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Industrial Clustering in the State of Sao Paulo

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Abstract

This paper argues that, contrary to the trend in the State of Sao Paulo as a whole, the interior of the State is managing to increase its share of the country's manufacturing output and employment because of successful industrial clustering. On the basis of an index of specialisation, the paper identifies a number of clusters and selects a few of them for comments in the light of existing theoretical approaches and empirical evidence. Some policy implications are also discussed.

Foreword

This paper derives from an ongoing joint UNICAMP (Universidade Estadual de Campinas) and UNESP (Universidade Estadual Paulista) research project co-ordinated by myself in collaboration with Joao Furtado, from the Department of Economics, UNESP. The research project team includes Renato de Castro Garcia, graduate student and researcher, NEIT – Nucleo de Economia Industrial e da Tecnologia, Institute of Economics, UNICAMP, and Sergio E. Ketelhute Sampaio, undergraduate student, IE/UNICAMP. I greatly acknowledge their support, project discussion and help with the database, the latter especially for computing an index of specialisation by micro-regions and municipalities of the state of Sao Paulo. Dr. Luis A. Paulino, from the Secretary of Employment, State Government of Sao Paulo, has encouraged the project since its inception. I am very grateful for his help and support, particularly for arranging visits and interviews in the interior of the State. The usual caveats apply, of course.

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Introduction

The economic problem addressed in this paper can be enunciated as follows: The State of Sao Paulo has been consistently losing its share of Brazilian manufacturing output and employment since 1985. The most affected region of the State is the metropolitan area, which lost 8.1 percentage points of its share of the country's total industrial employment between 1986 and 1997. However, the interior of the state has not only avoided losses but has even managed to increase by 0.6% its share of the country's industrial employment.[1] Why?

There are several causes, of course. The State of Sao Paulo was the hardest hit by trade liberalisation. It is also the great loser in the fiscal incentive war among Brazilian states, which led to relocations of manufacturing plants from Sao Paulo to other States. Since manufacturing was mostly concentrated in the metropolitan area, this region was the most severely affected by these trends. Hence the better performance of the interior. Additionally, relocations of manufacturing plants from the metropolitan region to the interior have been caused by diseconomies of agglomeration in the metropolitan area. But my guess is that industrial clustering in the interior, benefiting from local external economies and incentives, is part of the answer and possibly a substantial one.

Thus, it is worth trying to assess the importance of industrial clusters in the interior of the State, as well as to study their morphology and their economic and organisational characteristics, and to discuss clusters dynamics. As a preliminary research step, this paper will focus on the identification of clusters, rather than on clusters performance and technological dynamics. A few cases will be discussed in some detail, although no proper case studies have yet been done. Finally, some policy implications will be discussed at the end of the paper. But first the present theoretical discussion on clusters is briefly summarised below.

Theoretical framework

This is a fascinating new field of theoretical and empirical research, first and foremost because it combines a number of different approaches but also, and not the least important, because it stresses the importance of several analytical categories not always present in hard core economic analysis. Among others I would point out the following: (1) History. The mere existence of a cluster can be the result of an "historical accident". In the same way, the evolution of clusters is frequently determined by path dependent evolutionary processes, as well as by lock-in in successful trajectories; (2) Small events such as commercial or technological innovations or new organisational developments. These events can create a breakthrough in the cluster evolution; (3) Institutions. Local business associations, co-operatives, workers associations and other local institutions play a fundamental role in cluster development; (4) Social and cultural contexts. These are the basis for trust, which is essential for institution building and private co-operation; and of course (5) Public policies. Public support through specific policy measures is also fundamental for cluster competitiveness.

There is no room in this paper for a thorough review of these approaches. Instead, a general, birds'-eye view of the different approaches is offered in Box 1. Note, however, that these approaches are not mutually exclusive but rather complementary. Brief comments on these approaches are made next, and subsequently the paper concentrates on the approach which is considered the most promising one, namely H. Schmitz' collective efficiency approach.

[1] See IBGE (1999) and Azevedo and Toneto Junior (1999) for data and more detailed discussion.

Box 1. Summary of theoretical approaches

New Economic Geography (P.Krugman, 1998): Builds on A. Marshall's earlier contributions. Agglomeration results from cumulative causation induced by the presence of local external economies. External economies are incidental, and the spatial structure of the economy is determined by invisible hand processes of centripetal vs. centrifugal forces. Little room for public policies.

Business Economics (M. Porter, 1998): Stresses the importance of geographically restricted external economies ("concentrations of highly specialised skills and knowledge, institutions, rivals, related business, and sophisticated customers") in international competition. Location as part of business strategy. Market forces should determine cluster outcomes. Governments should provide education, physical infrastructure, and competition rules.

Regional Science (A. Scott, 1998): Economic geography and industrial performance are intertwined. There is an endemic tendency in capitalism for dense localised clusters. "These clusters are constituted as transactions-intensive regional economies which are in turn caught up in structures of interdependency stretching across the entire globe". Non-market co-ordination and public policies are essential in the construction of localised competitive advantage.

Innovation Studies (D. B. Audretsch, 1998): Local proximity facilitates information flows and the spill over of knowledge. Economic activity based on new knowledge has a high propensity to cluster within a geographic region. "This has triggered a fundamental shift in public policy towards business, away from policies constraining the freedom of firms to contract and towards a new set of enabling policies, implemented at the regional and local levels."

Small-Scale Industry & Industrial Districts (H. Schmitz, 1997; 1999): In addition to incidental or spontaneous local external economies "there is also a deliberate force at work, namely consciously pursued private co-operation and public support". The concept of collective efficiency brings together the spontaneous (or unplanned) and consciously pursued (or planned) effects, and is defined as "the competitive advantage derived from local external economies and joint action".

The first two approaches are similar in the sense that both consider clusters as a natural outcome of market forces. There is not much to be done except for correcting market failures and implementing general (horizontal) policy measures. The other three approaches are similar in the opposite sense. The three authors strongly emphasise the support of specific public policies and business co-operation in clusters. Essentially, the distinction between the two groups can be summarised by comparing three pairs of analytical categories: incidental versus deliberate nature of external economies, disabling versus enabling feature of external economies, and invisible hand processes versus public support in cluster performance and dynamics. H. Schmitz' collective efficiency approach departs exactly from this kind of comparison.

The collective efficiency approach recognises the importance of Marshallian local external economies, but stresses that such external economies are not sufficient to explain the growth and competitiveness of firms in clusters. A second and perhaps more important factor is the deliberate force represented by consciously pursued private co-operation (among clustering firms, trade and marketing agents, business associations, technology research centres) and by public support. The concept of collective efficiency thus combine the effects of both local (spontaneous or unplanned) external economies and consciously pursued (or planned) joint action and public support in explaining the competitive advantage of clustering firms (Schmitz, 1997; 1999).

The analytical framework of this approach can be summarised as follows: Marshallian local external economies are important to understand clustering, but they offer an incomplete explanation. Private co-operation and public support constitute a second critical factor for explaining clusters. Why are local external economies considered to be an incomplete explanation? Firstly, because they usually apply only to production. However, relevant external economies are also present in distribution and other specialised services, which are common in clusters. Secondly, because external economies are usually treated as market failures. The collective efficiency approach stresses the enabling rather than the disabling (market failures) features of technological external economics (Schmitz, 1997). Furthermore, and most important, external economies are incidental, while co-operation and public support are obviously deliberate. Specialised manufacturers of differentiated products, co-operating among themselves and

with specialised suppliers, traders, transport firms, etc. benefit from increasing returns to scale effects similar to those derived from Marshallian pure external economies. Private co-operation usually concentrates on production (inter-firm co-operation, networks, groups of firms co-operating, e.g. large firms/small businesses), but Research & Development (R & D), purchasing, marketing and other consortia are not uncommon. Finally, the collective efficiency approach stresses the role of self-help organisations in clusters. But public support through specific policies is also important and should be in synergy with private self-help (Schmitz, 1997:23).

An important question is how to define cluster. Altenburg and Meyer-Stamer (1999:1694) make a good point in stating that "in its broadest sense, the term 'cluster' only depicts local concentrations of certain economic activities (…). Pure agglomerations of unrelated firms do not give rise to collective efficiency". Thus it is essential to focus on external economies effects *and* on interaction. However, they continue, "given the complexity of patterns of interaction in clusters, (…) it is impossible to formulate a precise definition of clusters or to draw a borderline between pure agglomerations and complex clusters with strong externalities" (Altenburg & Meyer-Stamer, 1999:1694). Despite this difficulty, the same authors formulate what they call an operational definition of clustering based on measurable variables: "A cluster is a sizeable agglomeration of firms in a spatially delimited area which has a distinctive specialisation profile and in which inter-firm specialisation and trade is substantial". They also make a clear distinction between clusters and industrial districts. "Local business networks in which a dense social fabric based on shared cultural norms and values and an elaborate network of institutions facilitate the dissemination of knowledge and innovation, constitute a specific type of cluster and may be termed 'industrial districts'" (p. 1694).

Thus, what to look for in clusters? In addition to the presence of local external economies related to market size, as well as to skilled labour pooling, technology spill over and others that favour local specialisation, some characteristics are usually present in clusters. The most important of these characteristics can be summarised as follows. Local firms interact through production, trade and distribution linkages. They also co-operate in marketing, export promotion, supply of critical inputs, R & D and other activities. But, despite joint actions, local firms manage to keep a healthy balance

between co-operation and competition within the cluster. Local firms usually benefit from the support of a local institutional framework. Local business or other leadership usually co-ordinate public and private actions, and the existence of some forms of political, social or cultural identity create the basis for trust and information sharing.[2]

However, these characteristics should not be understood as restrictive analytical categories for the definition of cluster. In fact, as stated by Altenburg and Meyer-Stamer(1999:1694), "(t)he notion of clustering refers to a variety of industrial agglomerations".

[2] See Altenburg and Meyer-Stamer (1999) for a similar list of "ingredients" usually added to the notion of clustering.

Clustering indices: preliminary results

In order to be able to identify and characterise clusters in the interior of the State of Sao Paulo, the first step was to choose adequate databases. At least four databases could be used (RAIS – Relacao Anual de Informacoes Sociais; IBGE, Pesquisa Industrial Anual; SEADE, Pesquisa da Atividade Economica Paulista, and State government fiscal value added data), but the best one readily available was RAIS for the year 1997. Thus a first effort to identify clusters was made with this database, which gives information on employment and number of plants by sector and by micro-regions (MRs) and their respective municipalities. There are also data on plant size according to the number of employees, by sector and wage ranges. The latter data will not be used in this paper, but they will be most useful later on in the research project, for discussion of case study results after field research is completed.

Some methodological considerations are in order. First, only manufacturing industry is included, and even in manufacturing some sectors were not included, such as industries processing agricultural products or mineral raw materials, which are usually located near the source of input, and highly concentrated industries, which are located according to market access and other logistic criteria. Second, data were organised by MRs, leaving aside the metropolitan region and the regions in the great Sao Paulo area. Two other MRs were left aside due to imperfect data tabulation: Mogi Mirim and Mogi das Cruzes). Third, an index of concentration (or specialisation) was devised so to capture sector concentrations/specialisations in MRs relative to the state as a whole. It is defined as (for employment data only):

$$I = \frac{\dfrac{\text{No. of employees in sector X in MR “A”}}{\text{No. of employees in all sectors in MR “A”}}}{\dfrac{\text{No. of employees in sector X in the State}}{\text{No. of employees in all sectors in the State.}}}$$

This is a very simple index, of course. It indicates relative specialisation of MRs in specific branches of industry vis-à-vis the same branches of industry in the state as a whole. Thus, the higher the index, the higher the specialisation.

The index is subject to various criticisms, of course. One of them is that the indices are not strictly comparable among MRs. A very small region (in industrial concentration terms) in which one sector is preponderant and relatively concentrated vis-à-vis the state can produce an extremely high index for that sector, although it may not characterise a cluster. And vice-versa, a large and diversified MR tends to produce relatively small indices. Another problem is that a cluster does not necessarily "respect" geographic limits. So it is sometimes difficult to assess the extension of clusters to adjacent MRs or municipalities. To do this it will be necessary to breakdown MRs data by municipalities, which will be done in a more advanced phase of the research project. However, this index does seem to work as we can see from the preliminary results for some MRs shown below.

The total number of MRs in the database is 63, within which there are 597 municipalities. The total number of "sectors" (actually a five-digit industry classification) is 1,124. A master cross-section table with sector in lines and MRs in columns was first elaborated showing the indices of specialisation. The table can be read either horizontally so to figure out in which MR(s) a sector in concentrated (if concentrated at all), or vertically so to figure out which sectors are mostly concentrated in specific MRs. It would be impossible, within the limits of this paper, to give a general picture of industrial clusters in the state of Sao Paulo. Thus, a few cases were arbitrarily selected for discussion (see Table 1). However, this discussion is very preliminary since, as mentioned above, no proper case studies have yet been done.

Table 1

Indices of Specialisation in Selected Micro-Regions of the State of Sao Paulo, 1997

Micro-region	Sector	Specialisation index
Sao Jose dos Campos	29726 Arms industry	24.22
	35319 Aircraft building & assembling	24.21
Franca	19100 Leather tanning	21.18
	19313 Leather shoes	53.99
	19321 Trainers	13.18
	19399 Other non-leather shoes	9.24
	29645 Shoe machinery	3.93
Limeira	36919 Gem & Jewellery	11.54
Catanduva	29246 Ceiling fans	13.45
Votuporanga	36110 Furniture (wooden)	21.75
	36129 Furniture (metal)	15.18

Source: Elaborated from data in RAIS – Relacao Anual de Informacoes Sociais, 1997.

Comments on selected cases

Some very brief comments are made below on the MRs of Sao Jose dos Campos, Franca, Limeira, Catanduva and Votuporanga. These comments are based on existing printed reports, papers, press clippings, local studies and, in the cases of Limeira and Catanduva, also on short visits to local institutions and firms. It should also be noted that in all these MRs the main city (town) is the one after which the MR is denominated.

Sao Jose dos Campos

The agglomeration of high-tech industries in the region of Sao Jose dos Campos began with the Brazilian Air Force project to develop technological capabilities in aeronautics after the Second World War (DINIZ and RAZAVI, 1995). With this purpose in mind, the government created a sophisticated Science & Technology (S & T) infrastructure in the town of Sao Jose dos Campos. This S & T infrastructure included a graduate course (ITA – Instituto Tecnologico da Aeronautica), a technology research centre (CTA - Centro Tecnologico da Aeronautica), and a space research centre (INPE – Instituto de Pesquisas Espaciais). This S & T infrastructure is the core of the successful aircraft (civilian and military) industry and of the arms industry (missiles, tanks and electronic equipment) which developed in that town since the late 1960s. Later Sao Jose dos Campos became an important location for manufacturing. Other plants were established in the area and today it is a very diversified industrial structure. However, the question is, can it be described as a cluster? Yes, but only in the broadest sense. The concept of collective efficiency hardly applies to the arms-length relationships between a gigantic firm like Embraer (the aircraft builder) and its suppliers and service firms.

Franca

Franca is located in a former cattle-raising area. It was also a resting-place for travellers on former routes from Sao Paulo to the central regions of the country. Production of saddles, boots and other leather goods began naturally to attend travellers'

and local demand (SOUZA and GARCIA, 1998). Today it is the second largest concentration of leather shoe manufacturers in the country, after Vale dos Sinos in Rio Grande do Sul (described as a "super cluster" by H. Schmitz).

Franca is a perfect example of industrial clustering. It is highly specialised in men's shoes for both the domestic and international markets. It concentrates a great number of firms, some large, the majority small/medium. There is an important pool of skilled workers. Local industry employs about 20,000 workers (1997 figures), 16,000 of those in shoe and related industries (besides a large, undetermined number of informal jobs, workers doing parts of the production process in a putting out system). It concentrates almost the whole production chain in the cluster. Inter-relationships among firms, as well as trade and information exchange are intense, both backwards (tanneries, suppliers of parts and inputs, machinery suppliers) and forwards (domestic trade agents, specialised export agents, transport and other services). Firms co-operate in technological upgrading of products, processes and design with the support of local and State R & D institutions (CCTC – Centro de Tecnologia de Couros e Calcados/Instituto de Pesquisa Tecnologica) and in labour training with the help of SENAI – Servico Nacional de Aprendizado Industrial. Clustered firms are also supported by a diversified local institutional infrastructure of business associations, local government institutions, business co-operatives and labour unions. Local firms manage to balance competition and co-operation in a creative milieu, and there is some socio-cultural identity, which facilitates trust. The results are impressive. Although the cluster was hard hit by trade liberalisation in the early 1990s, it is fully recovered and competitive.

Limeira

Limeira has a more diversified industrial structure but shows a high index of specialisation in the gem and jewellery industry. Local information and data show that, in fact, there are about 350 firms in the gem and jewellery industry. A few of these firms are large, but most of them are micro/small firms and in many cases informal. The number of formal jobs (1997) is 1,216, but local sources estimate that there are approximately

15,000 workers (formal and informal altogether) in the gem and jewellery industry[3]. The cluster sells mostly to the domestic market but firms are now more actively seeking to increase foreign sales. Export consortia substituted for the former system of trade agents travelling with samples. One consortium is already in operation and two others are being formed. Figures for 1996 show that exports amounted to US$ 3 million, mostly to USA, Europe, Africa and Mercosul countries.

The cluster is well organised. The infrastructure supporting the industry comprises a local development agency (IDELI – Instituto de Desenvolvimento de Limeira), a local business association (Associacao Limeirense de Joias), the local workers' union (Sindicato dos Trabalhadores da Industria de Joias) and the state sectoral business association (Sindicato das Industrias de Joias). Relationships among firms are intense and varied. They co-operate to export, they promote two fairs per year, they joint efforts to purchase raw materials. A group of 17 firms organised a *"shopping de bruto"*, i.e. a shopping centre were micro/small firms buy unfinished pieces of jewellery. Firms also promote courses and training for workers. One of these courses is supported by an international institution, which required that at least 200 street kids are included in the programme. Such courses and training are most important since a substantial part of the work is performed at home (casting and assembling of pieces).

Process technology is not too important since a large part of the production process is manual and mechanical (i.e. not automated). Design, however, is fundamental. Firms usually finance specialists' trips to Italy to study design, and at least one of the firms (Galle, the largest and best equipped) is said to have a design centre.

Historically it is not yet clear why this industry came to be concentrated in Limeira. According to local sources, this industry used to be located in Sao Jose do Rio Preto and in Caxias (Rio Grande do Sul). At some time seven firms relocated from Caxias to Limeira, and some sparse firms from Minas Gerais did the same. Firms began to co-operate, which had been previously difficult for lack of trust, and thus the cluster was consolidated.

[3] Data and information from Projeto PML/SEBRAE/ACIL (1998). Additional information was provided by local interviewees.

Catanduva

The town of Catanduva has a population of 120 thousand and is located in a region in which sugar mills and alcohol distilleries are the bulk of the regional economy. It is presently known as the “capital of ceiling fans”, concentrating about 90% of the domestic production of ceiling fans. The question is, why there? First of all, because the region has a very hot climate, so market for fans was readily available, at least potentially. But in this case an historical accident is in the origin of the industry development. In the late 1950s someone from that town had seen abroad (Italy, it seems) a ceiling fan. Back home, this person decided to manufacture a similar fan using the motor of a floor-polisher appliance. It did not work, of course. However, a local mechanic, who had helped that person, became interested in the project. After manufacturing three different unsuccessful models, he finally invented a new model (belt-driven motor fan) which was extremely successful. He had this model patented and established the first plant to manufacture it. This plant used to manufacture about 100 ceiling fans per month, sold to shops, industry and clubs.

Thus the figure of a pioneer whose start-up firm was the only one in the business for 10 years is fundamental for understanding why that industry developed at all and why in that town. Subsequently imitators began to enter in the industry, most of them spin-offs from the original firm. Today there are at least 10 manufacturers in the region. Altogether they manufacture about 2 million ceiling fans per year employing about 5,000 workers. Sales are directed mostly to domestic markets, but the largest firm is beginning to export to South American countries.

The ceiling fans are almost entirely manufactured in-house. Only part of the motor assembly is put out (according to the pioneer, not anymore, at least in his plant), and also the fan blades, which are manufactured from mahogany in Rondonia by subcontracted firms. Product and process technologies are surprisingly dynamic. Firms are constantly innovating by introducing new models and new products, the latter to reduce idle capacity during the winter, and by upgrading the motor and parts like the blades (steel blades to substitute for the mahogany ones) and the main axle. This axle was formerly manufactured from steel (still is in some plants), but an innovation has been

recently introduced by the pioneer, who is still in the business. Such innovation consisted of manufacturing the axle in one piece moulded in a hard plastic. The introduction of this new material, according to the pioneer, allowed him to eliminate 8 operations in the production process, thus reducing his labour force.

Once more comes the question: is this agglomeration a cluster? Again the answer is yes, but only in the broadest sense. Firms do not co-operate. Rather, they compete fiercely. The nature of the spin-offs, which gave rise to imitators, may help to explain this fierce competition, non co-operation and lack of trust. One of them is a family split-up (a nephew of the pioneer) and some of the others are former employees who left the original firm because of the pioneer's "bad temper"! In addition, no local institutional framework exists to support the local firms, and firms do not interact in any way. Thus, collective efficiency can hardly be expected. But there is a positive side in this story, i. e., there is plenty of room for joint action to be stimulated and for public support to improve still further the competitive advantage of the local ceiling fan industry.

Votuporanga

Votuporanga is the second largest concentration of furniture manufacturers in the country, after Bento Goncalves in Rio Grande do Sul. Despite being an industry usually disseminated and characterised by a large number of small firms, the industry clustered in the region of Votuporanga. There are now about 350 furniture manufacturers, of which 170 in the town of Votuporanga, employing about 6,000 workers.[4]

How and why did the industry cluster in Votuporanga? Local business people say they cannot explain how the industry originated in the region, but they know quite well how and why it became such an important industrial cluster. The basic answer is joint action. A number of firms associated themselves in the early 1990s to overcome the difficulties imposed by macroeconomic adjustment policies and by firms' own management problems. What they started then can be described as a process of restructuring cum institution building to achieve competitive advantage. With the support of the local industrial association and the participation of the state agency of SEBRAE –

[4] See IPD (n. d.) and FERREIRA (1997).

Servico de Apoio as Micro e Pequenas Empresas, they created a restructuring programme centred on design but generally aiming at management, production and marketing restructuring. Local incentive policies, as well as partnerships with SENAI for labour training and with CETEMO – Centro Tecnologico do Mobiliario for technology development, the associated firms could achieve substantial improvements in efficiency (increased productivity and lower costs) and in quality. Total quality programmes were implemented with the aim to obtain the ISO 9000 certificate. The associated firms also created a “purchase centre” in order to obtain better prices and better quality from their input suppliers.

The associated firms supply mostly domestic markets, but they are presently seeking to export, having already established a showroom in Cordoba, Argentina, as a first step.

Thus, this is a clear example of joint action and public support to create competitive advantage for clustered firms.

Policy Implications

A comprehensive analysis of policy implications of clustered firms is yet to be done. However, there are some clues in the literature. The following paragraphs aim at summarising the main points and at raising other points for discussion.

First of all, it is widely recognised that the room for policy-making from a national point of view is increasingly restricted by international trade regulations, trade agreements, economic integration, financial globalisation, and so on. So, to have more room to manoeuvre in regional/local levels is extremely welcome for single nations, especially when one remembers that at these levels, as well as in the R & D and environmental areas, the WTO regulations are less restrictive to policy initiatives.

Second point is that, once we recognise that regional/local policies are a window of opportunity, then we must remember that these policies are no panacea, and also remember that clusters cannot be created. The local external economies and other local favourable conditions must be there and, as a rational-expectations believer would say, someone must be there, taking advantage of the local external economies. Then, what we can and should do in the first place is to identify existing agglomerations, which could be the object of policy initiatives.

Third point is, once we identify a number of promising clusters, which policies should we suggest? Of course, there is no blueprint policy. Each case should, in principle, be dealt with as a specific case. But some core measures have been suggested in the literature. So, let us go back to the same authors of the theoretical approaches discussed at the beginning.

Krugman's and Porter's analyses, as mentioned before, rely on market forces and general horizontal policy measures in the fields of education, infrastructure and fair competition. They do not advise on specific regional/local policies. However, Krugman concedes that some boosterism involving "concrete incentives, sort of proto-industrial policy" may "(...) in principle, at least, (...) make perfectly good sense" (Krugman, 1991:32-33). He also sees a case for industrial policy when "(...) it seems that the industry's success is largely a social construction – that individual firms do not stand or fall on their own efforts, but depend on the mutually reinforcing effects of each other's

success. This is just a non-technical way of saying that positive external economies are the key, but putting it this way may help the idea seem less abstract. (...) In most cases, the best evidence for the importance of external economies will come from geographical clustering. And such geographical clusters will in fact help us to define what is an industry. Simply observing a cluster is not, however, enough: one must ask why the industry is clustered, and make a judgement about whether the external economies, technological or market-size in nature, are sufficiently important to warrant government support" (Krugman, 1993: 176-177). He brings Porter (1990) along by stating that (p.177) "(...) Porter's analysis of international competition is largely a discussion of the importance of geographically restricted external economies. Porter does not follow through and assert that he has offered a justification for industrial policy, but in effect he has".

The other three authors do emphasise the need to make regional/local policies to reinforce cluster competitiveness. All of them discard old-stile subsidies and tax relief measures. Audretsch (1998) states that "a number of different high-technology clusters spanning a number of developed countries is the direct result of enabling policies, such as the provision of venture capital or research support." He goes on stressing that "such enabling policies, that are typically implemented at the local or regional level, are part of a silent policy revolution currently under way". H. Schmitz (1997, 1999) does not elaborate very much on policy implications, but he makes a very important point in emphasising the need for synergy between private co-operation and public support in clusters. The author who comes closer to a core set of policy measures to support local production systems is A. Scott (1998). He argues that "in the case of localised industrial complexes, significant augmentation of market capability by means of collective adjustment of the social bases of production can be achieved on at least three main fronts". He then proceeds by pointing out, in each one of the three fronts, tasks to be performed by local government bodies, business associations, workers unions, and private-public consortia or partnerships. The next paragraphs summarise Scott's (1998: 396-397) three main fronts.

The first one is the supply of critical inputs and services, which can be decisive factors in stimulating regional/local growth. This is of special significance in cases: (1)

where private firms tend to under-invest in the supply of such inputs and services, and (2) where these inputs and services also have an agglomeration-specific character. For example, technological research, labour-training activities, gathering of information about export opportunities, advertising and marketing of regional products.

The second main front is co-operation among firms so as to achieve more efficient transactional interactions. This requires some sort of governance relation to maintain order and minimise disruptions. Organised collaboration among firms makes it possible for them to learn from each other and to pool critical technologies and labour skills. Examples of this sort of collaboration are regional/local industrial consortia and private-public partnerships.

The third main front is the constitution of forums of strategic choice and action. These forums can be well focused on tasks such as securing trademarks for regional/local products, and mitigating problems related to short-term price or wage pressures. But they can also take the form of regional economic councils that regularly bring together major local constituencies like business associations, worker's organisations, financial institutions and local government agencies. These constituencies can thus discuss questions related to long-term industrial trends and strategies to manage regional/local development. Forums like these are extremely important in the context of rapid technological and organisational changes. It is essential for regional/local production systems to avoid being locked-in in the wrong trajectories, and also to be able to respond quickly to new opportunities, crises and upgrading challenges.

Final remarks

Having identified a number of industrial clusters in the State of Sao Paulo, some brief comments were made on a few selected cases. These cases show a variety of cluster history, morphology, industrial organisation, institutional framework and social/cultural contexts. To recognise this variety is fundamental for any policy initiative.

The research project from which this paper is derived will proceed by doing field research in a number of clusters. On the basis of these case studies, specific policy measures will be suggested for each case, on the lines of the core set of policies discussed above.

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