DIXIÈME RENCONTRE INTERNATIONALE DU GERPISA
TENTH GERPISA INTERNATIONAL COLLOQUIUM

La coordination des compétences et des connaissances dans l'industrie automobile
Co-ordinating competencies and knowledge in the auto industry

6-8 Juin 2002 (Palais du Luxembourg, 15, rue Vaugirard, 75006 Paris, France)

MULTINATIONAL ENTERPRISES, INTER-FIRM RELATIONSHIPS AND THE LOCAL DIMENSION OF KNOWLEDGE IN THE AUTOMOTIVE INDUSTRY IN BRAZIL

Cristiane M. d'AVILA GARCEZ
Economist from BNDES – The Brasillian Development Bank
Ph.D. Candidate Federal University of Rio de Janeiro

GLOBALIZATION, THE ROLE OF MULTINATIONAL ENTERPRISES AND THE LOCAL DIMENSION OF KNOWLEDGE AND INNOVATION

The emergence of the ICT's paradigm, and the relocation of the productive activity and the redirection of trade, capital and information - with the formation of supranational blocks and the worldwide centralization of the decision power in the so called Triad (USA, Japan and the EU) - configure the current path of economic growth.

Contrary to expectations, with the intensification of the process of internationalization of the economy, the innovative process is strongly dependent of local organizational structures and institutions, and the linkages established among the agents. In addition, the diffusion of innovation is not an automatic process.

In the case of developing countries, there exists an additional challenge in what regards the access to the benefits of knowledge, since such an access depends on the participation in the generation of technology.

In addition, one can verify the financial globalization, but one can not verify the globalization of technology, since there exists no significant intensification of the flow of knowledge, work and people (Lundvall and Borrás, 1997; Lastres, 1997).

Concerning the financial globalization, the new financial systems implemented in the beginning of the 1970s has destroyed the balance of forces of capitalism, by providing more autonomy to the financial market, in contrast with the financial power of corporations and the nation. The power of the national governments in controlling the flow of capital through its monetary policy has been broken with the end of the Bretton Woods treaty in 1971, which used to fix the price of gold and the parity of dollar. The financial capital has been strengthened with the end of the so called fordism-keynesianism, which somehow used to keep the above balance between the capitalism forces (Harvey, 1989; Chesnais, 1998; Guttman, 1998).

Concerning the production sphere, based on the studies of several authors about the role of FDI [1], in what regards technology, we can conclude that multinational enterprises do not promote the decentralization of research and development (R&D), nor the generation of patents.

Large firms play a central role in the production of technology, both quantitatively and qualitatively. Nevertheless, the generation and use of patents, and the distribution of investments in R&D indicate that such firms keep most of their technological activities in the home country (Pavitt and Patel, 1991; Pavitt and Patel, 1999).

Technological activities are heavily influenced by the characteristics of the systems of innovation of the home country, such as: the national system of basic research, education and training; the generation of sunk assets through cumulative technological processes; the capability of the financial system in recognizing the right of property of intangible assets; and the propitious macroeconomic environment for investments in technology.

It seems that the process of technological internationalization is mainly influenced by the necessity to adapt to the market conditions of the host country,[2] rather than by the existing scientific and technological infrastructure (Patel, 1995). As a result, MNEs tend to concentrate the most important phases of the technological activity in the home country, leaving their laboratories abroad with the adaptive R&D only.

In contrast, some authors advocate the existence of a decentralization of the technological activity, with a potential dissemination of the process of innovation. They argue that: (a) the host countries may play an important role in the activities of R&D, serving as a source of technology to the home country (Dunning and Wymbs, 1999; Cantwell and Iammarino, 2000); and (b) the growth in the generation of technology outside the home country indicates the movement of globalization of the generation of innovation (Archibugi

[1] See Chesnais, 1988, 1994 for the theory of the FDI

[2] See the taxonomy of the main location strategies of multinational companies in Dunning (1992, 1994).

and Iammarino, 1999).[3,4]

Archibugi e Iammarino (1999) argue that the globalization of the generation of innovation occurs through the subsidiaries of the multinational companies; its R&D and patents. The taxonomy presented by the above authors indicates that the technological globalization could only occur through the activities of MNEs.

However, there are other forms of technological globalization: in the international exploitation of the innovation generated internally, and in the global technological and scientific collaboration. Such categories may also benefit from the activities of MNEs, for instance through their participation in the international trade, or through international technological deals between firms. The activities of MNEs in these two categories do not seem to be consistent though, what might be an interesting subject to be analyzed from the perspective of the developing countries.

We must test the above hypotheses about the impact of the current changes in the world's economy and of direct investment and the activities of multinational companies on the national and local systems of innovation of developing countries. The strong presence of such companies in these countries, as in the case of Brazil, and the dependence on FDI for the balance of foreign accounts, makes this task even more important and probably urgent.

The approach of systems of innovation, developed by Freeman (1988, 1995), Lundvall (1988, 1992) and Nelson (1993), claims that the innovative process and the economic development originate from specific social, institutional, cultural and historical conditions.

The innovative process is basically characterized by interactive learning. The main concepts related with that process are: cumulative knowledge, which means that knowledge depends on previous experiences, and learning capability, which depends not only on the ability to aggregate knowledge, but also on the capability to forget of individuals, organizations, institutions, regions and countries. Knowledge and learning are, respectively, resource and process in the knowledge and learning economy and society (Lundvall, 1992; Lundvall and Borrás, 1997).

In this way, the elements and the linkages of the systems, together with the local institutional environment, will command the learning capability and, thus, the capacity to adapt to changes and to innovate (Lundvall, 1992; Freeman, 1995; Edquist and Johnson, 1997; Lastres et al., 1999).

[3] In Archibugi and Iammarino (1999), the analysis is based on the case of developed countries.

[4] According to Freeman (1995), the FDI is fundamental for the formation of a national system of innovation, bringing resources and the possibility of inserting the country in a international network.

The systemic characteristic of the innovative process is associated with the non-linear aspect of the technological change. In a linear approach, the activities of R&D alone, including innovation and diffusion, lead to the increase in productivity. It should be used in sectors of the economy in which technology is mainly science-based, where technological change relies on discontinuities. In a non-linear approach, incremental innovation becomes important, and aspects not related to formal R&D, such as learning by interaction, learning by doing and learning by using, become relevant.

In this new context, institutional learning and the social capital are key to the strategies of competition and development (Lundvall e Johnson, 2000). The increase in competition turns the competence building and the use of intellectual capital into fundamental subjects for all players in the world market, implying new technological and industrial policies.

Learning by interaction, learning by doing and learning by using, as well as the utility of the social and intellectual capital, are heavily influenced by the value of tacit knowledge.[5] In addition, considering the current rate of changes, the ones involved in the creation of knowledge are its sole beneficiaries.

In this way, the formation of networks of cooperation becomes a way of absorbing existing tacit knowledge. Once the access to codified knowledge is no longer sufficient for the adaptation of individuals, firms or regions to the ever changing technological and market conditions, the social interaction between the agents becomes crucial.

To this end, new organizational forms emerge, with the emergence of new links between the agents, such as: firms, universities, science and technology institutions, local governments, financial institutions, work unions and clients, among others. As a result, the local dimension of innovation is due to the tacit knowledge embedded in individuals and organizations, interactive learning, and competence building. It is worth stressing the importance of the trust in the above relations, as a way of overcoming the uncertainties of the innovative process. Such relations would also develop faster in an environment of proximity and identity between the agents (Locke, 1995; Humprey and Schmitz, 1998; Lemos, 1999; Lastres et al., 1999; Garcez, 2000).

Summarizing, the use of a local or regional approach of innovation has been increasingly applied, focusing either empirically or conceptually on the issues discussed above. This can be verified, for example, in the work of the following authors: Saxenian (1999), Cooke and Morgan (1994), Cooke e Morgan (1998), Ehrnberg and Jacobsson (1997), and Howells (1999).

[5] Freeman (1988); Lundvall (1992); Lundvall and Borrás (1997).

The aim of this paper

This work is centered in the theoretical concepts announced above - that may be summarized in: (a) the multinational enterprises' strategies determines the concentration of the technological activities in home countries; (b) the central role of these activities and of the local interactions among the agents for the innovative process and the socioeconomic development. These characteristics, together with the fragility of nationals economies in developing countries (with the macroeconomic instability and the imaturity of the system of innovation), add complexity to the above challenges.

The main aim of this paper is to present and discuss the impact of the current changes in the world's economy and the activities of multinational companies on the national and local systems of innovation of the auto industry in Brazil, in what concerns: i) the inter-firms relationships; ii) the relationships among firm and local institutions; and iii) the creation and transfer of knowledge.

In order to do so, it will be presented: (a) a resume of the recent changes in the paradigm of production in the world automotive industry - in order to show changes in the relationships among the social-economic agents and the role of Brazil in the distribution of the production around the world; (b) the panorama of the sector in Brazil, mainly in what regards the local features of new investments; and (c) the main features of two automotive clusters in Brazil, in what concern the local creation of knowledge and the inter-firm and institutions transfer of knowledge. Based on the comparison between these two clusters, we expect to have some clues about the local and national process of innovation, transfer of knowledge, and competencies promotion. At the same time, we expect to better understand the role of the multinational enterprises in local clusters in Brazil.

They were chosen for the study the cluster of the State of Minas Gerais (which is leaded by Fiat) and of the cluster of the State of Parana (which is leaded by Renault), in view of their importance in the industry as a whole – they are respectively the second and the third clusters in Brazil, after Sao Paulo - and because they reflect two different phases from the entrance of the automotive sector in the country. It will be put forth effort, along the work, to make comparisons with the arrangement of the State of Sao Paulo.

The study and comparison among the clusters will be based on questionnaire answers, part of the research project "Local Productive Arrangements and Systems in Mercosur"[6], and secondary datas.

[6]The project is coordinated by J. E. Cassiolato and H. Lastres, from the IE/UFRJ, and sponsored by BNDES and FINEP.

PANORAMA OF THE AUTOMOTIVE SECTOR - CHANGES IN SUPPLIERS CHAIN'S LINKS

World pattern of the automotive sector

One of the main recent changes in the structure of the automobile world industry says respect to the elevation of the outsourcing implemented by the assemblers, under the model of *lean production* Japanese that had beginning in the decade of 70 (Womack et alli, 1990). That process is characterized by the drastic reduction of the number of direct suppliers, that started to assume the logistics control, stock, engineering of the product and quality, and the co-design activity beside the assembler.

In this context, the assemblers created its own autoparts companies, so that they could execute those activities. In a second moment, these companies started to supply for several customers of the whole world, although not getting to do part of the strategy of *follow sourcing*, that happens predominantly between assembler and suppliers in which they have the control of the capital. The follow sourcing strategy postulates that component supplier follows the assembler through the world.

Another important movement was the *systemists* appearance, called like this for they already supply to the assembler complete systems. This movement brought an important change in relationship terms among the companies, once the assembly of the systems became accomplished in dedicated units, installed near the assembler's plant (Medeiros and Pinhão, 1999).

The conjugation of these two movements implies, to the receiving countries of the FDI, in the tendency to the reduction of opportunities supply for local companies, at least of the products of higher technological content.

At same time, happens the pressure of the world competition addressing the assemblers to reduce costs and to rationalize the activities, to increase the variety of products in plants specialized as well as elevating its participation in the world market. The strategy of the assemblers is gone back to growing internationalization, looking for to increase its participation in the world market, mainly with investments in emergent markets.

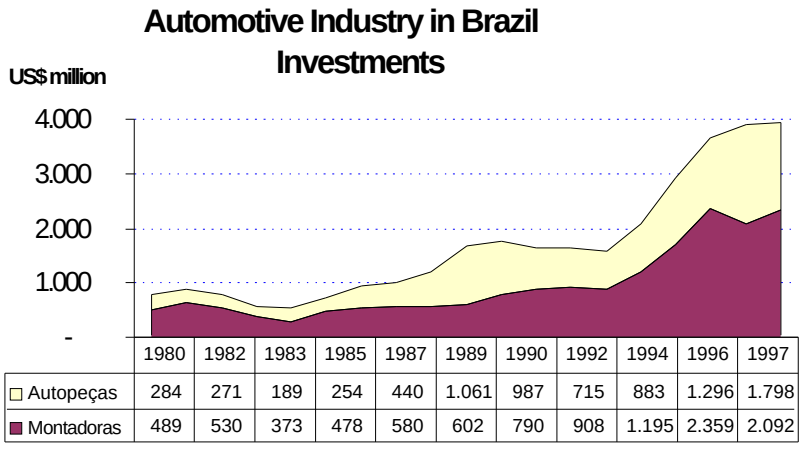
National pattern in Brazil – the role of the FDI and geographical aspects

The production of vehicles in Brazil began in the end of the fifties with factories of Volkswagem, Toyota, Ford, Mercedes-Benz, Scania and General Motors in areas placed to the south of the city of Sao Paulo. In that it weighs the high degree of the carmakers' *in-house* production, characteristic of that time, went being created an immense metal-mechanical park of supplier in the area, that would come to be known like ABC.

In the decade of 70, it happened the first period of expansion in the automotive industry[7], with the installation of new factories of Volkswagem, Ford and General Motors in the area called Paraíba River Valley (Vale do Paraíba), to the north of the city of Sao Paulo. In this same time Volvo would come settling in Paraná and Fiat in Minas Gerais.

After one decade, in the 80s, where the resources annually invested by the companies stayed in inferior levels than US$ 1 billion (**graph 1**), in the nineties the situation moves significantly, following the tendency described in the section previous of this work, starting from the liberalization and, in a second moment, of the stabilization of the economy. For these last 10 years the investments of the section can be contained in 3 great cycles:

Graph 1



	1980	1982	1983	1985	1987	1989	1990	1992	1994	1996	1997
Autopeças	284	271	189	254	440	1.061	987	715	883	1.296	1.798
Montadoras	489	530	373	478	580	602	790	908	1.195	2.359	2.092

source: Anfavea, 1999

- first cycle happens in the beginning of the nineties, after the abrupt Brazilian commercial opening, and it lasts up to 94, with the components (autoparts) industry doing heavy investments in modernization and industrial reorganization, accompanied modestly by the assemblers;
- the spectacular growth rates presented by the Brazilian market with the monetary stabilization did with that the assemblers answered for the great investments in the following period, from 94 to 97, when they arrive in Brazil the new comers (incoming), while the producers already installed, they expand its capacities with the construction of new plants;
- third cycle is the one of expansion and installation of the suppliers and systemists, to assist already to the new factories of vehicles inaugurated. Be observed that

[7] Are observed that other world carmakers were, during the years 60/70, presents in Brazil, or producing, or licensing its marks, like Renault, Alfa Romeo, DKW, Willis Overland, Chrysler, Dodge and Karmann-Ghia. Honda and Toyota are present in Brazil since the fifties, the first as a great producer of motorcycles and the other as a small producer of light commercial vehicles.

before this cycle of investments, the capacity installed for production of vehicles was esteemed in 2,5 million and today it is of the order of 4,0 million.

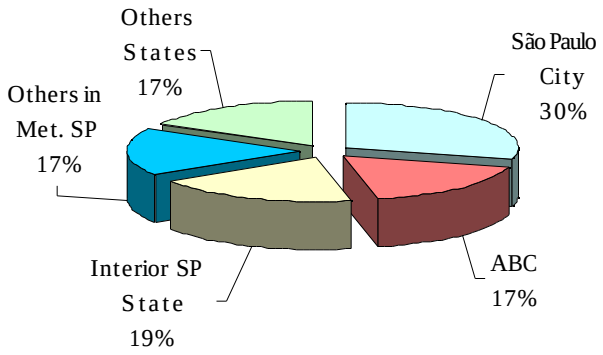
Investments in new units, in the decade of 90, were resolved taking into account, mainly, the growth of the internal market and an integration Brazil-Argentina, in the ambit of Mercosur. The new investments were basically still accomplished in the south-southeast area of the country, but distant of the industrial agglomerate of Great Sao Paulo, to know:

- Rio Grande do Sul: General Motors
- Parana: Chrysler, VW/Audi and Renault
- Sao Paulo (interior): Honda and Toyota
- Minas Gerais: Mercedes Benz and Iveco
- Rio de Janeiro: Peugeot-Citroën
- Bahia: Ford

In the autoparts segment, the new investments of the decade of 90 also happened in way more geographically dispersed, so much in others states, *off-Sao Paulo* - following the assemblers - as in the own State of Sao Paulo, where it had been installed outside metropolitan area. In spite of that, there is still a strong concentration in the State of Sao Paulo, according to the **graph 2**.

Graph 2

Regional Share - Autoparts Firms - 1998

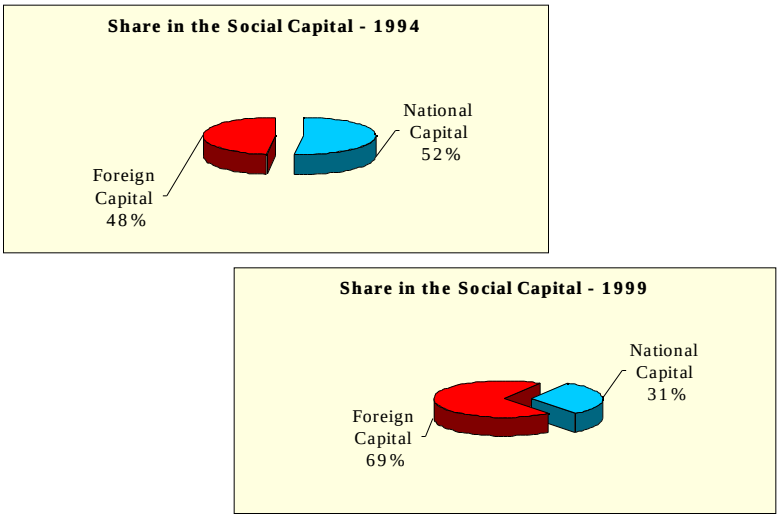


source: Medeiros e Pinhão, 1999.

As stood out previously, the recent evolution of the FDI has radically changed the configuration of the autoparts industry in Brazil. The production is made for more than 350 companies controlled by the national capital, while 150 foreign companies answer for about 70% of the revenue. According to data of Sindipecas (1999), the Brazilian association of the

components producers of the automotive industry (Brazilian Autoparts Association), it is observed that, along the decade of 90, its among more than 500 associated, the participation of foreign firms (**graph 3**) it passed of 15% in 1992, for more than 35% in 1999, while the revenue passed of 48% in 1994 for 69% in 1999.

Graph 3



source: Sindipecas, 1999.

LOCAL SYSTEMS OF PRODUCTION – CASE STUDY

They were chosen for the study the arrangements of MG and PR, in view of their importance in the industry as a whole – they are respectively the second and the third clusters in Brazil, after Sao Paulo - and because they reflect two different phases from the entrance of the automotive sector in the country. It will be put forth effort, along the section, to make comparisons with the arrangement of the State of Sao Paulo.

The arrangement of the automotive industry in the State of Minas Gerais started due to the growth of a large international assembly plant, Fiat[8]. It came to this State during the seventies, attracted by the tax incentives which were offered by local government and because of its closeness to the main Brazilian market (Rio-Sao Paulo axis, in the Southeast of Brazil).

By the end of the 90s, two other assembly plants started business in this State: Iveco, a Fiat's subsidiary in the heavy duty sector and Mercedes, with cars, in the city of Juiz de Fora[9],

[8] See the paths of strategies of internationalization of Fiat em Balcet e Enrietti (1997).

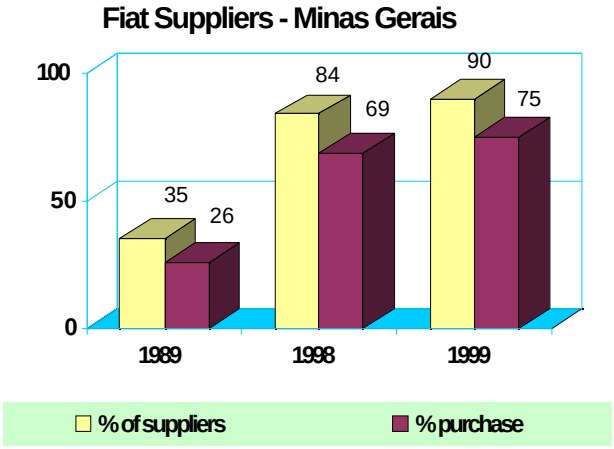
[9] Nowadays, the auto parts industry in this state is formed by over 150 companies, mainly small and medium size companies, with a total invoicing of approximately US$ 1.8 billion in 1998, and 30 thousand employees. On the other hand, Fiat invoiced over US$6 billion, with 25 thousand employees.

although this study focus the links between Fiat and their suppliers.

During that first period, the level of production *in house* was high and a large number of suppliers were located in the State of São Paulo, this was justified by the reduced production scale and by the practical flow of inventory formation

From the increase of production – due to the growth of domestic market – and the change in the production paradigm – with the advent of *just-in-time* – suppliers became attracted to locations closer to their customers, this process was called *mineirização* (in allusion to the State of Minas Gerais), as shown in **graph 4.** Initially, national suppliers, whose plants were located in the State of São Paulo, were attracted to this place. These process was not due to the existence of *sistemists*, in contradiction to the pattern of the new arrangements. However, more recently and obeying a logic similar of new arrangements, we can observe the entry of new world suppliers of auto parts and *sistemists*. Be stood out that, in spite of JIT, the degree of present in-house production of components in the arrangement is still relatively loud, if compared with the tendency of the new arrangements.

Graph 4



source: Medeiros e Pinhão, 1999

National supplier companies started joint-ventures with foreign companies, this was demanded by the automotive assembly plants, in order to obtain technology knowledge regarding the same vehicle in Europe. As a general movement of the auto parts segment in Brazil, foreign companies started to seek the control of local companies, as it happened to Freios Vargas, Metal Leve and Cofap. This one was sold to Magneti Marelli, first tear supplier of Fiat. Some of the large Brazilian firms were sold to transnational companies, as a result, by the end of 1997, only one out of thirteen large component manufacturers in this sector counted with national capital only.

This movement meant the reduction of P&D accomplished locally and the transfer of part of this activity for the countries of origin of the subsidiaries installed in national territory

(Humphrey and Salerno, 1997; World Investment Report, 1999, p. 202).

In regard to the educational infrastructure and local S&T, it is important to highlight that, on one hand, there is a bottle-neck in primary education reflecting on poorly offers of the basic workforce, on the other hand, there is a good level of higher education, which counts with one of the most developed networks in this country. We should also emphasize the existence of several public research institutes in the State, concentrating the largest part of local R&D activity. Therefore, following a national model, the weight of public institutions on the innovation system is very heavy, when compared with the private R&D. The low amount of large companies in the State explains part of the this result. Consequently, the weight of the basic research is also very heavy in relation to applied research (Lemos and Diniz, 1999).

Summary table of innovation capability within MG's arrangement

Topics on Innovation System	Main characteristics
Educational infrastructure	Great relevance to companies, specially regarding high school
Relationship/ interaction between agents	
Co-design	Occurs between assembly plants and suppliers from the same country, usually a foreign country. Occurs, in a smaller proportion, between the assembly plant and world supplier's subsidiaries of other assembly plants located abroad.
Cooperation (different types) and sub-hiring relationship	There was no increase in cooperation among competitors, lower level suppliers or suppliers of equipment and input. There was an increase in information exchange and tests for development and improvement of products, aiming a search for a better quality of input, equipment and staff.
Relationship between firms and education and research institutions	Scarce and with no tendency to increase.
Research and Development	Scarce and dropping. Only one supplier performing R&D locally. Efforts of R&D are mainly concentrated in suppliers of assembly plants in São Paulo In the assembly plant, only the tropicalization (adaptation) localization occurs. R&D and product's design are performed in the head office.
Patents Deposit	The patents deposit by suppliers of assembly plants is in São Paulo
Technology source	Importing of equipment and some cooperation among firms aiming quality

Source: Based on Lemos et alii (2000) and questionnaire answers, part of the research project "Local Productive Arrangements and Systems in Mercosur", coordinated by J. E. Cassiolato and H. Lastres.

In relation to the innovation capability of the arrangement in MG, we can observe that, in a wide range, local learning experiences are rather limited. There is no co-design activity in

the arrangement. These type of activities occurs fundamentally between the assembly plant and a suppliers located in the home country. Even other less sophisticated types of technological cooperation, are restricted. Recent history of arrangement shows that there was an increase in the flow of information only in the field of product development[10], aiming a better quality of input, equipment and staff. Staff improvement to be achieved through training. It wasn't verified a strengthening of the competitors relationship. Despite of the good research infrastructure, mainly in the local higher education structure, the relevance of this structure to the assembly plants when choosing their locations and the increase in value of local workforce training by the firms, the relationship between firms and research and training institutions are scarce and there is no tendency to change.

Innovation conditions are strongly compromised due to the poor relations of the arrangement, once they reduce the possibility of learning by using, doing and interacting, as well as the occurrence of spillovers.

R&Ds performed by assembly plants in Brazil are restricted to the *tropicalization* (adaptation of technology or product to the market's characteristics). R&D activities performed by the auto parts segment has actually vanished during a recent period, if compared to data from the pre and post periods of liberalization and opening of the economy. An interesting phenomenon is the concentration of R&D activities in another state of the country, São Paulo. The patents that were deposited by suppliers of assembly plants are also out of the arrangement, and there is also a concentration of deposited patents in São Paulo, indicating a regional division of work in contradiction to the space disconcentration of new investments that was presented in the previous section. According to data from C&T Secretary of the State of Sao Paulo (1998), 96% of the expenditures in R&D (operational expenses and investment in capital) from automotive corporations are focus on São Paulo State.

The capability of technological flood from the head office is limited, due to the few technological activities performed inside the firms of the arrangement, to the fragility of links between public and private agents and also to the lack of access to more advanced technologies, as the largest source we have mentioned was equipment acquisition and, as we already know, product design activities are still centralized in the head office.

The arrangement in the State of Paraná[11], which already held Volvo's plants (trucks and buses) and New Holland's (agricultural tractors), is receiving several foreign companies, manufacturers of vehicles and auto parts. The local suppliers concentration supplied mainly the two assembly plants installed in this State, before the new investments took place. With these new investments, new suppliers are being attracted to this State, and also to the country.

[10] Part of the movement is due to the process of hiring third parties to perform the assembly plant's activities.

[11] See the specialization patterns of the State and the institutional network in Passos (1999).

It is good to highlight that the strategy adopted by assembly plants recently established in Brazil is strongly based on a common market targeting both Mercosur and Latin America, settling the existence of suppliers to supply units in Brazil and Argentina at the same time. Another decisive factor to define the location of each new plant was the local government's action, through tax policy or as a capital partner.

New models and new forms of production organization, in relation to the assembly plants already established in Brazil, are distinguishing the arrangements that is being formed in the State. It can be observed that the new plants are rather lean, not only in terms of industrial operations – usually, only the operations of painting and assembly are done internally[12] - but also organizational operations - there are only a few hierarchical levels in the firm. One example of a non-vertical profile within the companies belonging to the arrangement was the installation of an engine factory, as engines were usually produced inside assembly plants.

Regarding the location of suppliers in relation to the assembly plants, we can observe that main suppliers are located inside or around the plant's land. Not only auto parts manufacturers are coming to the country, but also firms specialized in rendering services in the areas of logistics, alimentation and administration of industrial joint ownership (Medeiros e Pinhão, 1999).

The amount of new suppliers in the State is around 45, five are already established in the country, and they are mainly suppliers from the same country of origin as the assembly plants with which they are connected, showing how strong is the strategy of follow sourcing adopted in this arrangement.

The installation of a new assembly plant, with a significant volume, as it happened in this State, facilitates the attraction of new suppliers. Also, there is a possibility of business with local companies, as secondary suppliers, adding advantages regarding costs and logistics.

CONCLUSIONS

The intensification of the process of internationalization of the economy did not result in the automatic diffusion of innovation abroad. The innovative process is even more dependent of local organizational structures and institutions, and of the linkages established among the agents of the local system. As we saw, technological activities are heavily influenced by the characteristics of the systems of innovation of the home country, as well as

[12]With the exception of Volkswagen that includes heavy printing.

– according with the multinational enterprises' strategies - the main technological activities stay in the home country, while in host countries there are essentially technological activities related with the necessity to adapt to the market conditions.

In the case of developing countries, there exist additional challenges in what regards the access to the benefits of knowledge, since such an access depends on the participation in the generation of technology, and there is no indication that the technological globalization will come to these countries.

In this way - and reinforcing the relevance of the role of innovation to the socioeconomic development - it is urgent to investigate the impact of the direct investment and the activities of multinational companies on the national and local systems of innovation of developing countries. Particularly relating to Brazil, I would like to stress the role of the FDI in the balance of foreign accounts - even with the negative effect that new investments have been promoting in the balance of payments - and the strong presence of multinational companies in the country's economy.

In addition, we must take into consideration that: (a) the process of economic development in Brazil has resulted on the fast growth and diversification of their productive capability, but on a very restricted technological capability – since this is circumscribed to some kinds of sectors, organizations and institutions, and so it is not an abroad process (Garcez, 1995)[13]; and (b) there are no innovation policies in conjugation with the recent liberalization policy and macroeconomic policy, what makes the national systems of innovation even more breakable.

In the automotive industry of Brazil, concerning the effects of the internationalization process, we conclude that the new patterns of the FDI is responsible for the loss of valuable relations in terms of cumulative knowledge and learning processes into the productive chains, since: (a) due to the increasing participation of imports, part of the component and capital goods demand is transferred abroad; and (b) due to the evidences of the R&D performance of the assembly plants in Brazil and the relationships among the new comers, local suppliers and institutions in the two local arrangements, local learning experiences are rather limited.

In what concerns the location of the investments, despite the fact that new productive investments of the 1990s happened in a way more geographically dispersed, there is still a strong concentration of the autopart industry in the State of Sao Paulo. There is also a concentration of the technological activities in that State, indicated by the spends with R&D and the generation of patents,.

[13] See Cassiolato and Albuquerque (2000), for the insights about the use of the approach of systems of innovation in developing countries.

The more detailed aspects of the innovative process that takes place at a local level in the automotive industry of Brazil, is work in progress. It will be through the continuous investigation of that process that we will be able to identify the defense mechanisms in order to reach the sustainable competitiveness and the long term socioeconomic development.

BIBLIOGRAPHIC REFERENCES

ADAM-LEDUNOIS, S. and RENAULT, S. (2001*) Mouvement de création de parc fournisseurs: Le cas de Renault Sandouville*. Ninth GERPISA International Colloquium. Paris. 7-9 June. Proceedings.

Anfavea (1999) *Statistical Yearbook of the Brazilian Automotive Industry*. Associação Nacional de Fabricantes de Veículos Automotores. São Paulo: A Associação.

ARCHIBUGI, D. and IAMMARINO, S. (1999) *The policy implications of the globalisation of innovation.* Research Policy, 28, p.317-336.

BALCET, G. and ENRIETTI, A (1997) *La mondialisation cilee de Fiat et la filiere automobile italienne: l'impact dans les pays du Mercosur*. Actes du Gerpisa, n. 25. Janvier.

BOYER, R. and FREYSSENET, M. (2001) *Les uns fusionnent, les autres pas. Quelles recompositions de l'industrie automobile mondiale?* Ninth GERPISA International Colloquium. Paris. 7-9 June. Proceedings.

CALABRESE, G. (2001) R&D *globalization in the car industry*. In: International Journal of Automotive Technology and Management. Volume 1, No. 1, pgs 145-159.

CANTWELL, J. and IAMMARINO, S. (2000) *UE Regions and Multinational Corporations: change, stability and strengthening of technological comparative advantages*. Druid's Summer Conference. Denmark, jun 15-17.

Cepal (1999) *La Inversión Extranjera en América Latina y el Caribe.* Informe. Santiago do Chile: Naciones Unidas.

CHESNAIS, F. (1988) *Multinacional enterprises and the international diffusion of technology*. In: Technical change and economic theory. Ed. By G. Dosi et ali. p. 497-527.

CHESNAIS, F. (1994) *La mondialisation du capital*. Paris: Syros. 286p.

CHESNAIS, F. (1998) *A Mundialização Financeira*: gênese, custos e riscos. São Paulo: Xamã.

COOKE, P. and MORGAN, K. (1994) *Grow Regions under Duress*: Renewal Strategies in Baden Wurtemberg and Emilia-Romagna. In: Glabalisation, Institutions and Regional Development in Europe. Ash Amin and Nigel Thrift (ed). Oxford: Oxford University Press.

COOKE, P. and MORGAN, K. (1998) *The associational economy*: firms, regions and innovation. Oxford: Oxford University Press, 1998.

DUNNING, J. and WYMBS, C. (1999) *The geographical sourcing of technology-based assets by multinational enterprises*. In: Innovation Policy in a Global Economy. D. Archibugi, J. Howells and J. Michie (eds). Cambridge: Cambridge University Press.

DUNNING, J. H. (1992) *The competitive advantage of countries and the activities of transnational corporations*. Transnational Corporations, v.1, n.1, fev. p. 135-168.

DUNNING, J. H. (1994) *Re-evaluating the benefits of foreign direct investiment*. Transnational Corporations, v.3, n.1, fev. p. 23-51.

Fapesp (1998) *Indicadores de Ciência e Tecnologia em São Paulo*. São Paulo: Fundação de Amparo à Pesquisa do Estado de São Paulo.

FREEMAN, C. (1988) *Japan: a new national system of innovation.* In: Dosi et alii (eds). Technical change and economic theory.London and New York: Pinter.

FROUD, J.; HASLAM, C.; JOHAL, S.; WILLIAMS, K. (2001) *Cars after financialization: a case study in how and why capitalism is messy and unresolved*. Ninth GERPISA International Colloquium. Paris. 7-9 June. Proceedings.

GARCEZ, C.M. (2000) *Sistemas Locais de Inovação na Economia do Aprendizado*, uma abordagem conceitual. Revista do BNDES.

GUTTMAN, R. (1998) *As Mutações do Capital Financeiro*. In: Chesnais, F. (org) A Mundialização Financeira: gênese, custos e riscos. São Paulo: Xamã

HOWELLS, J (1999) *Regional systems of innovation?* In: Innovation Policy in a Global Economy. D. Archibugi, J. Howells and J. Michie (eds). Cambridge: Cambridge University Press.

HUMPHREY, J. AND SALERNO, M. (1997) *Globalisation and Assembler-Supplier Relations*: Brazil and India. Actes du Gerpisa, n. 25. Janvier.

HUMPHREY, J. and SCHMITZ, H. (1998) *Trust and Inter-Firm Relations in Developing and Transition Economies*. The Journal of Economics Studies, Vol.34, No. 4, April, pp.32-61. Frank Cass, London.

LAPLANE, M. F. e SARTI F. (1999*) Investimento direto estrangeiro e o impacto na balança comercial nos anos 90*. Texto para discussão 629. IPEA. Brasília, fevereiro.

LASTRES, H.M.M.; CASSIOLATO, J.E.; LEMOS, C.; MALDONADO, J.; VARGAS, M. (1999) *Globalização e Inovação Localizada*. In: Globalização e Inovação Localizada, experiências de sistemas locais no Mercosul. Brasilia: IBCTI/MCT.

LEMOS, C. (1999) *Inovação na Era do Conhecimento*. In: Informação e Globalização na Era do Conhecimento, org: H.M.M.Lastres e S. Albagli. Rio de Janeiro: Campus.

LEMOS, M.B. e DINIZ C.C. (1999*) Sistemas locais de inovação*: o caso de Minas Gerais. In: Globalização e Inovação Localizada, experiências de sistemas locais no Mercosul, org: J.E.Cassiolato e H.M.M.Lastres. Brasilia: IBCTI/MCT.

LEMOS, M.B. et alii (2000) *O Arranjo Produtivo da Rede Fiat de Fornecedores*. Relatório Preliminar. In: Projeto Arranjos e Sistemas Produtivos Locais e as Novas Políticas de Desenvolvimento Industrial e Tecnológico. IE/UFRJ,FINEP,BNDES.

LOCKE, R. (1995) *Remaking the Italian Economy*. Cornell University Press, Ithaca.

LUNDVALL, B. A. (1992) *National Systems of Innovation*: Towards a Theory of Innovation and Interactive Learning. London: Pinter.

LUNDVALL, B. A. and BORRÁS, S. (1999) *The Globalising Learning Economy*: Implications for Innovation Policy, Brussels, DG XII.

LUNDVALL, B. A. and JOHNSON, B. (2000) *Promoting Innovation Systems as a Response to the Globalising Learning Economy*. Draft of Contribution to the project Local Productive Clusters and Innovations Systems in Brazil: New industrial and technological policies. Setembro. Rio de Janeiro. Brazil.

MEDEIROS, A. M. e PINHÃO, C. (1999) *Pólos automotivos brasileiros*. BNDES Setorial. p. 173-199.

PASSOS, C. (1999*) Sistemas locais de inovação*: o caso do Paraná. In: Globalização e Inovação Localizada, experiências de sistemas locais no Mercosul. Brasilia: IBCTI/MCT.

PAVITT, K. and PATEL, P. (1991) *Technological strategies of the world's largest companies*. Science and public Policy, England, v. 18, n. 6, p. 363-368, December.

PAVITT, K. and PATEL, P. (1999) *Global corporations and national systems of innovation*: who dominates whom? In: Innovation Policy in a Global Economy. D. Archibugi, J. Howells and J. Michie (eds). Cambridge: Cambridge University Press.

WOMACK, J.; JONES, D.; ROOS,D. (1990) *The Machine that Changes the World*: the story of lean production. New York: Harper Perennial.

World Investment Report (1999) *Foreign Direct Investment and the Challenge of Development*. United Nations Conference on Trade and Development. Ney York and Geneva: United Nations.

SAXENIAN, A. (1999) *Comment on Kenney and Von Burg, "Technology, Entrepreneurship and Path Dependence*: Industrial Clustering in Silicon Valley and Route 128" in Industrial and Corporate Change, vol.8, n.1, march, p 105-110.

Sindipeças (1999) *Brazilian Autoparts Industry Performance*. São Paulo: Abipeças, Sindipeças.