Development, Entrepreneurial Activity and Industrial Extension

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Abstract This chapter analyzes the contribution offered by Brazilian industrial extension programs for the economic development to support the entrepreneurial capacity of industrial micro, small and medium size enterprises (MSME). The methodology utilized will be the study of literature that analyses the impact of entrepreneurship on economic development, as well as the one that analyses the role of industrial extension programs for the improvement of the entrepreneurial capacity of MSMEs. The results of analysis point out to a possible positive impact of extension activities on economic development, based on the effective utilization of this support tool to the MSMEs to enable them to pursue technological innovation, a present requirement for the competitiveness of the markets where they operate; these extension activities, since they relate to the institutional system in which they are inserted nationally, are not replicable, representing an instrument dependent on the industrial policy model adopted by each country. Also, critical elements are pointed out for analysis, envisaging the creation of new capability programs for MSMEs through extension activities.

Keywords Development • Entrepreneurship • Industrial extension • Innovation • Public policies

1 Introduction

The discussion concerning development issues had a new incentive after the Consensus of Washington. In this new scenario, the role played by States and institutions in this process is again being focused, in the pursue of a new 'design' of development strategies for emergent and developing countries, based on the

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critical analyses of development processes of more developed countries (Evans 2004, 2010; Chang 2009).

Starting in the 1980's, in the developed countries there was a broader understanding of the central role played by the innovation variable as a key-element for both entrepreneurial and national States' competitiveness. In 1980, the OECD innovation policy document, "Technical change and economic policy", links empirical results[1] to the innovation policies proposals, emphasizing the role of new technologies to overcome economic crises. The innovation systems ideas (Dosi et al. 1988), discussed academically, are found in the OECD policies documents (1992), with the introduction of concepts on: the formation of cooperation networks, strategic partnerships, spillovers, as well as the importance given to tacit knowledge. And, also, the introduction of the national system of innovation concept, considering the role of innovation as the most important strategic development component (Cassiolato and Lastres 2005).

This approach, known as neo-schumpeterian, emphasizes the relation issue of economic agents, focusing on the appropriation of knowledge through interactive learning (learning by interacting), both within the industry and in its external relations (Lundvall 1988) as forms of innovation capability. In fact, industrial economics literature emphasizes the cooperation theme between industries and, presently, one can observe that there is a convergence to focus analytically the competitive behavior of industries through intra and inter entrepreneurial relations and with the other innovation system institutions.

In this context, the network structure concept has become relevant, given its "capacity to gather the growing sophistication of interindustrial relations which characterizes the contemporaneous economic dynamics" (Britto 2002, p. 346), constituting itself as a reference framework applied to cooperation relations phenomena between agents and the coordinating action. In this sense, the role of industrial extension can be mentioned, acting in the entrepreneurial capacity, focusing on the micro, small and medium size enterprises (MSMEs), as a form of support in the strengthening of its capabilities and the maintenance of these industrial enterprises' competitiveness. Industrial extension can represent an important tool not only to assist MSMEs in seeking knowledge, but also to generate other innovations resulting from unexplored technological opportunities.

Thus, the objective of this chapter is to analyse the contribution offered by industrial extension programs to support the strengthening of entrepreneurial capability of industrial MSMEs, and to generate a positive impact on economic development. As a specific focus, it analyses the propositons of Acs et al. (2005), Hernández et al. (2008) and Hernández and Dewick (2011) which show the importance of enterprises networking to encourage the diffusion of knowledge. Based on these authors' findings, one intends to analyse whether extension programs indicate a possible way to technological diffusion in the MSMEs,

[1] Research conducted by Chris Freeman – project SAPPHO –, in the university of Sussex and Yale Innovation Survey were the fundamental milestones for the development of a theory of innovation.

confirming that these enterprises in Brazil lack the minimum capabilities to pursue a technological catching up to secure a competitive space in the present environment.

The chapter is divided into three sections, besides this introduction and the conclusion. In the second section, the Brazilian MSMEs environment is analysed, through representation indicators on the characteristics and difficulties faced by this group of enterprises, and the perspective of theoretical and empirical studies developed by Acs et al. (2005), Hernández et al. (2008) and Hernández and Dewick (2011) are presented. These authors discuss how the entrepreneurial capacity of more developed companies as opposed to the less developed ones can benefit the latter, through a knowledge spillover. The third section presents and analizes Brazilian case of industrial extension compared with the international experience, concerning North-American and Japanese industrial extension systems. The fourth section presents the recent evolutions of the Brazilian industrial extension programs.

2 Industrial MSMEs: Characteristics, Difficulties and Power to Overcome

In 2009, in accordance with the annual industrial research (PIA), the 299 thousand industrial enterprises were responsible for a total revenue of R$1.91 trillions, with a net sales income of R$ 1.54 trillions. The gross value of industrial production (VBP) reached R$1.53 trillions, but the value added was of less than R$ 680 billions. The participation of micro and small size enterprises in these amounts was of approximately 10 %, smaller than the medium size enterprises (14 % of the Gross income and 12 % of the value added). Such result shows the small representative role of MSMEs in the creation of value for the Brazilian economy, as compared to large enterprises, responsible for the generation of more than 75 % of all these economic indicators (La Rovere et al. 2012).

As far as exports are concerned, in 2010, out of the 19,275 firms that exported, contributing with a trade surplus of US$ 20.2 billions, the number of Brazilian exporting MSMEs was of 15,831, representing 72.2 % of the total exporting firms.[2] However, as opposed to the value exported, this participation was of only 5.1 %, indicating that in Brazil the participation of the MSMEs in terms of value exported is not expressive yet.

In the industrial sector, MSMEs are significant only in terms of the absolute number of companies and jobs: more than 295 thousand companies (98 % of the total of sector), employing four million people (51.6 % of the total of sector).

[2] Data on exports consolidated (MDIC 2011).

Based on La Rovere et al. (2013), one can observe that small and medium size enterprises represent the majority of companies researched (96.4 %), but in qualitative terms, from the standpoint of the innovating activities, one sees that large enterprises are relatively more innovating (60 %) than the small and medium size ones (38 %).

Based on these indicators, the difficulties faced by the MSMEs to obtain satisfactory economic results become clear, whether due to their production scale (size), their participation in exports, or due to their innovative activities. Joseph Schumpeter called the attention to the importance of entrepreneurship and innovation for development, however, we have observed that most part of MSMEs, in Brazil, are not entrepreneurial, in the Scuhmpeter's sense, but practice it basically due to necessity.[3]

In 2002, 55 % of the new enterprises endeavored in entrepreneurial activities were necessity-based firms (GEM 2002). Throughout the years, we have been observing a slow evolution in this scenario. However, even with the rate of initial opportunity-based entrepreneurs as a percentage of total early-stage entrepreneurial activity (TEA) reaching 69.2 % (GEM 2012), Brazil is still far from attaining the results of countries with an economy stimulated by innovation, being still classified in the group of countries with an efficiency-driven economy. And, even in this group of countries, it is still distant from other countries, like Mexico and Chile, which reached a TEA percentage of, respectively, 85.2 and 82.2 %.

Even if Schumpeter's (1911, 1942) focus has been placed on the entrepreneur, and the enterprise, respectively, this author does not analyse the relation of companies and the possibility of an innovation spillover of large enterprises and opportunity-based entrepreneurial activities for the MSMEs. This chapter will consider below the studies of Acs et al. (2005) and Hernández and Dewick (2011) to verify to what extent the MSMES are capable of overcoming their problems.

Acs et al. (2005), with the objective of building a bridge between entrepreneurship and literature in respect of economic opportunities, proposed the use of a new entrepreneurship theory: the "Knowledge Spillover Theory of Entrepeneurship" – KSTE, devised over Schumpeter's initial study, but, now, with focus on the origins of the opportunities, which is the object of the authors' research. According to the KSTE approach, "the creation of new knowledge expands the technological opportunity set. Therefore, entrepreneurial activity does not involve simply the arbitrage of opportunities, but the exploitation of new ideas not appropriated by incumbent firms" (Acs et al. 2005, p. 23).

This theoretical model also suggests that the stock of knowledge produces a knowledge spillover and that there is a strong relationship between spillover and

[3] Necessity-driven Entrepreneurs initiate an autonomous endeavor to generate income for themselves and their families, due to the lack of better work options. Opportunity-driven Entrepreneurs are those who start a new business by choice, even having job and income alternatives, or yet, to maintain or increase their income or for the desire of being independent. See GEM (2012).

entrepreneurial activity. They also affirm (Acs et al. 2005) that the fact that there is a positive relationship between R&D investments and entrepreneurship indicates that at least a part of this investment spillover fell on new participants, which is already an explanation for the origin of businesses opportunities.

Hernández et al. (2008), Hernández and Dewick (2011), on their turn, discuss the need of an institutional change – not only based on trade and labour contracts, but also on the generation of organizational capabilities for the construction of coherent, trustworthy and inclusion – to integrate necessity-based enterprises in the opportunity-based enterprise networks. They propose that the latent and emergent entrepreneurial strength existing in the small and medium size enterprises can be utilized through a social entrepreneurship by the generation of capabilities networking.

The problem is to understand why and how the enterprises emerge and how they can better integrate in a dual economy context, where advanced enterprises connected to world markets and a mass of manufacturers struggling to survive with low resources coexist. Hernández et al. (2008) research seeks an exact answer to this question. They study about the function and role played by each type of enterprise (necessity/opportunity) in a developing society which seeks a technological catch up for more complex activities and a higher value added by transferring knowledge and its dissemination.

One of the results of model simulation (Hernández and Dewick 2011) suggests that each enterprise, both necessity or opportunity-based, play an important role, especially in the case of developing countries, in the maintenance of a pattern or in the country's catching up. The opportunity-based enterprises contribute to reduce the 'cognitive myopia', since they are capable of a better information absorption, resulting from external technologies, representing key-institutions in the process of technological accumulation. As to the necessity-based enterprises, they are more effective in exercising the basic function of intraorganizational learning, dissemination of tacit knowledge and in the control of competitive-opportunist behavior and in fostering cooperation within the company, as key-institutions in the technology assimilation process. It becomes clear that there is not an 'optimal' enterprise, but that each one holds relative advantages in accordance with context and time. These structures are complementary. Figure 14.1 represents this complementary scenario. The authors also present the strong relationship between technological accumulation and assimilation.

For Hernández et al. (2008), the opportunity-based enterprises are particularly important in the innovation accumulation phase, where the investment directed to human capacity, physical capital and innovation is dominant (physical technologies), while necessity-based enterprises comply with the role of linking manufacturers and users, and to have as usual practice the use of technologies as innovations enter the dissemination phase (social technologies). Therefore, physical technologies would be more associated with the accumulation phase while the technological assimilation phase is more associated with organization and financial innovations.

This possibility of MSMEs taking advantage of knowledge spillover with such specificities, however, does not occur automatically, requiring a concrete action on

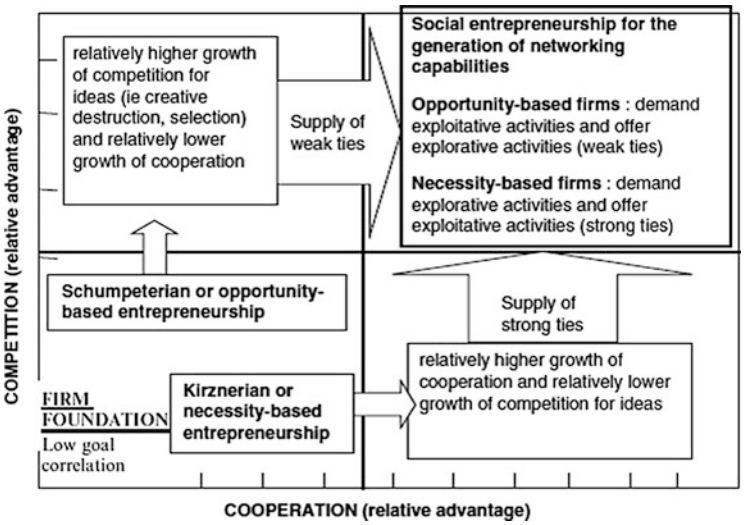

Fig. 14.1 Presents the dynamics or interface between opportunity and necessity-based firms (Source: Hernández and Dewick (2011, p. 230))

the part of the State through support mechanisms and the coordination of efforts, envisaging the capacity of MSMEs, so that the less entrepreneurial companies are capable of absorbing new knowledge and information to enable them to pursue their technological catching up. This is the content of the next section.

3 Industrial Extension: International Experience and the Brazilian Case

The difficulties faced by Brazilian MSMEs, pointed out in section two, are shared by other countries, not only by those with an economic condition similar to Brazil, but were also present in the now developed countries, such as the United States and Japan. According to Madeira (2009), several studies on the American model analyse the path of the extension activity applied to industrial enterprises (Rogers et al. 1976; Shapira 1990; Combes 1992),[4] with actions which started at the end of the XIX century, but were given more national relevance after the creation of the National Institute of Standards and Technology (NIST), in 1988, through which the government seeked to coordinate extension activities with the creation of the Manufacturing Extension Partnership (MEP), in 1989, to promote the capabilities and dissemination of new technologies for small and medium size enterprises

[4] Madeira (2009) offers an extended revision of the North-American and Japanese industrial extension models.

(SMEs), especially the access to new production and management technologies, difficulties regarding innovation, improvement of productive processes performance, productivity and quality (NAPA 2003; Madeira 2009).

An important aspect of these programs, particularly useful in the Brazilian case, is that one can improve the behavior of the SMEs by transferring simpler technologies, such as basic management aspects, production technologies already mature, available in the market, but new to the SMEs (Madeira 2009), as pointed out by Acs et al. (2005) and Hernández and Dewick (2011).

A similar action occurred with the Japanese extension system, that now seeks to comply with the demand for new technologies, especially more complex technologies envisaging technology-based SMEs. In fact, according to Shapira (1996), the second phase of the Japanese extension model and the indicators of its positive impact over SMEs competitiveness would have contributed to make the model a main reference for the expansion of the North-American extension system in the 1990's, when that country had to face a lack of competitiveness as opposed to the Japanese companies.

Based on the comparative analysis developed by Madeira (2009), concerning North-American and Japanese industrial extension systems, it becomes clear that the programs, in general, are focusing on the SMEs, with a view on technological capacity, knowledge dissemination and information, and a more recent emphasis on technological innovation, after the 1990's. Another aspect to mention is the large number of companies' networks formed by the action of extension programs, to solve problems, for the interaction between groups and other cooperation initiatives. In the North-American case, in the MEP context, from 150 to 200 networks have been formed and, in the Japanese case, 2,500 networks have been created. Another inference generated by Madeira's (2009) study is that the extension systems indicate a model that is not replicated, dependent on each country's institutional system, on its construction process of national industrial policies.

In the Brazilian case, extension started with experiences in agriculture, in the 1930's, and had a national impulse only after 1975, with the organization of public extension companies, linked to the Ministry of Agriculture. As to industrial extension, it is believed that this was inspired by the agricultural experience, in the mid-1980's with the creation of the first industrial policy initiatives, such as the Basic Industrial Technology Program, of 1985, and the Brazilian Program of Quality and Productivity, in 1986.[5]

The main programs with industrial extension characteristics at a special and national continuing level are: the Exporting Industrial Extension Project – Projeto Extensão Industrial Exportadora – PEIEX; the Technological Consultation Program of SEBRAE – Programa SEBRAE de Consultoria Tecnológica – SEBRAETEC; the Program of Mobile Units –Programa de Unidades Móveis – PRUMO; the Program of Support to Exports – Programa de Apoio à Exportação –

[5] The presentation of national programs, throughout the section, is based on Madeira's (2009) dissertation, with the specific references, where relevant, in the section text.

PROGEX; and the Program Innovate to Compete – Inovar para Competir. These are broad programs, from the standpoint of performance areas and forms of intervention. As to the institutional role, three of them are directly linked to the Federal Government Ministries (PROGEX and PRUMO, to the Ministry of Science, Technology and Innovation – MCTI; and PEIEX, to the Ministry of Development, Industry and Foreign Trade – MDIC); two are institutions of the "S" System[6]: the SEBRAETEC is coordinated by SEBRAE; the "Innovate to Compete" is coordinated by the National Service of Industrial Learning – Serviço Nacional de Aprendizagem Industrial (SENAI).

Out of these, in order to evidence some key-points mentioned in section two concerning MSMEs' difficulties – innovation and exportation -, SEBRAETEC and, in more detail, PEIEX will be presented.

SEBRAETEC is coordinated at a national level by SEBRAE, with actions distributed throughout the country. Its aim is to render long-term services so as to better comply with the larger investment demands, including the purchase of equipment and large scale and technological projects. After 2001, it started to be entirely managed by SEBRAE, offering services also to trade, agriculture and industrial, agriculture and cattle breeding sectors. It was structured into four activity areas: technological support, business support; technological modernization; and technological innovation (Magalhães 2004).

In 2003, SEBRAETEC starts to focus on collective actions to support the companies' productive groups, adjusting its line of activity to the new guidelines concerning industrial public policies for the organization of the so-called local productive arrangements (APL) or local production systems (SLP), indicating the recognition about enterprise networking importance for the compliance of its objectives as discussed above. After that, a new logic is formed regarding SEBRAETEC services, with a central role addressed to the collective diagnosis. The evaluation of this program is periodically carried out, but only by SEBRAE, through the preparation of a performance report and satisfaction researches gathered from the companies served and by third party companies for the assessment of the program's impact, but the results are not made available for public information.

A study analysing the efficiency of SEBRAETEC services in the State of Minas Gerais (Magalhães 2004) has identified positive results, such as the increase in productivity, improvement of processes and products quality, reduction of waste and sales increase. But, according to Madeira (2009), the scarcity of evidences on the impact of this nationwide program, makes one doubtful on its broader efficiency, also considering that it is a program which has been historically based on

[6] Term defining the set of organizations of corporative entities involved in professional training, social assistance, consultation, research and technical assistance which, besides having their name beginning with the letter "S", have common roots and similar organizational characteristics, supported by the companies' social contributions.

frequent alterations, due more to the Brazilian industrial policy institutional changes than to a virtuous continuing improvement process of the extension services rendered to the MSMEs. Another aspect to point out is the focus placed on partnerships between institutions and enterprises and not between enterprises.

PEIEX, another nationwide extension program coordinated by the MDIC since 2005, is a fostering and qualification program involved in the solution of managerial-technical and technological problems of small size companies located in the SLPs. Its methodology is composed of three main phases: diagnosis, implementation of services and project assessment by the entrepreneurs served. It is one of the structural projects of the "APL Program", within the framework of the Brazilian industrial policy, with the objective of increasing the competitiveness level in the APLs.

As to this program – PEIEX –, Madeira (2009) carried out an empirical study with the local production system of Franca, an industrial cluster of shoe manufacturers, located in the State of S. Paulo, then considered as the second largest footwear production center in Brazil. Its choice is due to the fact that in this SLP there is a predominanceof MSMEs (of a total of 760 companies, 552 were micro-size, 130 were small-size, 65 were medium-size and 13 were large-size enterprises). The purpose of the research was to understand how the extension actions and the SLP interact and influence the productive improvement of the MSMEs located in the industrial clusters.

The results of research indicate that there are different impacts by the PEIEX, according to the companies' characteristics. As far as "size" is concerned, the effects were more significant in the micro-size enterprises, involving a larger number of services rendered in the different areas that were mutually related. Madeira (2009) also considers that the reduced size facilitated the identification of problems, leading to a greater possibility of achieving positive results. As to the "state of development", another variable considered, the PEIEX has generated more expressive results in the less advanced companies, in which management techniques were less mature as opposed to other companies, which was regarded as being due to the characteristics of program, aiming at a larger number of companies in a shorter time of execution. Besides, it has been observed, based on interviews held with the extension people involved, that the services offered were 'semi-standard', based on ready teaching materials, informative CDs, teaching publications and computer spreadsheets.

This standard feature generates negative consequences, having in mind the unique characteristic involved in the amount of resources held by each company (Penrose 2006), with different needs, and that many times received the same standard services. This fact "compromises one of the most important theoretical principles on the definition of industrial extension programs, which is the need to adapt to each company's requirements, in accordance with its specific characteristics" (Madeira 2009, p. 188).

Madeira (2009) concludes that: 1- the impact of program is directly influenced by the interference methods utilized; 2- intensive and more extended services permit to utilize more adequately the method which tends to produce a longer duration and more significant effect for the enterprises; 3- programs with less intensive characteristics, and shorter duration, tend to produce a more peripheral impact on the companies' development, requiring complementation by other programs.

In respect of the Brazilian industrial extension programs, the author identifies that their non-continuity represents one of the negative points of extension programs, which places them far from North-American and Japanese international experiences, where the programs are permanent and funded on a firm institutional framework, lasting for years, serving as a basic element for the development of the national productive structure. In those countries, the main success factor was exactly the continuity and stability of the extension programs throughout the years. Besides, the fact that the programs are not continuous has endangered the generation of results due to the lack of continued improvement on the scope of services offered, which had a direct impact on the evolution of local producers' knowledge base (Fauré and Hasenclever 2005).

The restriction of scope regarding services rendered is also pointed out as one of the program's deficiencies for limiting the reach of projects due to the different profiles of the beneficiaries. Another difficulty is that the programs offer similar services, with a double offer, which shows the lack of articulation among the existing extension alternatives.

4 Recent Evolutions of the Industrial Extension System

This section presents the evolution of Brazilian industrial extension programs after Madeira's (2009) research. In 2007, to offer a better view and understanding on the micro and small-size enterprises segment situation, the Committee on Technology and Innovation, of the Permanent Forum of Micro and Small Size Enterprises, in the context of the MDIC, prepared a document to provide "a better knowledge on the main characteristics of this segment of companies and the facts which influence their technological development and capacity of innovation" (MDIC 2007, p. 7). This document was structured into five questions: the characteristics of micro and small size enterprises; the capacity to obtain financial resources; the factors that make it difficult to reach technological development and innovation; the construction of a favourable environment and the support institutions.

In this document (MDIC 2007), 50 % of the factors pointed out as main difficulties are connected to questions in which the role played by industrial extension programs is relevant, in the sense of qualifying the micro and small size enterprises to enable the absorption of new technologies, as well as assisting them in terms of organizational structure capable of creating conditions for a longer

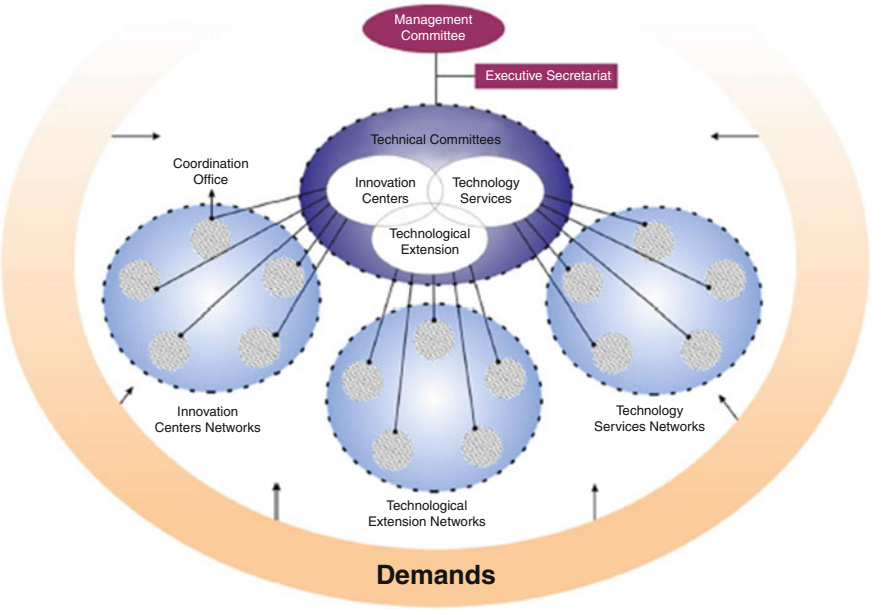

Fig. 14.2 MDIC: SIBRATEC structure (Source: Ministry of Development, Industry and Foreign Trade – MDIC)

duration in the management of new knowledge, keeping a continued learning dynamics as part of the organizational culture.[7]

In the same year of 2007, by Decree 6.259 of November 20, 2007, the Brazilian Technology System (SIBRATEC) was created. Operated by the Financing Agency of Studies and Projects (FINEP), it aimed at complying with the objectives contained in the Action Plan for Science, Technology and Innovation for the National Development (PACTI 2007–2010) and the priorities of the Productive Development Policy (PDP). The structure of SIBRATEC is illustrated by Fig. 14.2. Its objective is to support technological development of Brazilian companies, acting like an articulation and approximation instrument of the scientific and

[7] Among the factors pointed out are: low support to the establishment of a state research center or institution; lack of managerial structure; lack of definition about the micro and small enterprises' technological problems requiring solution; lack of technology-based innovation culture; lack of physical infrastructure and qualified human resources; lack of knowledge of entrepreneurial and technological managing processses; lack of support to consultation services in innovation, rationalization, technology and management; lack of qualification for the innovating management.

technological community with the enterprises, offering conditions to improve their innovation rates, thus contributing to increase the added value of sales, productivity and competitiveness in the internal and external markets (MDIC 2013).

SIBRATEC is organized in the form of three types of networks named as components: Innovation Centers, Technological Services and Technological Extension, as suggested by the authors Acs et al. (2005), Hernández et al. (2008) and Hernández and Dewick (2011) mentioned in section two.

The "Innovation Centers" Thematic Networks are formed by development units or groups which are part of the technological research institutes, research centers or universities, with experience in interacting with the enterprises. Their objective is to generate and transform scientific and technological knowledge into products, processes and prototypes with commercial feasibility to promote radical or growing innovations.

The SIBRATEC Thematic Networks of "Technological Services" are formed by accredited laboratories and entities or laboratory quality management, to support the infrastructure of calibration services, trials and analysis and conformity evaluation, both mandatory and voluntary, the qualification of human resources, the improvement of laboratory quality management, proficiency analysis programs, as well as activities of normalization and technical regulation to meet the needs for the companies' market access.

The State 'Technological Extension' Networks gather specialized entities in technological extension acting in the region, through the organization of an institutional arrangement, formed by local entities of technical, managerial and financial support, in which the S&T State Secretariat or the State entity responsible participate, as well as representative entities of the economic sectors, Regional Development Bank, Foundation for the Support of Research (FAP), SEBRAE, Euvaldo Lodi Institute (IEL) and R&D Institutions. Their objective is to foster technological extension to solve small obstacles to technological management, the adaptation of products and processes and to improve production management of MSMEs.

This represents a new approach to the problem of companies' qualification to increase competitiveness, which already contemplates, in its institutional character, the network approach, a concept that can offer a better analytic capacity to the government system of productive support, in association with the other economic agents involved, in the sense of overcoming the flaws pointed out by Madeira (2009) in the previous section about SEBRAETEC and PEIEX Programs. However, a difference observed, and already mentioned in the previous section, is that these networks are formed between institutions and companies and not between companies, as in the American and Japanese programs.

Conclusion

Development is closely related to entrepreneurship and innovation, but this depends on the companies' capacity which, in the case of the MSMEs is very restricted, both in terms of capacity to innovate and to export. Thus, it is observed that the contribution for the development of this type of company strongly depends on industrial extension programs for qualification.

The analysis conducted on the Brazilian programs has shown that they went from an individualized to a collective type of service, through networking formation. In this sense, the lessons pointed out by Acs et al. (2005), Hernández et al. (2008) and Hernández and Dewick (2011) to take advantage of knowledge spillover seems to have been considered. However, some characteristics of Programs and the Brazilian industrial structure seem to have hindered the performance of industrial extension programs in achieving better results.

Considering the concrete operational situation of companies' networks, one can mention three potential impacts involved in the consolidation of arrangements. The first one is direct, associated with the technical-productive cooperation existing in the network, linked to the gain of operational efficiency originated from technical saving actions and to the reduction of production and business costs. This is associated with work division and to the specialization pattern of agents, and there is still gain associated with the increase of productive flexibility, allowing a greater response speed of the productive system to market changes. In this aspect, it seems that industrial extension programs still leave much to be desired since they do not emphasize the relations between enterprises, but between enterprises and institutions.

The second impact concerning networks interorganizational coordination involves the capacity of these structures to face the environment's lack of stability, being related to the size of network agents and to the degree of centralization of internal relations in terms of their design. This impact is related with the transactions regime and the contract basis regulating this structure, their incentive mechanisms, control and level of mutual trust. In this chapter, it can be observed that there is low efficiency in the interorganizational coordination process, due to the internal network characteristics and the degree of centralization of the authority flow in coordinating the respective arrangements. Besides, the fact that most part of the programs are standardized shows a low network flexibility to conform, funded on environment stimulations, adapting to changes in the network members functions based on the adjustment struture alterations.

The third impact is related to the technological cooperation in the companies' networks, reinforcing their competitiveness by strengthening their innovative capacity, encouraged by the creation and circulation of knowledge and information in a collective learning process, involving each agent's

(continued)

incorporation of learning to a social pool of knowledge – commercial, technological, managerial etc. – generated by the network. The absence of major innovations in large companies and a weak scientific and technological infrastructure make this virtuous process of companies' qualification difficult through knowledge spillover.

As discussed in this chapter, interaction between enterprises results in the consolidation of collective coordination mechanisms concerning decisions. Such result is not natural, given the multiple and specific role played by the actors involved, which evidences the importance of extension program in this respect. Here the liaison between industrial extension programs of government agencies and of the several institutional partnerships becomes clear, as its application utilizing technological networks, as well as their specific role in collective coordination, especially when dealing with MSME networks, which is the focus of these extension programs. However, many improvements still need to be carried out so that these extension programs may reach their objectives.

References

Acs, Z. J., Audretsch, D. B., Braunerhjelm, P., & Carlsson, B. (2005). *The knowledge spillover theory of entrepreneurship* (Discussion papers on entrepreneurship, growth and public policy # 2705). Jena: MPI.

Britto, J. (2002). *Cooperação interindustrial e redes de empresas* (In: Kupfer D, Hasenclever L (orgs) Economia industrial: fundamentos teóricos e práticas no Brasil). Rio de Janeiro: Elsevier.

Cassiolato, J. E., & Lastres, H. M. M. (2005). Sistemas de inovação e desenvolvimento: as implicações de política. *São Paulo em Perspectiva, 19*(1), 34–45.

Chang, H. J. (2009). *Maus Samaritanos: o mito do livre-comércio e a história secreta do capitalismo*. Rio de Janeiro: Elsevier.

Combes, R. S. (1992). *Origins of industrial extension: a historical case study*. Dissertation. School of Public Policy, Georgia Institute of Technology.

Dosi, G., Freeman, C., Nelson, R., et al. (Eds.). (1988). *Technical change and economic theory*. London: Pinter Publishers.

Evans, P. (2004). *Autonomia e parceria: estados e transformação industrial*. Rio de Janeiro: Editora UFRJ.

Evans, P. (2010). Constructing the 21st century developmental state: Potentialities and pitfalls. In O. Edigheji (Ed.), *Constructing a democratic developmental state in South Africa: potentials and challenges*. Capetown: HSRC Press.

Fauré, Y. A., Hasenclever, L. (Orgs). (2005). O desenvolvimento econômico local no estado do Rio de Janeiro: estudos avançados nas realidades municipais. E-Papers, Rio de Janeiro.

GEM – Global Entrepreneurship Monitor. (2002). *Empreendedorismo no Brasil (Relatório Global 2002)*. Curitiba: IBQP.

GEM – Global Entrepreneurship Monitor. (2012). *Empreendedorismo no Brasil: 2012*. Curitiba: IBQP.

Hernández, I., & Dewick, P. (2011). Social entrepreneurship for the generation of networking capabilities. In A. Pyka & M. G. D. Fonseca (Eds.), *Catching up, spillovers and innovation networks in a schumpeterian perspective* (pp. 217–233). Berlin: Springer.

Hernández, I., Velásquez, D., Puentes, C. Y., et al. (2008). Difusión y generación de conocimiento bajo estructuras organizacionales por necessidad y por oportunidad. In I. Hernández (Ed.), *Empresa, innovación y desarrollo* (pp. 95–112). Bogotá: Universidad Nacional de Colombia.

La Rovere, R. L., Hasenclever, L., & Pinto, J. P. de M. (2014). An introduction to small and medium-sized enterprises (SMEs) in Brazil. In N. Hernandez & J. Ramirez (Eds.), *ME s unleashing the potential: Opportunities and challenges. The cases of Brazil, Mexico, France, Germany, Italy and Spain* (1st ed.). New Delhi: Bloomsbury.

Lundvall, B. A. (1988). Innovation as an interactive process: From user-producer interaction to the national system of innovation. In G. Dosi et al. (Eds.), *Technical change and economic theory*. London: Pinter Publishers.

Madeira, P. (2009). *Extensão industrial em sistemas locais de produção: os efeitos da aglomeração na aquisição e difusão de novas capacitações em PMEs*. Dissertação de mestrado. Universidade de São Paulo.

Magalhães, M. M. (2004). *Programa SEBRAETEC: análise de sua eficácia sob a ótica das entidades tecnológicas mineiras*. Dissertação de mestrado. Universidade Federal de Santa Catarina.

MDIC – Ministério do Desenvolvimento, Indústria e Comércio Exterior. (2007). *Desenvolvimento tecnológico e inovação nas microempresas e empresas de pequeno porte: fatores de influência*. MDIC, Brasília.

MDIC – Ministério do Desenvolvimento, Indústria e Comércio Exterior. (2011). *Balança comercial brasileira – dados consolidados*. Brasília: MDIC.

MDIC – Ministério do Desenvolvimento, Indústria e Comércio Exterior. (2013). Ações de C,T&I – Sistema Brasileiro de Tecnologia (SIBRATEC). Brasília. http://www.mct.gov.br/index.php/content/view/313014.html. Accessed 10 Sept 2013.

NAPA – National Academy of Public Administration. (2003). *The National Institute of Standards and Technology's Manufacturing Extension Partnership Program*. Report 1: Re-examining the core premise of the MEP Program.

OECD – Organization for Economic Co-operation and Development. (1992). *Technology and the economy: the key relationships*. Paris: OECD Publishing.

Penrose, E. T. (2006). *A teoria do crescimento da firma*. Campinas: Editora UNICAMP.

Rogers, E. M., Eveland, J. D., & Bean, A. S. (1976). *Extending the agricultural extension model*. Preliminary report. Institute for Communication Research, Stanford University.

Schumpeter, J. A. (1984 [1942]). *Capitalismo, socialismo e democracia*. Rio de Janeiro: Zahar.

Schumpeter, J. A. (1997 [1911]). *Teoria do desenvolvimento econômico/Coleção Os Economistas*. São Paulo: Nova Cultural.

Shapira, P. (1990). *Modernizing manufacturing: new policies to build industrial extension services*. Washington, DC: Economic Policy Institute.

Shapira, P. (1996). Modernizing small manufacturers in the U. S. and Japan: public technological infrastructures and strategies. In M. Teubal et al. (Eds.), *Technology infrastructure policy*. Dordrecht: Kluwer Academic Publishers.