Systems of innovation, clusters and industrial districts:
analytical and policy implications of convergence and differences in the approaches

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1 – Introduction

The need to formulate new industrial and technological policies – associated to the recognition of the advantages of collectively mobilizing firms and other organizations – has contributed to the dissemination of the focus on groups of different agents. As a result, policies targeting production systems and agglomerations have rapidly spread both in public and private spheres. From an analytical point of view, concepts focusing on group of agents, their interactions and stressing the environment where production takes place have been revisited and further developed. Examples include notions such as new industrial districts, clusters, *milieu innovateur*, as well as innovation system (IS).

The main objective of this paper is to put forward the argument that - even if significant similarities and convergence can be found in these approaches - there are also distinctions underlying their conceptions, with important implications not only for research, but also for policy-making activities.

Item 2, highlights the advantages of the approach on systems of innovation and addresses the main differences and convergence between this and the approaches based on production and technological agglomerations.

The Brazilian experience in developing and using the concept of production and innovation systems, both in analytical and normative terms, is analyzed in item 3.

Item 4 explores the main findings of the evaluation of the Brazilian experience to illustrate the argument that the employment of any of these notions without taking into account its precise meanings can lead to limited and inappropriate policy focus and methodologies.

The conclusion develops the main argument of the paper:

- that both research and policy activities will benefit significantly from incorporating a deeper knowledge of the different conceptual basis of these approaches
- that the focus on system of innovation offers broader perspectives and can help overcoming important limitations of the approach on agglomerations.

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2 – Systems of innovation and economic agglomerations: convergence and differences between approaches

The discussion below highlights the advantages of the approach of local systems of innovation and addresses the main convergence and differences between this and other approaches on economic agglomerations (such as clusters, industrial districts, etc.).

Main characteristics and advantages of the concept of innovation systems

Since its introduction in the 1980s, the literature on systems of innovation has steadly advanced. From the initial contribution of Freeman (1982, 1987) and Lundvall (1985), other important efforts include the analysis of national system of innovation in several countries coordinated by Richard Nelson (1993); as well as the development of the notions of regional (Carlsson and Stankiewicz, 1991) and sectoral innovation systems (Malerba and Orsenigo, 1997). It is also worth noting the French structuralist work on '*systèmes productifs locaux*' (Courlet, 2000) and the fact that this notion is being used by Datar (Délégation à l´Aménagement du Territoire et à l´Action Régionale) of the French government.[3]

In Latin America, several initiatives incorporating the notion of IS have taken place. Among them it is worth mentioning:

- the work coordinated by ECLAC[4] to focus on and compare systems of innovation in Latin America, including the case of Argentina, Mexico and Brazil (Katz, 1996, 2003);
- the reflections about the use of the concept of national system of innovation from the South developed mostly in Uruguay (Arocena and Sutz, 2000);
- the Mexican discussion on national innovation systems (Dutrenit et al., 2001);
- the studies on clusters and local innovation systems in Costa Rica, focusing on energy and environment (Vargas 2000; Segura, 2000);
- in Brazil, the work by RedeSist, which will be further discussed in item 3, and that has mobilized several case studies were produced in different regions of the country, covering industries such as aerospace, biotechnology, automobile, software, textiles-apparel, agro-industry, tourism, music and footwear.[5]

In Asia, an important effort in this direction include work about China (Gu 2003, Wu, Tu and Gu 2003, for example), Thailand and Vietnam (Chairatana, and Tan Sinh, 2003), India (Baskaran and Muchie, 2003, Abrol 2004, Joseph, and Intarakumnerd 2004) and Iran (Reza Razavi and Maleky 2004).

In Africa Muchie, Gammeltoft and Lundvall (2004) coordinated a collection of papers on African issues within the framework of innovation systems. Djeflat (2003 and 2004) analyzed the flows of knowledge in local learning system and emerging networks in Maghreeb countries, addressing the question of knowledge creation and diffusion/transmission of innovation with a particular stress on institutions, incentives and technology structures that have evolved to support SME innovative activities.

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[3] For details see Datar "La France, puissance industrielle: une nouvelle politique industrielle par les territoires", La Documentation Française, 2004.

[4] Economic Commission for Latin America and Caribbean.

[5] In September 2005, more than 500 technical notes, articles, chapters of books, thesis and dissertations were available in the site, which registered more than visitors 36000, with about 78000 downloads (since June 2004).

In other works (Lastres and Cassiolato, 2000 and 2005) we argued that the IS approach allows for a broader understanding of how industrial and technological development occurs. Underlying the system of innovation approach is the:

- emphasis on historical and national development trajectories, as well as on the role of technical change and innovation, which are characterized as systemic processes with multiple directions and sources (internal and external to firms and national boundaries);
- re-conceptualization of firms as organizations embedded within socio-economic-political environments, reflecting specific historical and cultural trajectories;
- stress on the need of taking into account the productive, financial, social, institutional and political spheres in their micro, meso and macro contexts.

Among the main advantages of this approach, we point out that it deals with the complexity of different cases; and that it targets groups of different agents (firms of different sizes and performing various types of activities, as well as other organizations dealing with education, training, R&D, promotion, financing, etc.) and connected activities that usually characterize any production and innovation local system. Therefore, it surpasses the restrictions of traditional focus on sectors, individual organizations and space (municipalities and micro-regions) as analytical and intervention units. By establishing a bridge between the territory and economic activities, it aims at covering economic, social and political contexts, as well as the cognitive environments where the main processes of learning, capacity building and innovation takes place and where tacit knowledge flows.

From the point of view of less developed countries (LDCs), the usefulness of the IS perspective resides in the fact that its central building blocks allow for the specificities of these countries to be taken into account. Also of particular relevance is the emphasis on the importance of innovation as a source of dynamic competitiveness, instead of the stress on the so-called traditional comparative advantages (based on low labor costs, the exploitation of natural resources without a long-term perspective and the manipulation of the exchange rates), which Fajnzylber (1988) called 'spurious competitiveness'. Furthermore, the understanding of innovation as a context specific and socially determined process allows demystifying ideas about the possibilities of generating and acquiring technologies in less developed countries. It makes clear, 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), assimilate and transform technology.

A perspective that allows linking micro, meso and macro dimensions of competitiveness is also crucial for all countries and particularly for LDCs. Important constraints to technological (and productive) development in these countries have included: macro-economic instabilities, hyper-inflation, high external debt and high interest rates. The example of most countries of Latin America highlights this need of taking into consideration all these dimensions when designing policies to promote industrial and technological development. In fact, at least from the 1970s onwards, there is a significant intellectual contribution in this region showing that macro-economic policies have greater importance for firm strategies towards technological change than specific industrial and innovation policies. That is why they have been called, since the 1970s in Latin America, 'implicit' industrial and technology policies (Herrera, 1971).

This idea was further elaborated by Coutinho, 2003, who shows how key macro variables (the rate of interest, the foreign exchange rate, the expected inflation level) and other macro-economic conditions shape micro-economic decisions. This author also distinguishes benign from malignant macro-economic regimes, arguing that the latter heavily penalizes productive and innovative investments with harmful effects to domestic production and the

competitiveness of the country and represents a significant challenge to industrial and technological policies, being capable of annulling them. It is worth stressing that malignant macro-economic of this kind is a common feature among most LDCs.

These are some of the reasons why we have argued that the IS approach:

- makes it possible to focus on different dimensions and on national (and local) economic, social and political structures;
- does not ignores that processes of development and of knowledge generation, use and diffusion can not be treated in isolation from issues of international hierarchies and power, as well as historical and cultural specific contexts;
- has a significant coherence with the concepts and theories elaborated in the Latin American region to understand development and underdevelopment.
- has had a fast diffusion in academic, entrepreneurial and policy-making environments in the region.[6]

Convergence and differences with economic agglomerations approaches

Several bodies of literature have renewed the stress on clustering, particularly of small and medium enterprises (SMEs), as a source of competitiveness. Examples, in advanced countries, include mainly the following cases:

- the work about the Italian agglomerations based on the Marshallian notion of industrial district (Becatini 1990, Brusco 1990) and which emphasizes also the role of external economies (scale economies external to the firm but internal to the 'district') and industrial atmosphere (conventions, rules, etc.);
- the Californian School that, focusing specially on the analysis of US high-tech agglomerations, stresses the role of institutions and considers the region as a nexus of interdependence, both traded (aiming at reducing transactions costs) and untraded, including technological spillovers and conventions, rules and languages to develop, communicate and interpret knowledge;[7]
- the approach of *milieu innovateur* (Camagni, 1991) aiming at understanding the conditions under which the environment stimulates innovation activities by local firms, emphasizing socio-cultural (formal and informal) relations
- the mainstream economics agenda that incorporated the idea of increasing returns due to agglomeration following Krugman's stress on geographical factors in competitiveness (1995);
- the recognition in the business literature that competitive advantages in the global economy derive from a constellation of local factors sustaining the success of leading firms. This has drawn attention to the importance of proximity and clustering, not only of suppliers firms but also competitors, triggering local dynamism (Porter, 1998);

[6] See Cassiolato, Lastres and Maciel, 2003; Lastres, Cassiolato and Arroio, 2005; and for details of the connections between the IS and the Latin-American Structuralist approaches see Cassiolato, Guimarães, Peixoto and Lastres, 2005.

[7] See, for instance, Lawson, 1997; Markusen 1996; Storper, 1989; Pyke and Sengerberger 1992.

- the conceptualization of "collective efficiency" (Schmitz, 1995) and the work about cluster up-grading SMEs agglomerations in LDCs (Schmitz, 2003, Giuliani, Pietrobelli and Rabelotti, 2004).

Several African, Latin American and Asian authors have also produced important contributions to the understanding of these processes in LDCs. Among those in Latin America who have participated in the Globelics conferences, it is specially worth mentioning:

- the work about Argentine SMEs agglomerations attempting to capture firms' competences and (collective) learning processes (Boscherini, López and Yoguel, 1999, Moori-Koenig and Yoguel 1999);
- the Mexican studies on cluster and networking of SMEs (Casas, 2003, Dutrénit, 2003, Vera-Cruz and Gil, 2003, Unger 2004);
- in Brazil, the work on industrial districts, clusters and networks (Britto and Albuquerque, 2000; Britto, 2001; Vargas and Campos, 2003; Lemos, 2003).

In Africa, recent effort in this direction include:Oyelaran-Oyeyinka (2004) discussion of the determinants of inter-firm and inter-organizational collaboration among SMEs in Nigeria, Kenya and Zimbabwe; and Wood and Kaplan (2004) examination innovation and the role of networks in the South African wine industry. In Asia, an important effort in this direction include work about China (Wu, Tu and Gu 2003, for example), Thailand and Vietnam (Chairatana, and Tan Sinh,2003), India (Baskaran and Muchie, 2003, Abrol 2004, Joseph, and Intarakumnerd 2004) and Iran (Reza Razavi and Maleky 2004).

All these approaches – as well as those on systems of production and innovation - have stressed the importance of the spatial dimension, proximity and interactions among firms to explain their successful performance and competitiveness. Moreover, a consensus was built, in the last decades, on the relevance of understanding the basis of industrial and technological development and on the need to design and implement policies. Issues such as learning, innovation and capacity building became increasingly incorporated in most of these approaches.

Three other points of - at least partial - convergence refer to the recognition that:

- non-economic agents apart from firms are important elements of any production and innovation system;
- the specificities of the environment were firms and other agents are located, as well as their interaction, are also critical to their survival and development;
- the focus on local activities can never ignore the global dimension.

This convergence has produced a number of significant results in the research agenda on industrial and technological development, with respective policy implications. We argue, however, that there remain notable differentiations between all these approaches and the innovation systems perspective. Concepts such as development, innovation and competitiveness have specific connotations when used in different theoretical frameworks. Differences can also be found in the understanding of their nature and of their role for development.

This has important consequences, particularly in the case of the LDCs. For example, a broader understanding of innovation - as the introduction by organizations of new ideas to produce goods and services, irrespective of whether or not they are new to their domestic or foreign competitors - contributes to avoid the false conflict between innovation and local

development. Any production system, rudimentary or complex, as well as any agent within it can innovate and, then, be object of policies promoting innovation.

Besides these differences in the weight and in the understanding of their central elements, a main distinction between the innovation systems perspective and the approaches on agglomerations persists, deriving from their conceptual basis.

As the IS notion implies that neither production nor innovation constitute isolated processes - the focus of analysis is on production systems**;** regardless of its level of specialization, number of clustering firms, etc.. Systems of innovation comprise clusters, industrial districts, etc., but are not limited to them, including all types of production and innovation structures. Hence, the IS approach can be used to analyze not only structured and specialized agglomerations. For this reason, we argue that the system of innovation represents a broader concept with wider applicability to different countries and productive activities. Again, there are significant implications, both analytically and in policy terms, deriving from this point.

In the following items of the paper we will discuss the effects in practical terms of these convergences and divergences in the approaches. We argue that this analysis contributes to the advancement of the knowledge about their use, both in analytical and normative terms.

Item 3 will examine the Brazilian experience in developing and using the concept of Local Productive and Innovative Systems and Arrangements (LPISAs). This is based on the knowledge accumulated by developing and applying this concept on a number of empirical and other studies and by designing and implementing industrial and technological policies for these systems and agglomerations.

3 - Analytical and policy-making focus on production agglomerations and systems in Brazil

The conceptual and analytical experience

In 1997, a research network – RedeSist – was formally set up in Brazil aiming at investigating and understanding local processes of learning and capability creation and accumulation, as well as putting forward propositions for their mobilization.[8] Our first step was to try to derive from the *national system of innovation approach* an operational tool. This effort led to the development of the concept of *local productive and innovative systems and arrangements*.[9]

Based on these concepts and premises a compatible empirical methodology was developed to gather information about the strengths and vulnerabilities of Brazilian production, innovation and learning processes. This methodological framework aims at covering micro, meso and macro elements influencing the evolution of local systems. The methodology chosen focuses mainly on the analysis of how productive and innovative capabilities of selected systems are acquired and developed. This includes the investigation of:

- how knowledge is assimilated and used by firms and diffused within the systems;
- the form and level of interactions among agents, the competence structure of the system;

[8] The first research grant obtained came from the Brazilian National Council for the Development of Science and Technology - CNPq - and from the Organization of the American States. The latter allowed us to formalize cooperation also with colleagues from Uruguay and Argentina.

[9] Cassiolato and Lastres, 1999 and 2003.

- policies and other incentives more appropriate for mobilizing and developing these capabilities.

In these 8 years, more than 50 case studies were produced in different industries and regions of Brazil.[10] After two first rounds of field work, we have noticed that most of the case studies selected by local research teams, either focused or included the analysis of clusters (or industrial districts), and that these and the IS concepts were often being used as synonyms. At this point, two things became clear. First, the importance of convergence, in pragmatic terms, between the systemic approach with those based on cluster and other concepts of economic agglomerations. Secondly, the resulting synergies and mutual reinforcement of these approaches, particularly the possibilities of developing a stronger pool of research and comparative analysis.

It is understandable that researchers are often tempted to choose those cases that are more sophisticated and complex, for their richness in terms of investigation and comparison. These are also the cases that are more similar to those in the most advanced countries. However, it became clear that empirical studies focusing on less structured and fragmented systems could also provide important findings and even bring a broader understanding of the reality of productive and technological development, particularly in those countries where they are frequent. Therefore, we started to explicitly target case studies of production and innovation systems that could not properly be considered as clusters or any other kind of agglomeration.[11]

This conclusion led to the definition of RedeSist's concept of local productive and innovative systems and arrangements.

Local productive and innovative systems involve groups of economic, political and social agents localized in the same area, performing related economic activities, in which formal and informal interdependence and consistent linkages usually result in cooperation and learning processes, with a potential to generate the increase of productive and innovative capabilities. They generally include firms - designing, producing and commercializing final goods and services, suppliers of inputs and equipment, service providers, etc.) - and their different forms of representation and association. They also include other public and private organizations specialized in educating and training human resources, R&D, engineering, promotion, financing, etc.

*Local productive arrangement*s refer to those less structured cases in which interaction, cooperation and learning processes are incipient.

[10] RedeSist's methodology - including sample plan, questionnaires developed to base the interviews with the different agents and an analytical structure – case studies, as well as other results of the work developed by the research network are available in www.ie.ufrj.br/redesist/.

[11] RedeSist's research agenda for the period 2005 and 2006 includes mainly cases in the area of creative industries and other which are important especially in terms of social and regional development.

The policy-making experience

In the policy-making sphere a parallel development was observed. Mainly because of the convergence discussed above - and the resulting preeminence given by international agencies to these approaches on agglomerations and systems - most governments in Latin America see them as a new important form of promoting industrial and technological development.

In Brazil, since 1999, most agencies in charge of industrial and technological policies have applied the focus on production and innovation systems. After that the importance of the issue has further increased both in the public and private policy spheres. In May 2003, a Permanent Working Group for LPISAs (PWG-LPISAs) was set up with the objective of integrating and articulating all government and non-government agencies at federal level. This group has representative members from 25 ministries, the five Brazilian official banks and other organizations and other private organizations responsible for industrial and technological policy.

A Program for LPISAs was institutionalized at the federal level by its inclusion in the 2004-2007 government budget. The program is coordinated by the Ministry of Development, Industry and Trade, which also acts as the executive Secretariat of the PWG-LPISAs. The group launched in 2004 a term of reference for a national action in the area and as part of its mandate it attempted at identifying LPISAs in the Brazilian territory. The group identified more than 400 LIPSAs supported by at least one federal agency. Eleven of these cases were selected for a pilot phase of policy promotion, which counted with the support of at least 5 federal agencies (www.desenvolvimento.gov.br).

This initiative to organize and coordinate policy actions in Brazil indicates the importance of the promotion of LIPSAs for development, particularly for micro and small enterprises (SMEs).[12] Another positive aspect is that the interest and participation of different agents in mobilizing LPISAs has contributed to widen the scope of action beyond issues of competitiveness, innovativeness and economic sustainability. It has for instance, contributed to make clearer the links of such themes with questions such as social inclusion, employment and income generation, decrease in inequalities and regional differences, local and environment development and national integration.

The evaluation of this six-year experience showed that most of the policies designed and implemented were in fact cluster policies. The next item will discuss the idea that – without denying the significant advantages – it is important to recognize and advance the understanding of the respective parallel limitations, given their analytical and normative implications.

[12] See Lemos, Albagli and Szapiro, 2004; Lages, Braga e Morelli, 2004.

4 - What can be learned from the Brazilian experience?

The evaluation of experiences accumulated in research and policy-making in Brazil shows that the convergence between approaches based on production and innovation systems and agglomerations has offered significant advantages, which include mainly:

- the mutual reinforcement of these approaches; and
- the fact that the long tradition of studies on economic agglomerations, has certainly played a fundamental role in decreasing the usual resistance that all new conceptual approach or theoretical contribution faces when it starts to be diffused.

However, at the same time, some limitations were found mainly from the superficial and indiscriminate use of the different terms and the preeminence given to the idea of agglomeration. One consequence of this emphasis has been the establishment of a principle that (i) the very existence of an agglomeration (cluster, district, etc) would be a sufficient reason for its selection both as a case study and for policy support; and that (ii) information about the localization of the agglomerations could, by itself, answer what policies should be implemented.

As a direct consequence, a trend was set up towards their identification and localization, often followed by the development of increasingly sophisticated maps and information systems. In fact, in 2005, most of policy agencies at national, state and municipal levels dealing with industrial and technological development, together with Brazilian research groups and consultancy firms, have engaged in processes of identifying and characterizing existing industrial agglomerations in the country.

Both in the case of research and policy-making efforts, these activities have involved the use of very expensive techniques, normally developed in the most advanced countries. Methodologies and software were imported and adapted; international consultants were hired and some Brazilian specialists and researchers were sent abroad to acquire skills in spatial econometrics.

Initiatives of this kind constitute important exercise, and the evaluation of their use has brought about important reflections on its advantages and limitations.

One of the problems identified is that these activities have often required significant research and financial effort and that often their construction and use have become an end in itself. Therefore, in terms of the research effort what could be an important first step, usually condenses all the work to be done. And in terms of policy-making, mapping and planning activities consume so much resources that only a small amount of money is left for policy itself.[13]

Existing agglomerations are generally identified through indicators (location quotients, specialization indexes, etc.) obtained from available official statistics. Arguably, the resulting mapping exercises and information systems have at least two problems. First they are restricted to organized activities, leaving behind a huge number of agglomerations, based on informal activities and work, which increasingly characterize production in a significant number of sectors in Brazil.[14] Secondly, as the selection refers to those agglomerations with above the average indicators, cases that would probably be more important and in need of analytical and policy support are left behind.

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[13] For details see Lemos, Albagli and Szapiro, 2004.

[14] For example, more than 70% of the labor force in the Brazilian clothing industry is informal (Melo 2003).

Moreover, the emphasis on agglomerations has led to a selection process *a la* 'picking the winners'. Targeting existing structured and specialized agglomerations has the obvious advantage of concentrating on systems that have historically shown capacity to survival. However, one cannot forget its correlated limitations. Perhaps the most significant limitation here is that it leaves aside a whole range of production systems that, although not showing immediate economic relevance, may be very important in terms of social and regional development. These cases were, by definition, excluded from analytical and policy consideration.

A related problem is that this sort of conduct has led, not only to the development and use of different definitions of the concept, but to the search for rules, mostly quantitative, to characterize agglomerations and to define their shape and types. As a result, endless, divergent and, most of the times, useless debates on these issues have been ignited, blocking further efforts to develop an useful policy tool. It also has led to the questioning about the existence or not of agglomerations in some systems that are incipient in terms of number of agents and forms of articulation. A crucial point here is that because of definitional matters a system is included or excluded from the research and policy agenda. There have been reported cases of applications of prospective recipients of government support that were deferred under the justification that they do not constitute a system, arrangement, cluster or district.

Another limitation refers to the use and adoption of methodologies developed in advanced countries to create typologies of LPISAs aiming at applying differentiated analytical and policy tools according to their classification. These typologies start from the idea that LPISAs are in different ‘stages’: potential, incipient, stagnating, dynamic, mature, world class, etc. Some focus on the type of governance; others categorize them according to policy objectives: export, local development, innovation, competitiveness. These methodologies can be quite useful as analytical and normative tools of complex and differentiated realities. However, a recurrent problem is the supposition that there exists a benchmark model to be followed by all. Also, as it is the case of any tool, one should keep in mind what are the contexts and objectives to which these methodologies were built for. And of course LPISAs' information systems, models and typologies cannot replace the tacit knowledge that local agents possess about their own condition and needs, as well as of their territory, which is fundamental for both successful research and intervention procedures.

A connected problem refers to a superficial and biased understanding of the central issues of the analytical and policy backgrounds, namely development, competitiveness and innovation. Even if these biases reflect mainly the analytical framework influencing policy-making, resulting limitations become more evident and serious in the policy dimension. The evaluation of the experience accumulated so far shows, for instance, that there is a common dissociation between economic and social development and that promoting innovation is often opposed to the promotion of local development or social inclusion. Agencies still design polices to either diminish local social inequalities (normally to disorganized local systems) or stimulate learning and innovation processes (most of the times to clusters). It is also worth pointing out that such separation normally comes from a restricted notion that innovation is something totally new in the world, R&D intensive and geared to technologically more advanced environments.

It is also worth pointing out that in most approaches, knowledge continues to be associated to the purchase of foreign machinery and innovation keeps confined to process improvements. Therefore, the understanding of innovation as a local and cumulative process and the emphasis on capacity building systems as central factors for sustainable growth and dynamism are often given less eminence. Openness to foreign capital and technology becomes priority in most of the policies targeting innovation.

This superficiality and bias are also found when examining the objectives of some policy programs when they (i) intend to 'build' cooperation, governance, innovation and even the whole system; and (ii) treat firms and other agents as 'patients' who supposedly need to learn how to interact, innovate, etc. Without denying the role of demonstration programs displaying the importance of these processes, we would like to call the attention to problems of imposing policy prescriptions based on models that ignore already established local conditions and do not take into account historical evolution. Not understanding that production systems are intrinsic parts of societal systems, some of these programs spend a significant amount of resources attempting to do the impossible, i.e. create (artificially) local specific social constructs. Even worse is the risk of destroying culturally based processes of knowledge creation, assimilation, use and diffusion.

Of course these trends represent important limitations, especially because by disregarding local specificities and by dissociating social and economic development they contribute to increase the level of inequality between different segments of the society and of the economy. We argue that overcoming these two problems it is the main challenge of science and technology and innovation policies in all countries and particularly those less developed.

Conclusion

The fast spread of policies targeting production systems and agglomerations both in public and private spheres, witnessed in the transition of the millennium, can be associated to the recognition that (i) the focal points of the new industrial and technological development policies should be the promotion of knowledge acquisition, use and diffusion; and that (ii) the best means to do that would be the mobilization of collective agents, their interaction and environments.

Important knowledge has been developed at research and policy-making spheres in Brazil. However, as the overall results from our analysis show, it seems that both research and policy activities for LPISAs are still suffering from misunderstandings and misconceptions and, therefore, from the risk of being just a "new icing on an old cake" (Reinert & Reinert, 2003).

This paper argues that there is significant room for advance by overcoming some of the limitations identified in the evaluation of research and policy-making efforts by using the knowledge accumulated with more than half a decade of pragmatic experience.

As seen above, the first main limitation refers to the fact that concepts such as local productive system, cluster, industrial district are used indiscriminately and that the idea of agglomeration prevails. This has led to a trend of identifying, locating and quantifying the LPISAs, which is often associated to the development of sophisticated maps and information systems and involves very expensive techniques, normally developed in the most advanced countries. As these activities require significant research and financial effort, usually their construction and use become an end in itself. In terms of the research effort what could be an excellent first step, usually summarizes the whole work that is done. In terms of policy-making, activities of planning, mapping, etc. consume so much resources that only a small amount of money is left for policy itself.

A second limitation refers to the establishment of a principle that

- the very existence of an agglomeration (cluster, district, etc) would be a sufficient reason for its selection both as a case study and for policy support;

- information about the localization of the agglomerations could, by itself, answer what policies should be implemented.

The emphasis on agglomerations has also represented a sort of 'picking the winners' type of selection. Although this has many advantages, it brings important limitations, especially from the point of view of LDCs given:

- the exclusion, by definition, from analytical and policy consideration of other production systems, which are considered as incipient in terms of number of agents and forms of articulation and may be very important in terms of social and regional development, but do not show economic importance;
- the development of different definitions of the concept and recipes of type, shape, number and other rules to characterize agglomerations, as well as endless and divergent debates on that.

A third limitation refers to the superficial understanding of the central issues of the analytical and policy framework, including mainly the dissociation and antagonism between economic and social development, the restrict understanding of competitiveness and innovation. Social and economic objectives should not be seen as antagonist. Treating them together for the development of a given territory tends to generate more consistent results with a positive long run effect. Additionally, even if the role of non-economic agents is recognized in different approaches, the importance of their interactivity is minimized as they are subordinated to the inflow of knowledge and technology from outside sources. Another important point is that the emphasis on local development should not be perceived in terms of a fragmentation of the national space.

A fourth limitation relates to the use of models based on the most advanced countries and organizations, which are not applicable to LDCs. This has a particular effect that is important to address. As these models are inadequate to the realities of LDCs, their requirements are not fulfilled. Then a set of criticism is directed to the agents and environment of these LDCs mostly because their "behavior does not obey the rules of the model". Instead of acknowledging that the model is wrong and that policy prescriptions more adequate to the different realities of these countries, should be pursued, local agents are blamed. This attempt at enforcing conformity without regard to specificities of different realities works in a truly Procrustean fashion.[15] Even if obvious, the point here is that analytical and policies frameworks have to be developed taking into account the specific requirement of contexts they are targeting, and not the other way round, that is forcing reality to adapt to models.

Here, we would like also to recall a reflection about the value and contribution of theories and concepts that were developed through the observation and analysis of processes occurring in different contexts. Particularly important is the alert of Arocena and Sutz (2003) about the question of adequacy of approaches conceived by focusing on experiences in the developed world, when applied in less developed regions. In other words, about the use of *unsuitable models under the hegemonic lamppost, however potent its light might be'*.[16] Of course a lot of competence is required to choose among the various sources of illumination those that - like

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[15] See Lastres, Arroio and Lemos, 2003, who use this metaphor to argue about the need of developing policies adequate to the cases in question and not the other way round.

[16] Arocena and Sutz invoke Weizenbaum, 1976 joke about the drunk, the light spot and the keys: 'One dark night a policeman comes upon a drunk. The man is on his knees, obviously searching for something under a lampost. He tells the officer he is looking for his keys, which he says he lost "over there", pointing out into the darkness. The police officer asks him: "Why, if you lost the keys over there, are you looking for them under the streetlight?" The drunk answers, "Because the light is so much better here".' (p. 127).

lanterns or flashlights, instead of rigid lampposts - can be useful. Even more important is the required mastery in the use of such instruments.

The development of the national system of innovation approach in the 1980s has reinforced the thesis that (i) innovation is a localized process and bound to national and regional frontiers, contrasting with the idea of a supposed techno-globalism; and that (ii) there is not a 'model' to be imperatively followed. Each case must be studied according to its peculiarities, its specific characteristics, and the international context – with its limitations and opportunities – in order to evaluate what should be its own, specific, strategies and mode of development (Freeman, 2003; Johnson and Lundvall, 2003). It is also worth noting that the idea of national system of innovation was developed precisely when the idea of globalization was spreading all over the world; and together with this the conclusion that national characteristics and policies would loose relevance.

It is perhaps this incompatibility of the systems of innovation approach with modeling and creation of typologies that has led to the view that: "there are still concerns in the policy making community that the NIS approach has too little operational value and is difficult to implement" (OECD 2002: 211). In fact our argument is quite the opposite. The flexible and pragmatic character of this concept may be seen as a great advantage, even if it makes the life of the policy-maker a bit more difficult.

According to our point of view, the mistakes with most development policies reflect a complete conceptual misunderstanding and also the submission to alleged urgencies, trends and fashions. The main argument here is that behind these fashions - that have emphasized the setting up and support of parks and poles, industrial districts, clusters and systems using traditional mechanisms and inappropriate concepts - there are interesting ideas that have not been considered for the sake of quickly implementing half-baked policy measures. Additionally, most of the times, they are employed as panacea. It is also worth re-emphasizing that the use of new concepts, models and policy tools is far from being trivial, demanding cultural changes and institutional learning mainly by researchers and policy-makers.

For the emphasis on LPISAs to correspond not only to mere using new labels to old practices in order to follow a 'fashion'[17] and to get access to financial support, analytical and normative approaches have to advance and really incorporate the essence of the concept. A crucial conceptual distinction between the approaches discussed in this paper refers to the fact that even if the IS concept may be used to capture and analyze agglomerations (such as industrial districts, clusters, *milieux*, etc.), it goes beyond that. As seen above, the IS notion implies that the focus (of analysis or policy) is on production systems irrespectively of its level of specialization, number of clustering firms, etc.

There are significant research and policy implications based on these qualifications. Our main argument here is that the IS concept represents a broader analytical and policy focusing device than those based on agglomerations. As the notion of cluster, industrial districts, milieu automatically emphasizes structured and specialized agglomerations, its use leaves aside others that may also require both research attention and policy support. The understanding and the promotion of emerging and less structured systems can be very important in all

[17] In periods characterized by deep transformations it is particularly necessary to distinguish among the emerging trends, those that are permanent from those that ephemeral, or as pointed out by the Brazilian geographer Milton Santos distinguish the mode (modo in Portuguese) from the fashion (moda in Portuguese). For details see Lastres, 2001.

countries. Research effort and policies targeting industrial and technological development cannot ignore these cases, particularly in LDCs.

Under this perspective, we may conclude that there are as many systems as the production capacity of a country allows for. Such understanding helps avoiding endless discussions about, for instance, if incipient and disarticulated agglomerations constitute (or not) a system. More useful for policy ends is to establish criteria specifically designed to selected cases to be supported, within a wider development policy. For instance, if the development agenda includes objectives such as to the increase the number and quality of employment and income, to compensate for social and regional inequalities and to alleviated the deficit in the balance of payments, the LPISAs selected to be supported would be those that can help achieving these objectives. In other word, the focus on LPISAs should not constitute an end per se and it is certainly not a matter of counting them and increasing their number. Also the selection of cases for policy purposes should be based on political decisions; and not by possible limitations of analytical and normative concepts (Cassiolato e Lastres, 2003).

To sum up, there are several reasons why we argue that the IS approach represents a powerful instrument to understand and to orient policies to promote learning, innovation and competence building processes. First it helps to overcome the limitations of the focus on individual organizations, sectors, agglomerations and space (municipalities and micro-regions) as analytical and intervention units. Second, it covers economic, political and social contexts and the cognitive environments, where the main processes of learning, capacity building and innovation takes place and where tacit knowledge flows. Third it offers a broader understanding about the possibilities of acquiring and using technologies. Fourth, it helps avoiding two important traps: (i) of dissociating economic and social development, (ii) of adopting a supposedly automatic selection of cases to be supported, which in fact only contributes to the increase of inequalities between regions and segments of society. Fifth, it does not dismiss the possibility of using innovation policies to reduce inequalities. Finally, and therefore, it represents an important conceptual basis for orienting innovation policies in all countries and particularly the LDCs.

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