its own development and refinement"

(Cassiolato et al, 2005; Guimarães et al., 2006)



Characterising the learning economy

- More rapid transformation
 - shorter product life cycles
 - shorter life time for competences (halving time = 1 year for computer engineers?)
 - more frequent shifts in working tasks
- New kind of competition
 - Learning based rather than knowledge based
 - Success of people, firms and regions reflect capability to learn
- Inherent polarisation in the Learning Economy
 - Exciting but stressful for the rapid learners - exclusion of slow learners



Main challenges for policies in the 2000s

- General conditions for implementing policies significantly deteriorated in the 1990s. Countries are more vulnerable, however well local ISs may have been performing (Freeman, 2003) and have less degree of freedom to implement policies
- LDCs are even more vulnerable:
 - ☞ high external debt and high interest rates are important constraints to technological & industrial development
 - ☞ macro-economic contexts in LDCs constitute 'implicit' policies of greater importance than industrial and innovation policies (Herrera, 1971)
 - ☞ economies with 'malignant' macro-economic contexts are heavily penalized (Coutinho, Globelics, 2003)



Urgency

- to develop new ways of thinking development overcoming the immobilization resulting from
 - ☞ a hegemonic and globalized system of thought (Arocena and Sutz, Gobelics, 2004) and
 - ☞ the frustration, as the promises that more open, deregulated and privatized systems would bring modernization, sustainable progress and convergence with the MDCs did not materialize - and the results of the policies of the 1990s have been deteriorated social conditions, more unemployment, more violence and more divided societies (Katz, Gobelics, 2004)



Urgency

- to advance the understanding of the conditions of the **new accumulation pattern and geo-political context**, as well as of the required policies taking into account local, national and international constraints and opportunities

☞ **Advantages of the IS approach**



Policy models that (Lastres and Cassiolato, Globelics, 2004):

- have a very limited and biased notion about innovation
 - promoting innovation is most of the times opposed to the promotion of local development or social inclusion
- are extremely sophisticated and based on exemplary cases (or benchmarks) of advanced countries
- ignore and are totally inadequate to the reality of LDCs and to the specific requirements of different production systems
- ☞ as the requirements of these models are not fulfilled, a set of criticism is directed to the agents and environment of these LDCs



Policy models that (Lastres and Cassiolato, Globelics, 2004):

- this attempt works in a true Procustean fashion
- As the Greek mythology tells Procustes used to offer hospitality to passing strangers. They were invited in for a pleasant meal and a night's rest in his very special bed with the property to match whomsoever lies upon it, either by stretching the guest on the rack if he was too short for the bed or chopping off his legs if he was too long
- Lastres, Arroio and Lemos, 2003 use this metaphor to argue about the need of developing policies adequate to the cases of MSEs in Brazil



Policy models that (Lastres and Cassiolato, Globelics, 2004):

- even referring to collective agents, policies continue to treat them individually and as 'patients' who supposedly **need to learn how to cooperate, innovate, develop governance, etc.**
- spend more resources in information systems, mapping, planning and evaluation activities than with the support of the selected cases

→ the mistakes with most development policies are due to conceptual misunderstandings and often reflect the submission to alleged urgencies and fashions in their implementation



Facing the challenges and taking advantages of the opportunities

- Need to distinguish 2 different meanings of mode
 - in periods of radical transformations what is sometimes seen as characteristics of the new phase (mode) may be just a partial and biased interpretation (fashion) of what is still difficult to perceive and precise (Santos, 1998)
- Importance of mobilizing capabilities and knowledge for the sustainable competitiveness instead of pursuing low costs practices based on the depreciation of labor and natural resources ('spurious competitiveness' - Fajnzylber, 1988)



In Brazil, the use of the innovation system (IS) approach with policy objectives

- ☞ started in 1999, when the ministry of S&T included in the 2000/03 pluri-annual plan a specific budget line of action for LPI SAs
- ☞ main initiatives in the last 2 years include:
 - ☞ the setting up of an inter-ministerial group with the objective of coordinating policies for LPI SAs at the national level
 - ☞ the institutionalization of a Program for LPI SAs in the 2004-2007 pluri-annual plan

Even if some of these criticisms apply main results include:

- fast to use and to learn
- the accumulation of experiences by supporting more than 200 cases with this approach
- long-term academic, policy-making and entrepreneurial interaction



The use of the LPI SAs approach with policy objectives in Brazil

Policy evaluation

- ☞ interviews with federal promotion agencies and with agents in 3 selected LPI SAs (Lemos, Albagli, Szapiro, 2004)
- ☞ interviews with different agents in 90 LI PSAs all over Brazil (Cassiolato, Lastres, Maciel, 2003, Cassiolato, Lastres, 1999 and 2005)

Future research

- ☞ analysis of international programs both at national and state level



Main lessons - facing the challenges and taking advantages of the opportunities

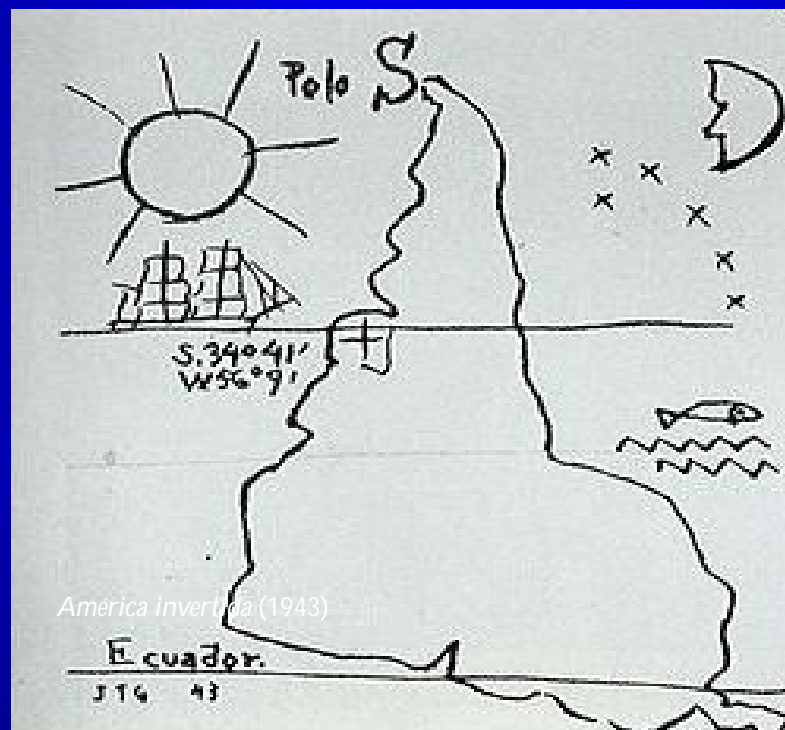
- Understanding that knowledge is acquired and accumulated by people
 - need to invest in education and to revert the 'brain drain' process
- Importance of promoting development without dissociating the economic from the social dimension
 - need to diminish regional inequalities and to endogenize and embed local development
- Need to further target the upgrading of local capabilities and social capital



Main lessons - facing the challenges and taking advantages of the opportunities

- Importance of promoting **national coherence and coordination** instead of allowing for **fragmentation and perverse dispute between regions**
- Need of developing new and collective policy instruments and mechanisms (cooperative banks, support for collective actions, etc.)
- Relevance of mobilizing the participation of local agents in the design and implementation of the policies
- Importance of adding to - **instead of replacing** - the tacit knowledge accumulated by local agents about the historical, economic, social and political environment of these LPI SAs





He dicho Escuela del Sur; porque en realidad, nuestro norte es el Sur. No debe haber norte, para nosotros, sino por oposición a nuestro Sur. Por eso ahora ponemos el mapa al revés, y entonces ya tenemos justa idea de nuestra posición, y no como quieren en el resto del mundo. La punta de América, desde ahora, prolongándose, señala insistentemente el Sur, nuestro norte.

Joaquín Torres García. Universalismo Constructivo, Bs. As. : Poseidón, 1941