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DISCUSSING INNOVATION AND DEVELOPMENT: CONVERGING POINTS BETWEEN THE LATIN AMERICAN SCHOOL AND THE INNOVATION SYSTEMS PERSPECTIVE?

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“One cannot confuse the pondered knowledge of what is from the other with a mental submission to their ideas, submission that we are very slowly learning to get rid of”.

Raul Prebisch

1 - Introduction

From the 1950s to the 1970s the central preoccupations of the international research and policy agenda was to come to terms with underdevelopment. During this period a theoretical framework— structuralism - shaped the debate on the issue. There are many differences within structuralism, but its contributors share the view that underdeveloped countries are significantly different from industrial advanced ones. Hence they could not follow the same “paths” towards development) Some authors even went beyond that arguing that structural inequalities in international economic and geo-political relations were the main causes of underdevelopment. Other consensual points of these writers were the understanding that (i) structural changes and specific knowledge and policies were necessary to overcome backwardness and (ii) that structural changes would require government intervention. rely

The emphasis of the agenda changed dramatically in the late 1970s as a crisis – which combined stagnation, inflation and unemployment - started in developed countries and spread throughout the world. This had a parallel with the diffusion of orthodox monetary-based thinking, which became the hegemonic paradigm throughout the 1980s and 1990s. However, significant difficulties remained in understanding the nature of the crisis, the specificities of the IT revolution and the acceleration of globalization, as well as in conceptualizing the problems and in formulating policy prescriptions to cope with it

One of the most fruitful alternative thinking developed in advanced countries came from a resurrection and updating of earlier thinking that emphasized the role of innovation as an engine of economic growth and the long-run cyclical character of technical change. Christopher Freeman's now famous paper of 1982 pointed out the importance that Smith, Marx and Schumpeter attached to innovation (p. 1) and accentuated its systemic and national character (p. 18). He also stressed the crucial role of government policies to cope with the uncertainties associated with the upsurge of a new techno-economic paradigm and the very limited circumstances under which free trade could promote economic development.

In the South, neo-liberalism had a negative impact on the previous structuralism consensus. The leading proponents of what Toye (1987) has called the 'counter-revolution in development theory and policy' introduced a radical neo-liberal agenda in which "development practically disappears as a specific question (remaining) only as the welfare achieved by the elimination of obstacles to market functioning" (Arocena and Sutz 2005, p. 16). This agenda stated that long-run growth should be maximized through the pursuit of short-run allocative efficiency as determined by market prices; and that even if market failures existed, imperfect markets were better than imperfect states.

The basic neo-liberal principle has been that underdevelopment is simply the result of bad allocation of resources and that is virtually exclusively caused by government intervention (with the proliferation of controls that distort prices and the existence of an over-dimensioned public sector) and reduced the complex problem of underdevelopment to a matter of simply following some simple economic "recipes" (get the prices right, get the property rights right, get the institutions right, get the governance right, get the competitiveness right) based on replicating Anglo-American institutions throughout the world and orthodox textbook ideas about liberalization of international trade and investment, privatization, and deregulation (Chang 2005).

By proposing a world where countries would converge if they followed the same liberalizing economic recipes and using their economic and political power to influence government and intellectuals, international organizations forced a radical shift in the nature of the debate. One of the most significant by-products of these views was that previous theorizing about development and underdevelopment coming from Latin America was almost totally discarded as a frame of reference for understanding and changing the world. Another consequence, perhaps more disturbing, is that 25 years of neo-liberal experimentation with economic policies led to a more divided world, with the gap between rich and poor countries (and people inside countries) widening and poverty and starvation increasing.

Since it was formulated in the 1980s, the Systems of Innovation approach has been increasingly used in different parts of world to analyze processes of acquisition, use and diffusion of innovations and to guide policy recommendations. This is also true in Latin American countries, where it is being applied and understood in close connection with the basic conceptual ideas of the structuralism approach developed in the region since the 1950s under the influence of the Economic Commission of Latin America and Caribbean. In fact, since the mid-nineties, the work of RedeSist – the Research Network on Local Productive and Innovative Systems – based at the Economics Institute of Rio de Janeiro, Brazil - has been using such dual frame of reference.

Stemming from the research program of RedeSist, this paper aims at (1) identifying and discussing common aspects, as well as main differences between both approaches; and (2) exploring the advantages of linking these approaches particularly, but not exclusively, in the case of development.

The importance of examining convergences between these frameworks is three fold. First, it contributes to a deeper reflection on the use of the concept of innovation systems in understanding and orienting the processes of innovation and capacity building in less developed countries. Second, we argue that both approaches can benefit a lot from incorporating contributions from each other. Finally, this effort of discussing conceptual coherence may even provide ground to identify convergences when comparing analytical and normative frameworks to be used in national systems of innovation and in development studies not only in the Americas but also in Africa, Asia, Oceania and Europe.

2 - The evolution of the Latin American Structuralism Approach – LASA

LASA is essentially an analytical body concerned with an historical account of systems of political economy. It firstly examined the middle and long-term trends in the social and economic evolution of the region, particularly through the contributions of Raúl Prebisch (1949a and 1949b) and Celso Furtado (1958, 1961). The theory departed from a diagnosis of the deep transition Latin American underdeveloped countries went through from commodity export based growth (*crecimiento hacia afuera*) to a model where manufacturing and urbanization started to play a larger role (*crecimiento hacia adentro*) especially in larger countries such as Argentina, Brazil and Mexico. The approach relied on a method that emphasized the behavior of social agents and the trajectory of institutions.

Another fundamental point of LASA's frame of reference is the proposal that "underdevelopment is ... an autonomous historical process, and not stages that, economies that already achieved a superior degree of development have necessarily to go through" (Furtado 1961, p. 180). In other words, is not possible to understand underdevelopment conditions as if peripheral countries would follow the same "historical steps" of developed countries nor development could not be understood as an universal process; but, on the contrary a historical specific process of each country.

As it is neither linear nor sequential, development is a unique process and depends on several aspects related to political, economic, historic and cultural specificities that occur from long-run structural changes that generate ruptures with historically established patterns. Both theory and policy recommendations are highly dependent on each particular context. Notwithstanding the power of its analytical tools, one cannot easily find references to this line of thinking at the body of history of economic theories. (Bielschowsky 2000)

3. The importance of the innovation systems perspective for less developed countries

The innovation systems (IS) perspective departed from Schumpeter and has evolved through the incorporation of other contributions and evidence from empirical work. Particularly relevant is that since the beginning of the 1970s, the innovation concept has been widened, to be understood as a systemic, non-linear process rather than an isolated fact. Emphasis was

given to its interactive character and to the importance of (and complementarities between) incremental and radical, technical and organizational innovations and their different and simultaneous sources.

A corollary of this argument is the specific and localized character of innovation and knowledge. A proposition by Nelson (1993) that innovation should then be understood as the process by which firms master and implement the design and production of goods and services that are new to them, irrespective of whether or not they are new to their competitors – domestic or foreign is particularly important for the analysis of innovation in less developed countries. The firm was re-conceptualized as an organization embedded within a broader socio-economic–political environment reflecting historical and cultural trajectories. This understanding helps to avoid an overemphasis on R&D in the innovation process, encouraging policy-makers to take a broader perspective on the opportunities for learning and innovation in small and medium-sized enterprises and in the so-called traditional industries (Mytelka and Farinelli, 2003).

This focus on the localized (and national) nature of the generation, assimilation and diffusion of innovation is on opposition to the idea of a supposed techno-globalism. This understanding of innovation as a localized, context specific and socially determined process implies, for instance, that acquisition of technology abroad is not a substitute for local efforts. On the contrary, one needs a lot of knowledge to be able to interpret information, select, buy (or copy), transform and internalize technology.

Systems of innovation, defined as a set of different institutions that contribute to the development of the innovation and learning capacity of a country, region, economic sector or locality, comprises a series of elements and relations that relate production, assimilation, use and diffusion of knowledge. In other words, innovative performance depends not only on firms and R&D organizations performance but also on how they interact, among them and other agents, as well as all the other forms by which they acquire, use and diffuse knowledge. Innovation capacity derives, therefore, from the confluence of social, political, institutional, and cultural specific factors and from the environment in which economic agents operate. Different development trajectories contribute to shape systems of innovation with quite diverse characteristics requiring specific policy support

It is this understanding of the systemic nature of innovation that allows for two crucial dimensions of the innovation systems approach to be explicitly discussed: the emphasis on

historical and national trajectories and the importance of taking into account the productive, financial, social, institutional and political contexts, as well as micro, meso and macro spheres (Freeman, 2003; Lastres, Cassiolato and Maciel 2003).

Although all of these contexts are relevant for a discussion about development, two in particular should be singled out that are pertinent to this paper. One is the financial context, recognized by Schumpeter (1912) in his *Theory of Economic Development*. For him entrepreneurs, to become the driving force in a process of innovation, they must be able to convince banks to provide the credit to finance innovation. In this sense, any discussion about innovation systems has to include the financial dimension.¹ The other is the idea that space matters, that analyzing systems of innovation should be done at the national (Freeman 1982 and Lundvall 1988) and local levels (Cassiolato, Lastres and Maciel 2003).

The concept of national innovation systems was introduced by Christopher Freeman (1982, 1987) and Bengt-Ake Lundvall (1985, 1988). Since the beginning of the nineties this concept has been used as an analytical tool and as a framework for policy analysis in both developed and underdeveloped countries. As a result, research and policy activities explicitly focusing on systems of innovation can be found in most countries and a rapidly growing number of studies of specific national systems of innovation have been produced.

Although some authors tend to focus on the innovation system in a narrow sense, with an emphasis on research and development - R&D - efforts and science and technology - S&T – organizations, a broader understanding of national innovation systems (Freeman, 1987; Lundvall, 1985) is more appropriate. This approach takes into account not only the role of firms, education and research organizations and S&T&I policies, but includes government policies as a whole, financing organizations, and other actors and elements that influence the acquisition, use and diffusion of innovations. In this case emphasis is also put on the role of historical processes - which account for differences in socio-economic capabilities and for different development trajectories and institutional evolution - creating systems of innovation with very specific local features and dynamics. Therefore, the stress on the importance of the national character of systems of innovation.²

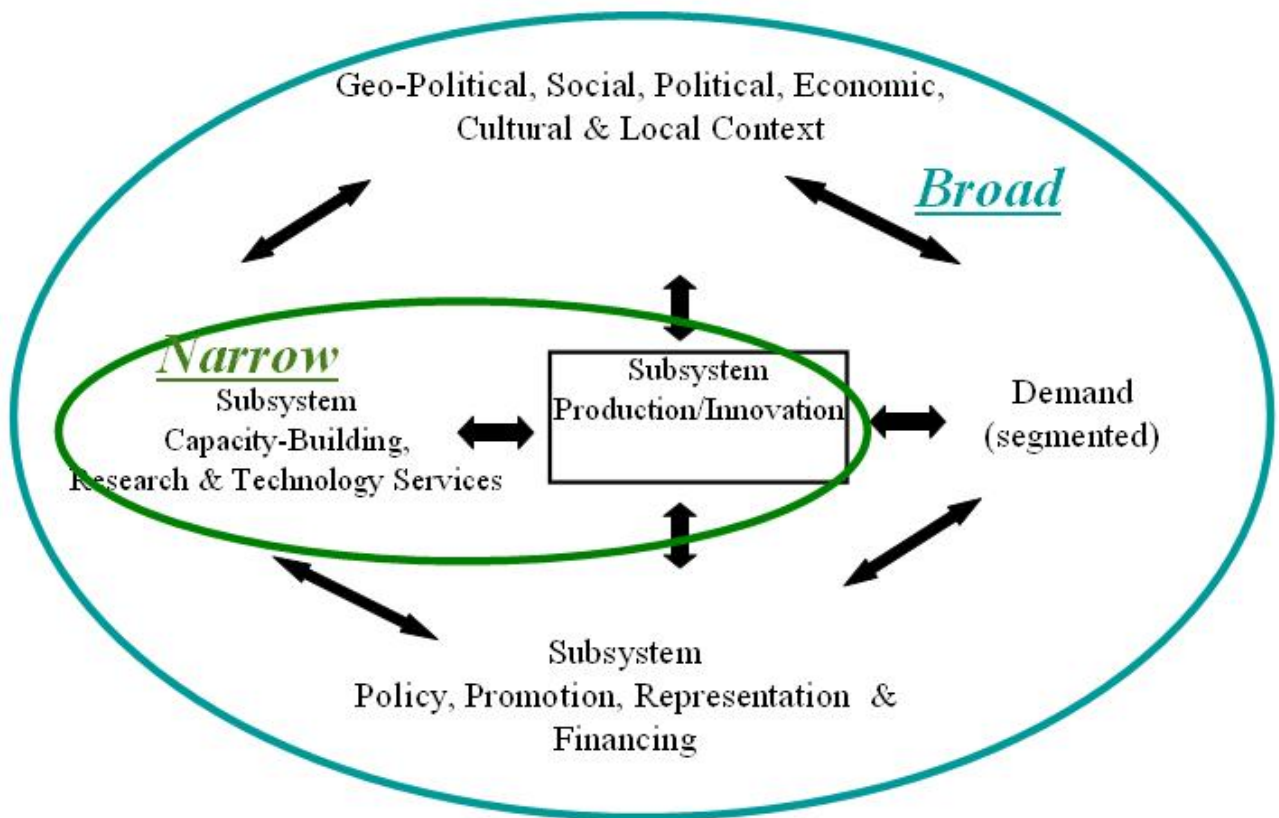
¹ See for instance Mytelka and Farinelli 2003; Freeman, 2003; Chesnais and Sauviat, 2003.

² It is worth mentioning that, already in the first paper introducing the concept, written as a contribution to the 'OECD Expert Group on Science, Technology and Competitiveness', which met during 1980-1983, Freeman

Figure 1, below is an attempt to show both the narrow and the broad perspectives on national innovation systems. The broad perspective includes different, connecting subsystems that are influenced by various contexts: geopolitical, cultural, social, political, economic, local and so on. First there is a production and innovation sub-system which contemplates the structure of economic activities, their sectoral distribution, degree of informality and spatial and size distribution, the level and quality of employment, the type and quality of innovative effort. Second there is a sub-system of capacity-building, research & technological services which considers. education (basic, technical, undergraduate and postgraduate), R&D, training and capacity-building, S&T information, metrology, consulting, intellectual property. Third, there is a policy, representation and financing sub-system which takes into account explicit policies (S&T&I, industrial, sectoral) and implicit policies (macroeconomic, investment, trade, etc.), regulation (sectoral, foreign trade, intellectual property, environment, innovation), promotion, financing and representation. Finally, there is the role of demand, which most of the times is surprisingly absent most analyses of innovation systems. This dimension includes pattern of income distribution, structure of consumption, social organization and social demand (basic infra-structure, health, education).

(1982) argued not only that the performance of countries were tied to innovation but, most important, that factors beyond the realm of R&D and S&T organizations influenced significantly innovation performance of firms and countries, pointing out the national nature of these factors. Later on he specifically used the broad concept of NIS in the analysis of the Japanese economic and technological performance from the 1950s to the 1980s (Freeman, 1987).

Figure 1- The Narrow and the Broad Perspectives on National Innovation Systems



This portrayal of the national innovation system framework is a corollary of an understanding that,

- innovation capacity derives from the confluence of economic, social, political, institutional and cultural specific factors and from the environment in which they operate, implying the need for an analytical framework broader than that offered by traditional economics (Freeman, 1982, 1987; Lundvall, 1985);
- the number of firms or organizations such as universities and research institutes is far less important than the habits and practices of such actors with respect to learning, linkage formation and investment. These shape the nature and extensiveness of their interactions and their propensity to innovate (Johnson, 1998; Mytelka, 2000, Johnson & Lundvall, 2003);
- main elements of knowledge are embodied in minds and bodies of agents or embedded in routines of firms and in relationships between firms and organizations. Therefore, they are localized and not easily transferred from one place/context to another, for it is something more than information and includes tacit elements (Polanyi, 1966; Lundvall, 1985);
- the focus on interactive learning and on the localized nature of the generation, assimilation and diffusion of innovation is in opposition to the idea of a supposed techno-globalism (Freeman, 1995). The understanding of innovation as a context

specific process implies that the acquisition of foreign technology abroad is not a substitute for local efforts (Cassiolato & Lastres, 1999);

- national framework matters, as development trajectories contribute to shape specific systems of innovation. The diversity of NISs is a product of different combinations of their main features that characterize their micro, meso and macroeconomic levels, as well as the articulations among these levels (Freeman, 1987, 1999; Lastres, 1994).

From the specific point of view of less developed countries (LDCs) the usefulness of the IS approach resides precisely in the facts that (i) its central building blocks allow for their socio-economic and political specificities to be taken into account and (ii) it does not ignore the power relations in discussing innovation and knowledge accumulation.

4 – Connecting the innovation systems perspective with the Latin American Structuralist Approach (LASA)

LASA acknowledges the central role of innovation, learning and capacity building on development processes. It is based on a systemic and global perspective regarding the “peripheral condition” and the growth restrictions in less developed countries. Therefore, the dynamics of local productive and innovation systems are seen as dependent on their international insertion. Additionally, and as the analyses of economic phenomena also takes into consideration their social, political and historical complexity, policy prescriptions are based on the assumption that the process of development is influenced by and reflects the particular environment of each country, rather than to recommendations based on the reality of advanced countries.

The innovation systems literature also explicitly recognizes that some of its most important conceptual pillars are rooted in the development discussion. For example Johnson et al (2003) in a paper that links the system of innovation approach with development point out that the innovation system perspective was inspired by ideas “concerning the interdependence between different sectors from Hirschman (1958) ... (and)...of positive and negative feedback, of cumulative causation, of virtuous and vicious circles and of the importance of institutions from Myrdal (1968)” (p. 2).

In fact, 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. One, of course, was connecting technology with production generating new products, new processes or the establishment of new markets. The other was 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. Their joint work constituted what became known as the 'triple alliance' on the discussion of terms of trade, as all of them took important part in the setting up of the UN.³

A number of development studies followed these ideas, arguing that technical change plays a central role in explaining the evolution of capitalism and in determining the historical process through which hierarchies of regions and countries are formed. Furtado (1961), for instance, established an express relation between economic development and technological change pointing out that the growth of an economy was based on the accumulation of knowledge and understood development within a systemic, historically determined, view. Although original these contributions have a close correspondence with Myrdal's (1958) proposition that (i) contexts and institutions matter; (ii) positive and negative feedbacks have cumulative causation; (iii) cycles may be virtuous or vicious and with Hirschman's (1958) point that interdependencies among different activities are important.⁴

A significant development resulted from the joint effort of Chris Freeman at the Science Policy Research Unit and Hans Singer at the Institute of Development Studies at the University of Sussex, in the late 1960s. The contributions combined the discussions on poverty, self-reliance and the role of science and technology. The synthesis of this endeavor is the Sussex Manifesto (Singer et al., 1970), prepared for the debates of the UN Second Development Decade of the 1970s by Singer, Freeman, Cooper, Oldham and others. This document observed that less than 10 percent of global R&D took place in the less developed world. Its main proposition was that developing countries should have their own scientific and technological capability not only for increasing production, but, more importantly, for improving the capacity to produce.

³ Prebisch became Executive Secretary of the UN Economic Commission for Latin America, Myrdal became Executive Secretary of the UN Economic Commission for Europe and Singer joined in 1947 the Economics Department of the UN on a provisional assignment that lasted 22 years. For details see Sapsford & Chen (1999).

⁴ For details see Cassiolato, Lastres, Mytelka and Lundvall. (2005).

These efforts set off important associated work on “appropriateness” of technologies, employment and basic needs heavily focusing on inclusion and exclusion, equity and development (not just growth) and learning and capabilities as fundamental issues regarding technological development. On the employment question, the technology and development issue became connected with the Keynesian idea that the main assets of a country are its human resources and with Edith Penrose’s concept that the firm is a collection of capabilities that are embodied in human beings.

In fact, in the same period (1970s and 1980s), authors inspired by the Latin-American Structuralist literature, developed a number of firm level studies on technology and development where the second of Schumpeter’s ideas – the disruptive character of development – was taken into account. This work was instrumental in showing, not only successful stories of technological up-grading, but also important limitations of traditional approaches to technology and development; precisely because they do not consider key elements, such as the role of institutions, of the macroeconomic regime and of power conflicts.

Crucial in this line was a series of studies undertaken under the sponsorship of the Canadian International Development Research Council in the 1970s, the S&T Policy Instruments project (Sagasti, 1978). This research revealed a key element to the understanding of innovation and technology in the region: the finding that implicit policies (general economic, industrial and trade policies) had a much deeper effect in innovation strategies by firms than explicit ones. It suggested that implicit policies not only did not contribute to fostering internal technological development by firms but, most importantly, inhibited them (Herrera, 1981, Erber 1983). This work also pointed out that by concentrating on learning processes within the firm, the technological capabilities literature ignored external economies associated to the capacity to generate innovations.

The need to address paradigmatic changes and the problems and options deriving from the upsurge of the information technologies led to the upsurge in Latin America in the 1980s of a series of interconnected work from the innovation perspective. Building on Furtado’s work on changes associated with the industrial revolution (Furtado, 1958) authors like Herrera (1975) and Perez (1983) analyzed the opportunities and challenges associated to the introduction of these radical changes in the region.

It was only then that the innovation and development literature started to integrate the empirically validated knowledge about learning inside firms with the contributions stemming from the work of Freeman, Perez, Herrera and others on new technologies, changes of technological paradigm and systems of innovation. What gave special impetus on this direction was the empirical work focusing on technological capability building as part of a broader national innovation system. The role of government policies in orienting the speed and direction of technological changes was also highlighted (Freeman and Perez, 1988).

The convergence between the Latin American structuralist school and the innovation systems perspective is not surprising as the conceptual underpinnings of both schools rely on the same solid ground: Schumpeter, List, Marx and previous scholars of the Renaissance tradition (Serra 1618) that focused their analysis of the economic and social processes on production and knowledge. This tradition suggests that wealth originates from immaterial forces (creativity and knowledge) and that the accumulation of assets occurs through the incorporation of new technologies and innovation. This approach is totally different from the classical school and the physiocrats that understands these processes on a mechanistic and barter-centered way (Reinert 1999).

It is from this initial emphasis on knowledge accumulation and on the associated increasing returns that one may describe positive mechanisms of self-reinforcement leading to virtuous cycles of development in a national economy. Then, both approaches recognize first that development processes are characterized by deep changes at the economical and social structure. In other words, development takes place from (technological and/or productive) discontinuities that cause and are caused by productive, social, political and institutional structure of each nation.

Second, development is also a systemic process. According to Fiori (2001), the most original contribution from the LASA has been its systemic perspective about the unequal world capitalism development, claiming that the world economic system is hierarchic. This intrinsic characteristic of capitalism got underway with the unfolding of the industrial revolution. European countries in the 19th century and US during the 20th century had the power to impose technological, commercial and developmental patterns that promoted inequalities and created a hierarchy in the world system that originated the systemic periphery (underdeveloped countries).

The systemic character comes also straight from Schumpeter's idea of a dynamic system, with the role of 'historical increasing returns'; the systemic evolution of capitalism produces an uneven distribution of the gains from technical change, creating, on the one hand, systemic economic development, and causing, on the other hand, underdevelopment.

Third, there is also the recognition of a national specificity of these processes. We could find in Furtado, the same stress on the national character of development processes that was found in List (1856) and also in Freeman (1982) and Lundvall (1988) when they stress the idea of national innovation system.⁵ Furtado (1961) discusses the transformation of "national economies where its structural complexity is manifested on a diversity of social and economic forms. For Furtado, it is in this transformation that lies the very essence of development: structural changes "in the internal relations of the economic and social system" (p. 103), that are triggered by capital accumulation and technological innovations.

Both schools also deny any idea of a general equilibrium. Competition in the capitalism system is an active dynamic process of creation and destruction of economic opportunities rather than an adjustment towards an imaginary equilibrium. Therefore, innovation, discontinuities and uncertainty are the main factors that contribute to the dynamic of capitalist accumulation through time. Technical asymmetries between core and periphery, deterioration of international trade exchange, structural debilities are all elements that are not compatible with any tendency towards equilibrium.

The emphasis on diversity, and the recognition that (a) both theory and policy recommendations are highly context dependent, (b) the economy is firmly embedded in society and (c) knowledge and technology are context-specific, conform some general identities of the two approaches that are rooted on older traditions. In what follows we propose to detail five common aspects between the IS literature and the LASA: the relevance of technical progress (innovation) to development process; the preeminence of non-economic factors, asymmetries in (and the dual character of) the international economical and technological process of development, learning asymmetries and the specific importance of policy for structural change.

⁵ For details see Lastres, 1994.

4.1. The relevance of technical progress (innovation) to development processes

Both LASA and IS approaches argue that structural change triggered by technical progress (innovation) is the main determinant of development. The significance the IS framework gives to innovation is well known. Joseph Schumpeter (1911) already emphasized the need to understand the relationship between technical innovation and the long-term economic development cycle. His contributions have been used by many authors that intend to explain the dynamics of capitalism through an endogenous analysis of the technical progress.⁶ Productive, technological, organization and institutional changes are important outcomes of the innovative process as an instrument of long-term development.

As for LASA, Furtado (1961) established a direct relation between economic development and technological innovation pointing out that the growth of an advanced economy was based on the accumulation of new scientific knowledge and on the application of such knowledge to solve practical problems. The Industrial Revolution set into motion a process of radical changes based on technical progress that lasts till now and that is at the roots of how the world economy is conformed. In essence, those changes: (i) rendered endogenous the causal factors related to growth into the economic system; (ii) made possible a closer articulation between capital formation and the experimental science. Such articulation has turned to be one of the most fundamental characteristics of modern civilization. As pointed out by Furtado (1961), the beginning of such process took place at the countries that were able to industrialize and create technical progress first, and the quick accumulation made possible in the development of this process became the basic engine of the capitalist system. For this reason, there is a close interdependency between the evolution of the technology in the industrialized countries and the historical conditions on what such development was made possible.

4.2 The preeminence of non-economic factors

Among the main efforts of the LASA is the attempt to stress the importance the non-economic factors on the evolution and performance of countries and national economies. As the behavior of the economic variables rely on those parameters - that are defined and evolve into a specific historical context - it is quite difficult to isolate the study of economic

⁶Cassiolato and Schmitz (1992) .

phenomena from its historical frame of reference (Furtado 2002). This assertion is more significant when analyzing economic, social and technological systems that are different from each other, as in the underdeveloped economies.

At this point there is to be noted an important differentiation of LASA with the French structuralist school particularly about the role – for analyzing development - of historical processes, of the social reality and the need to deepen “the understanding of the behavior of economic agents, departing from precisely defined contexts” (Furtado 1961 p. 98). In this perspective, it is necessary to take into consideration the behavior of social agents as well as trajectories of institutions. In these two pillars rest the essential fundamentals of the theoretical construction of the structuralism comparative historical analyses: peripheral Latin American underdeveloped structures conduct more than determine specific behavior trajectories that, *a priori*, are unknown. Development process under peripheral conditions is different due to its historical movement that is singular to its specific experiences. In this context, “underdevelopment” may not, and should not, be considered as an anomaly or simply a backward state. Underdevelopment may be identified as a functioning pattern and specific evolution of some economies. Social and economical peripheral structure determines a specific manner under which structural change occur (industrialization during the 1950s and 1960s) and technical progress is introduced. Hence different outcomes from those happened in developed countries are to be expected (Furtado, 1961; Bielschowsky, 2000; Rodriguez, 2001).

Perhaps the most important point concerning the neo-schumpeterian perspective is that economic development is considered as a systemic phenomenon, generated and sustained not only by inter-firms relations, but most significant by a complex inter-institutional network relations. Innovation is eminently “social process” (Freeman 1995). Therefore, development – resulted from the introduction and diffusion of new technologies – may be considered as the outcome of cumulative trajectories historically built-up according to institutional specificities and specialization patterns inherent to a determined country, region or sector.

In the same way, the IS approach, in convergence with LASA, understands that development processes cannot be understood as if economical history of all countries followed the same development trajectory. Firstly, it recognizes that each country traces its own development trajectory according to its specificities and possibilities. Secondly, it also recognizes that the evolution of national (and regional) economic systems depend fundamentally on their hierarchical and power position into the world capitalist system. At last, it is important to

mention that differently from the standardization and convergence that globalization theories suggest, the IS perspective and LASA point out that local and national conditions lead to different trajectories and rising diversities in the national and sub-national systems (Furtado 1998, Cassiolato and Lastres, 2000, 2002; Lastres, Cassiolato and Arroio, 2005).

4.3. Asymmetries in and the dual character of the International economic and technological development

In this section, we explore LASA and IS convergence on the argument that those nations that were able to obtain a better position in the “innovative race” tend to be more dynamic and competitive than others, reaching better social and economic performance, and consequently, more geo-political power. Thereupon, division lines had been established between those that are capable to promote or directly participate in the innovative and development processes and those kept out.

Fiori (2001), suggests that LASA presents a strong Schumpeterian inclination, given the role played by innovation and technological diffusion in explaining the evolution of the capitalism history and in the determination of this historical process of hierarchy formation of regions and countries. According to Prebisch (1949), the industrial core was formed from the irregular and slow diffusion of the technical progress, where just a small sum of the world population were benefited by those new forms of production. Therefore, around this core was formed the periphery of the capitalist system. The “coexistence of a centre, commanding technological development, and of a vast and heterogeneous periphery marginal to the system is on the basis of the income concentration at the world level. This is an important point since it discards any idea of development as a “catch-up” process with backward countries followings the steps of the development of advanced countries. According to Furtado, “Presbisch’s view implies that there is not an inevitable trend towards a passage from any given stage of progress to another supposedly superior”. (Furtado 1961, p. 153).

It follows that the main formulations of Presbisch and LASA school converge with the innovation system perspective in a point normally ignored by the literature: the “dualization” of the capitalist system, the idea that the evolution of the system creates at the same time systemic and virtuous development and vicious underdevelopment. Although normally

associated only the LASA school some authors (Reinert 1999, Myrdal 1968) argue convincingly that this dualization of the world economy after the advent of the industrial revolution is at the core of Schumpeter's dynamic system, when he points out the role of 'historical increasing returns'. In this direction Schumpeter analysis retains the characteristics of other authors of the German school of a system which produces uneven growth and an unequal distribution of the gains from technical progress, with internal and external roots. He proposes that two key mechanisms which create uneven distribution of the gains from technical change: (i) extremely uneven advance of the 'technological frontier' concentrated on the "centre", and (ii) collusive form of distribution of the gains from technical change, "because the forces of the producing country (capital, labor, and government) in practice - although not as a conspiracy - 'collude' to appropriate these gains" (Reinert 1999). These asymmetries have important geo-political connotations, and occur with developed countries concentrating in advances in the technological frontier - specializing in the production and distribution of sophisticated goods and services - - and underdeveloped in those characterized by lower productivity. Myrdal, in a clearly structuralism fashion, indicates that a corollary of the virtuous circles of development are the vicious circles of underdevelopment and the perverse effects on the world economy.

Intensive knowledge-based activities proportionate the domination, generation and use of innovation consolidating and maintaining strategic and leadership positions. Contrarily, less intensive knowledge-based activities tend to be devalued and just considered when only costs are taking into consideration. In other words, those activities are related to the "spurious competitiveness", based on lower wage rates, fiscal incentives, natural endowments exploitation, environmental degradation, etc. International division of labour is then characterized by the concentration of intensive knowledge-based activities in the core countries, and less intensive knowledge-based activities in peripheral countries.

Both structuralist and neo-schumpeterian authors claim that international division of labour have as consequence the maintenance and enlargement of development and knowledge gap among nations. Those gaps are even widened by high-priced and technological intensive goods and services export from developed countries, while underdeveloped ones are restricted to an obsolete non-competitive pattern of production and exportation.

Hence the LASA vision suggesting that the rupture with a pattern of specialization based on the production and exports of primary goods could only be overcome with the incorporation in the region of the benefits of the second industrial revolution. In this sense the emphasis on

industrialization as the propelling element of development in the region given by authors such as Furtado and Presbisch is precisely the same given to the new information technologies by neo-schumpeterians of the system of innovation approach.

In the IS perspective, Freeman (1988) argues in the same direction when arguing that the time lag between innovators and imitators is positively related to the support of innovation by leading countries, and to the fragility of the necessary conditions to innovate by the imitators countries. According to him those “technological asymmetries” are simultaneously a barrier to the accessibility to new technologies and an incentive for those who lead technological process to innovate. Even more, historical and international asymmetries between core and periphery tend to last and accentuate. Furthermore, for both schools worse than technological asymmetries are learning and knowledge asymmetries, which make impossible to access, comprehend, use and diffuse the new knowledge.

4.4 Learning asymmetries

In the IS perspective the process of dualization between nations would not be nurtured only by the technological gap, but mostly by the difficulties in assessing information and knowledge and by the constant magnification of the technological frontier. The more distant underdeveloped countries are from the technological frontier the larger will be the barriers to an innovative insertion in the new technological paradigm.

Hence, more serious than technological asymmetries are knowledge and learning asymmetries, with the implication that access, understand, absorb, dominate, use and diffuse knowledge turns to be impossible. However, even when the access to new technologies becomes possible, most of the times they are not adequate to the reality of underdeveloped countries and/or these countries do not have a pool of sufficient knowledge to make an adequate use of them. This occurs because the learning process depends on the existence of innovative and productive capabilities that not always are available. On this aspect, Arocena and Sutz (2003) argue that there are clearly learning divides between North and South that are perhaps the main problem of underdevelopment nowadays.

In a complementary fashion, Tavares (1972, p.50) points out that “underdeveloped countries import a kind of technology that were conceived by leading economies according to a constellation of resources that is totally different from ours. The need to import this

technology was given by the very substitutive character of industrialization and by the impossibility of creating new techniques more adequate to our own conditions”.

The importance of the knowledge and learning gap was already mentioned by Prebisch in 1949. For him the problem of productivity in peripheral countries, more than being linked to the scarcity of savings to investments in technology and capital goods, is related to the “capacity of men that know to use efficiently these goods in the different phases of the production process” (Prebisch 1949a). In this sense he recognizes the importance of knowledge and capacity-building for development.:

“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, *apud* Bielschowsky (2003, p.175)).

In his analysis of development and underdevelopment, Celso Furtado concluded that “it is possible to industrialize and grow without breaking the structure of dependence and domination that perpetuate underdevelopment” (Tavares, 2001). That is, “technological innovations that seem to be more advantageous are those that approach cost and price structures of (advanced) countries and not those that allow for a speedier transformation of the economic structure (of underdeveloped countries) by absorbing the subsistence sector” (Furtado, 1961, p.192). The net result is a slow modification of productivity and of the occupational structure of the underdeveloped country. In this sense, we understand why, even with a high degree of industrial diversification, these countries are not capable of shattering with the occupational pre-capitalist structure nor with the economic domination they are inserted in.

4.5. The specific importance of policy for structural change

The presence of neo-liberal policies was very intense in the two last decades of the 20th century in underdeveloped countries. The central target of these policies was the elimination of any important role for State in fostering structural change. Policies and institutions for

development as designed by advanced countries and international organizations are totally in contradiction with their own historical experience. no country has developed its productive base without resorting to active industrial policy -.both early industrialized and newly industrialized countries applied the same principle, although to varying degrees and in different ways (Shafaeddin, 1998, Chang 2001).

Above we mentioned the importance both, LASA and IS give to the role of the State. Here we point out the consideration they give to the role of policy in times of radical change. The IS approach is particularly important to this discussion because it considers that policies' implementation are particularly relevant during the advent and diffusion of a new techno-economic paradigm. For important authors in the IS perspective, such as Freeman and Perez, development proceeds in long waves, the pivot of which lies in technological revolutions. Thus it builds upon Schumpeter's theories of long cycles in economic development and his exploration of 'creative gales of destruction'. This idea has been developed further, initially for advanced countries (Freeman 1987, Perez 1983, Freeman and Perez 1988) but also has been extended to LDCs (Perez 1985, 1988, 1989).

For them, changes in the 'techno-economic paradigm' (TEP) - pervasive changes with a major influence on the behavior of the entire economy and society - are essential to explain periods of economic growth and crisis. While fuelled by revolutionary technological opportunities it takes time for a new paradigm to crystallize and even longer for it to diffuse right through the economy. Crises are seen to arise when there is a mismatch between the emerging new paradigm and the old institutional framework. The State intervention is essential to internalize the benefits of the new paradigm and minimize its costs.

LASA's stress on industrialization as a way to promote structural change and development could be traced to Presbisch's (1949a) perception that after the 2nd world war, the new hegemonic center and the Bretton Woods system were not favorable to the development of the periphery and underdeveloped countries should pursue their own paths. Hence his proposition of industrialization and endogenization of technical progress as the most powerful tools for development and the need of policies to do so As already mentioned Presbisch singles out technology as a factor which determines the existence of two groups of countries. The need to overcome this disparity is at the heart of his economic policy suggestions: the State should promote industrialization through which technological advances could be absorbed. According to Bielschowsky (2003), Prebisch justified protectionism stating that even if industrial production could be less effective in the periphery as compared to the

centre, it should be more efficient than agricultural production. New investments should be led by the State, given the difficulties for capital accumulation as a consequence of low levels of internal savings

Later on Furtado (1961) in his book “Development and Underdevelopment” included in the policy agenda of LASA important questions such as how to deal with heterogeneity and poverty since these were necessarily dealt with by tackling industrialization per se. By incorporating these issues Furtado advanced LASA policy agenda towards topics that were later brought by Perez which has included these issues in the IS perspective.

5 - Conclusions

In their paper to the Rio Globelics Conference, Reinert and Reinert (2003) warned about the abuse of the IS perspective in academic and policy circles. They mentioned that “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 neoclassical way of thinking” (p. 63). Their point was that development ideas and policy proposals that are spreading in the last few years are just attempts to introduce the fashion around innovation and knowledge in frameworks of analysis that still emphasize that: (i) both theory and policy recommendations are independent of context, (ii) the economy is largely independent from society; and that (iii) there is no distinction between real economy and financial economy.

The Reinerts paper warned about a worrisome trend of combining the IS perspective with neo-classical economics. In other papers (Lastres and Cassiolato, 2004, 2005) we discuss some of the important policy misunderstandings that are coming from such attempt. In this paper we stress that a more fruitful combination lies in associating the IS approach with LASA. The paper aimed at making explicit the connections between the IS perspective and the Latin American Structuralism school in an attempt to specify its analytical and normative corollaries. The discussion above shows, in the first place, that there are significant convergences between them deriving mostly from common roots. Secondly, it demonstrates that both lines of thought have already benefited from incorporating contributions from each other, suggesting that this mutual interchange can be amplified.

From an analytical point of view, the most important convergence are in

- the emphasis to both production and innovation;
- focus on the localized (and national) nature of the generation, assimilation and diffusion of innovation;
- observance of the systemic nature of innovation and the need of taking into account the productive, financial, social, institutional and political spheres, as well as micro, meso and macro dimensions.

Therefore the importance of knowledge not only about local, national and international conditions but also about how local systems are “connected” to the global geo-political and economic systems. In Brazil, we are using the main contributions of the IS perspective with the pillars of Latin American Structuralist school as a conceptual base for a better understanding of our industrial and technological development. This combined approach has been used by RedeSist since 1997 to guide a research program on local productive and innovative systems in Brazil and other Mercosul countries with both empirical effort (aiming at examining learning and capacity building in local systems) and policy recommendations. We believe that this combination of approaches have provided, in the first place, useful and rich analytical and normative tools. This experience has confirmed that both approaches can benefit a lot from incorporating contributions from each other.

Arocena and Sutz (2003, 2005) note that, a ‘Southern framework of thought’ is fundamental to the analyses of development problems related to knowledge, innovation and learning. This paper makes a contribution in that direction. By combining the systems of innovation and the structuralist approaches we believe that we have achieved a perspective that is relevant to the study of innovation, learning and capacity-building in the South. This allows to advance ideas that - contrary to the neo-classical propositions - emphasize that:

- economy agents and processes are embedded in social and political environment;
- both theory and policy recommendations are highly context dependent;
- constraints – internal and external - to development will always exist and should be the central concern of policies..

Finally, 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 empirical and comparative analysis and, therefore, could help to foster its own development and refinement.

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