

The profile of use of industrial property by Small and Medium Enterprises in Brazil in 1998-2005

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Abstract

The technological innovation is fundamental for the role of international competitive and the promotion of economic development. In this term, the Small and Medium Enterprises (SME) have specific role in the innovative process. For developed countries, the SME are conceived to be a great instrument for technological diffusion, while for developing countries they are relevant to generate a great number of employees, contributing to the economic dynamics. In general, the SME have advantages and limits of innovative activities.

The advantages of SME are linked to act in specific niches of market, to promote differential product and services and to realize flexible mechanisms in terms of process and product. The limits of SME are related to investment in Research and Development (R&D), due to strict financial support as compared to large enterprises. In 1990s there was an economic rupture in Brazil whose result has been structural changes based on global economy. These changes were the trade openness, the privatization of State companies, the macroeconomic stabilization and the constitution of new regulation concerning intellectual property and technological innovation. Besides it has observed the increase of foreign direct investment and the redefinition of innovative process. As consequence Brazilian firms have restructured the productive process and redefinition the scope of production. This change of production is related to the competitive approach for their products and services in global market.

However, Brazilian Innovation System has continued immature, because the integration of innovative agents is not completed. In this aspect the industrial property right can be used as an instrument to protect the technological innovation and to promote technological diffusion. Brazilian firms including SME have characterized by low rate of technological innovation as well as by low use of industrial property by Brazilian firms.

These scenarios can increase technological gap between Brazilian firms and firms located at technological frontier, generally settled in developed countries.

The great participation of SME in Brazil is approximately 60% of the total number of enterprises. The motivations of creation of Brazilian SME are related to the occasional entrepreneurship, as far as the unemployees are launched to open their own enterprises without previous market planning. As a consequence, it can explain the high mortality rate of Brazilian SME. Brazilian government has been promoting policies to increase the competitiveness of Brazilian SME for augmenting Brazilian export participation in global market. In this aspect, the role of industrial property by Brazilian SME has been stressed as one mechanism of protection, technological development and commercial diffusion, contributing for economic development. The article will intend to analyze the use of industrial property by Brazilian SMEs from 1998 to 2005 as well as the rate of technological innovation related to Brazilian firms size.

The methodology is a survey that describes the role of use industrial property by Brazilian SME. This methodology permits to evaluate the profile of Brazilian SME in terms of use of industrial property. It was used the concept of SME based on Brazilian Institute of Geography and Statistic (IBGE) that is classified by number of occupied workers. For IBGE, Small Enterprise stands for between 10 and 49 occupied workers and Medium Enterprise stands for between 50 and 99 occupied workers. The data of innovative activities by size of Brazilian firms and the data of use of industrial property by Brazilian SME are based on Brazilian Innovation Survey (PINTEC).

Brazilian SME scenario presents low rate of technological innovation. As the financial support to Brazilian SME is very restricted, the R&D activities are concentrated in large firms in Brazil. In these circumstance, Brazilian SME is not concentrated on technological innovation, but it seems to be promoted incremental innovations. Consequently, these firms can use the industrial property rights as an instrument to promote the competitiveness. However, the registration of patents by Brazilian SME is very low. The main use of Industrial Property by Brazilian SME is concentrated in trademark.

The structure of the article is followed. Firstly, it will be presented the theoretical approach concerning the technological innovation and the use industrial property by Small and Medium Enterprises. After, it will be treated the Brazilian context of Brazilian SME in terms of economic activities and change of regulation due to innovative activities and industrial property regime in Brazil. In the last section, it will be discussed the role of industrial property in Brazilian SME in terms of innovative activities. Finally, it will be presented some conclusions about the analysis of the use of industrial property by Brazilian SME.

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Introduction

The technological innovation is a way to promote the competitive for firms in local and international markets. In this aspect, the investment on Research and Development (R&D) is important to create technological competences, to insert the technological paradigms, to promote cumulateness, appropriability and opportunity of technological innovation. Generation and/or acquisition of technological knowledge tend to promote a virtuous and sustainable cycle of growth in the firms.

Indeed, the technological progress is a result of knowledge generation incorporated in the industrial process and product that lead a competitiveness gain to the firms. In this way the importance of knowledge appropriation is recognized to be an expressive intangible asset such as industrial property. Economic agents can use this asset in different ways. Its function is a mechanism of barrier of entry, technological diffusion under licensing mechanism and also as cooperative action among different economic agents to develop technological issues. In this way, the industrial property is a result of the investment of technological development that allows interchangeable knowledge and economic relationships.

The literature has mentioned the role of small and medium enterprises (SME) in economic development as a potential mechanism of the development of technology and the diffusion of innovation and as well as regional economic growth. Majority entrepreneurs are created by small and medium enterprises. It is due to the flexibility of SME to change rapidly of industrial process in contrast to large firm that presents a tendency of rigid industrial structure. In this way, SME is able to adapt easier and be inserted in new technological trajectories.

However, the role of technological innovation by SME is limited, because they do not have the same capacity to invest on R&D. Some industrial sectors are not possible to entry, because the level and the quality of investment on R&D are complex product.

Brazilian economic context changed in the 1990's after the rupture of industrialization by imported substitution³. The new context has promoted the search by competitiveness in Brazilian firms. However the investment on R&D by Brazilian firms is low, this fact has reproduced in Brazilian SME. As well as the use of industrial property as methods of protection by Brazilian innovative SME is restricted in terms of patents and the trademark is more representative than patents.

This study is focusing on the profile of use industrial property by Brazilian innovative SME in Extractive and Transformation Industry. It was used the concept of SME based on Brazilian Institute of Geography and Statistic (IBGE) that is classified by number of occupied workers. For IBGE, Small Enterprise stands for between 10 and 49 occupied workers and Medium Enterprise stands for between 50 and 99 occupied workers. The data are based on Brazilian Innovation Survey (PINTEC) produced by Brazilian Institute of Geographic and Statistic (IBGE)⁴. It is analyzed the importance of technological innovation by Brazilian firms and their investment in innovative activities and the use of industrial property by innovative SME in terms of the registration of patent and trademark and the use of the instrument of licensing, patents and know how.

In Brazil, SME has developed the importance role in economic activities such as entrepreneur movement and creation of occupation; export goods and services and contribution of productive chain. However, the mortality rate seems to be very high among SME, because of the lack of professional managing, investment due to difficulties in credit availability.

The structure of the article is followed. Firstly, it will be presented the theoretical approach concerning the technological innovation and the use industrial property by Small and Medium Enterprises. After, it will be treated the Brazilian context of Brazilian SME in terms of economic activities and change of regulation due to innovative activities and industrial property regime in Brazil. In the last section, it will be discussed the role of industrial property in Brazilian SME in terms of innovative activities. Finally, it will be presented some conclusions about the analysis of the use of industrial property by Brazilian SME.

Technological Innovation and Industrial Property Right: briefing theoretical approach

The competitiveness is based on the investment in technological innovation that generates an endogenous firm growth, highly, dependent on firm capability to access, assimilate, use, and diffuse knowledge in its productive process, in whatever way generation and/or acquisition knowledge is expressed. As a source of innovative activities and competitiveness by firms, there are industrial property rights⁵ that are the mechanisms of protection for investor in R&D, diffuse the technology for other economic agents and control the flux of industrial property licensing and transfer of technology among economic agents, preventing opportunistic behavior in appropriation of the creative intellectual effort of the firm.

³ That process of industrialization in Brazil constituted the diversity industrial sectors in Brazil. However, it did not support the authentic competition of Brazilian firms.

⁴ This data from PINTEC/IBGE is triennial. The data was produced in 1998-2000, 2001-2003 and 2003-2005. However some data was only produced in 2001-2003.

⁵ The industrial property is included by the scope of intellectual property. Other scope of intellectual property is Author's Right and *sui generis* protection.

According to economic approach, the technological innovation is a result of knowledge that has an expectative of gain when it is on market and, therefore, an economic value is associated to it. So knowledge appropriation under temporary exclusive right of use allows economic transactions to knowledge and a premium-price around innovation. In fact, this exclusivity of use is a reward for the innovative attempts that allows the recover of investments made in R&D and, simultaneously, assures a source of re-investment again in new R&D project, like a virtuous circle around technological development.

The industrial property rights provide juridical assurance in commercial relationships and decrease the asymmetric information among economic and non-economic agents. Furthermore, the industrial property rights are associated to the diffusion of new products and/or productive process by society; as a result the initial premium-price tends to decrease due the entrance of other economic agents into market.

Indeed, the use of industrial property⁶ by innovative firms can revert their innovative efforts toward competitive position on market. The industrial property system prevents the producer of imitation by competitor and reinforces the ownership of industrial property rights by the technological developers. In fact, majority sectors demands high levels of investment on R&D, as competitive practices, that needs to be protected by illegal copies infractions, characterizing untruthful concurrence.

Although, the development of knowledge cannot assure technological innovation a domain on market position, because other sources of innovation can come across and be rapidly spread into market. Nowadays industrial sectors are influenced by the cycle of products and technology, which become more reduced. Moreover, there is a tendency on convergence over technology such as information technology, microelectronic, computer and telecommunications industries. Furthermore, each sector presents specificity such as structure of markets, dynamic of economic of economic agents, and management of tangible and intangible assets. The sectoral dynamic is also affected by intra-sectoral behavior, which depends on the special internal dynamic engendered by the size of the firm. The appropriability regime⁷ can influence the sectoral dynamic, as it can determine some specific behavior among economic agents (Pavitt, 1984).

The strong appropriability regime provides juridical assurance on partnering intensive based-knowledge activities for ongoing technology and innovation developing processes or for diffusion process around innovation. In this case, the strong appropriability tends to reduce firm integration process that may lead to an inefficient industrial, as it stimulates the practice of subcontracting. This subcontracting activity can promote advantages toward flexibility capacity and technical-manufacture of SME, as well as lesser any restrictions to establish complementary assets (Teece, 1986).

In this context, SME is stimulated to work at differentiation products driven to a niche market demand, aggregating value to services and goods in order to attain competitiveness in whatever market domestic or external one. In fact, SME advantage derived from its size toward a productive flexibility to attends niche market, to follow tendency on fashion and to differentiate goods rather than compete on price market that large size firm requirement is requested as a condition to implement scope and scale economies (You, 2005).

This situation is due, inherently, to the size of the firm. The SME presents difficulties in limit credit access and so difficulties in infrastructure and R & D investments, difficulties in logistic and commercial channels establishment and lack of marketing planning in order to give visibility to products and services. Although, SME possesses technical-productive capability requirements for promoting its growth, it does not have financial support to invest in production, simultaneously, in technological upgrade development and in complementary assets (You, 2005).

⁶ It will treat in this article the use trademark and patent. The scope of protection of industrial property is patent, industrial design, trademark and geographical indications.

⁷ The weak appropriability regime tends to enforce firms, especially large ones, to whatever sort of integration activities like backward, forward and lateral integrations, in order to protect the rent from innovation, in case of hard copy innovations. On the contrary, in case of easy copy innovations, it can lead to a lesser commercial value, as technical-manufacturing capabilities requirements offering a lower barrier of entrance by the imitators. Sometimes, imitator-manufacturers with lower cost than those of innovator firms can capture the profit from innovation; *'innovator firms may well end up ceding the lion's share of profits to the imitator'* (Teece, 1986, p. 302). In this context, governmental assistance is essential to support innovator firms until they get profit from innovation. For that reason, the technological diffusion and cooperation among economic agents are difficulties to be achieved.

Each industrial property right contributes to protect a specific intangible assets linked to productive activity in economy that range from industrial products and/or processes. The patents and trademarks are more significant instruments of industrial property rights related to the appropriation of technological innovations, which is the scope of its study.

Patent stands for a technical solution approach and it is one of source of technological innovation, related to technical aspects and improvements like adaptations or better functions. So, it is applied on products and processes. The patent rights imply on a temporary exclusivity on market exploration that is conditioned to disclosure of technology by a technical description. After finishing exclusivity period, the technology falls on public domain and anyone who has the technical-manufacture capability requested can reproduce it on market, without the previous allowance to patent applicant or any additional cost for using it. In this way, the industrial property rights are conceived to be a great and fair mechanism of transfer of technology. Furthermore, patents are related to an exclusive temporary right for economic exploration.

Trademark is related to the firm distinctiveness on market. In the past, it was only used to identify the manufacturer responsible for the product quality in order to prevent misleading to consumer decision and to optimize consumer's acquisition. Nowadays, trademark management⁸ represents customer's fidelity, based on firm reputation built over time. The customer's fidelity may impact on lesser effort in advertisement, divulgation and marketing tools toward the sale of new products. The concurrence opportunistic behavior can capture customer's fidelity and even penalizing firm reputation, due to inferior product quality in comparison to original one. This untruthful concurrence manner harms the firm imagine on market (Ramello, 2005). Another positive aspect is that trademark as exclusive right has not a pre-defined period of time to be extinguished; it depends on the interest of the trademark owner to demand right renovation.

The role of Small and Medium Enterprises (SME) contributes in the technological diffusion and mature progress. Although, the grade of technology can be used also to attain competitiveness on market, in case of updating and/or improving products and/or productive processes of SME.

On the other hand the firms can use the procedures of licensing or just industrial property rights. Licensing involves permission to use of industrial property rights and is associated to **innovation** diffusion policy and technological transfer that implies on payments of royalties. Industrial property right can be used as element barrier due to exclusive exploration on market and transfer of technology on inter-firms cooperation for developing technology. The next section, it will analyze the Brazilian characteristics and context of SME in terms of innovative activities.

Brazilian context and Brazilian SME: economic activities and changes of regulation

Brazilian economic context changed in terms of the behavior of economics in the 1990's. The main changes are related to the rupture of industrialization by imported substitution, the constitution of MERCOSUR⁹, the stabilization of Brazilian economy by Real Plan in 1994 the privatization of State companies and the increase of foreign direct investment after 1994¹⁰ (Teruya, 2004).

Although the stabilization of Brazilian economy by Real Plan has got the control of internal process, this plan had based on high rate of interest and currency band and valuation of currency. As a consequence the import increased and the capacity of export by Brazilian SME in the 1990's was restricted, due to lower competitive of products in terms of quality, differentiation and low aggregate value.

In the 1990's Brazilian SME was harmed by lack investments in firm infrastructure, as a consequence of several economic crisis and the lack of institutional measures to support financial SME growth. Besides, obsolete machines and equipments, lower productivity rate. Besides, Brazilian deregulation process and the openness of foreign trade contributed to SME failure, especially in case of competition on market for goods and service.

⁸ Sometimes, advertisings and other form of brand-name concurrence can generate spurious customer's necessity that may lead to great concentration when undergone mass media advertisements (You, 2005).

⁹ MERCOSUR is a regional agreement concerning the free trade and the free mobility of economic factors among Argentina, Brazil, Paraguay and Uruguay.

¹⁰ There are other characteristics of the new stylized facts of Brazilian economic context. However these are the main motivations.

Indeed, the lack of networking among economic agents, the restriction of flux of knowledge among private sector and institutes of science and technology and the lacks of public policies did not contribute to creation of authentic competitiveness of Brazilian firms. So, it could be resulted in adaptative, defensive, imitative and immature efforts of innovation (Cassiolo, 2005). In this context, SME tends to works on mature technology to develop its products; and they dedicate more on incremental innovative rather a radical one.

However, in general the change of currency policy in 1999¹¹, the export has increased and the balance of trade has been trade surplus. Brazilian technological industrial policy has signalized toward competitive policy, R & D support and exportation foment policy. In this context, public policy tends to create sectorial structural change in order to promote dynamic innovation.

In terms of SME in Brazil, it is noticed that the number of SME has increased through the time. Traditionally, a parcel of Brazilian SME is informal and its existence is related to unemployed mass launched to entrepreneurship for survival, as an 'occasional entrepreneurship', principally after liberalization market. This process became evident after the change of the 1990's decreased the formal employment and the alteration of Brazilian structure of industry characterized by regressive specialization (Coutinho, 1997; Salles Filho *et al*, 2005). In certain economic activities, informal firms existence were important as a resistance to denationalization industry, under openness for foreign trade, as the unique way to survive on market.

Majority of Brazilian firms is SME group. The main stylized facts of the Brazilian SME (Salles Filho *et al*, 2005):

- a) the high capacity of entrepreneurs in Brazil. Brazil is considered the main player related to the rate of infant firm. The reasons of high rate of entrepreneurs are the subcontracting of the products or services by great companies; opportunity in niches of markets; decrease of formal employees; necessity of openness of business to survive;
- b) the high rate of mortality of small and medium enterprises. In reality, a great number of formal SME starts on market also by occasional entrepreneurship rather than business entrepreneurship. So, the lack of professionalism, planning and experience result in a high mortality rate among SME. On the one hand the impact of mortality is concentrated in small firms. On the other hand the medium enterprises presents the probability the success more than small firms;
- c) the insertion of economic activity. The Brazilian SME is representative in relation of numbers of Brazilian firms. These groups of Brazilian firms are 53% of firms in industrial sector in 2000.
- d) the generation of occupation in labour market. The Brazilian SME are responsible more 60% of occupation¹² of labour market in Brazil in 2001;
- e) the importance on Brazilian export. There were the increase of number of Brazilian SME that exported goods or services in the period of 1997-2003.

The innovation rate of total Brazilian innovative firms presented the stability and increased between 31.52% in 1998-2000 and 33.36% in 2003-2005, but the rate of growth is not low. However the rate of innovation rate in Small and medium firms did not have the same tendency in the period of 1998 and 2005. The innovation rate in small firms increased from 26.65% 1998-2000 to 2001-2003 and decreased between 31.11% in 2001-2003 and 28.94% in 2003-2005. The innovation rate of medium firms was rose down strongly from 43.04% in 1998-2000 to 34.94% in 2001-2003 and grew between 34.94% in 2001-2003 and 40.61% in 2003-2005. It observes the innovation rate in Brazilian innovative medium firms is more than the innovation rate of Brazilian innovative small firms and the innovation rate of Brazilian innovate firms in the analyzed period.

¹¹ The currency policy has based on floating currency since 1999.

¹² It is included the participation of micro-firms that generate between 1 and 9 occupations.

Table 1 Innovation rate in percentage by Total, Small and Medium Brazilian innovative firms in Extractive and Transformation Industry from 1998 to 2005.

Period	Total	Small Firms	Medium firms
1998-2000	31.52	26.65	43.04
2001-2003	33.27	31.11	34.94
2003-2005	33.36	28.94	40.61

Source: PINTEC/IBGE

Note: The size of firms is based on the number of employees in Brazilian firms.

Following table 2, the representability of Brazilian innovative small firms is more than medium in the period from 1998 to 2005. In terms of the participation in the process of innovation, Brazilian innovative SME has corresponded more 80% in the analyzed period. Nevertheless Brazilian innovative SME presents limitation to invest constantly in R&D, because the source of funding for Brazilian innovative SME is limited. Although, the new industrial policy in Brazil called Productive Development Policy (PDP) has a object to stimulate Brazilian SME in terms of the export of goods and services.

Table 2 Rate of Small and Medium Brazilian innovative firms in relation of all Brazilian firms that implemented Process and/or process Innovation in Extractive and Transformation Industry from 1998 to 2005.

Period	Small Firms	Medium firms
1998-2000	66.47	14.33
2001-2003	74.53	11.41
2003-2005	68.88	13.42

Source: PINTEC/IBGE

The table 3 shows the investment in R&D by Brazilian innovative firms in 2003 and 2005. It observes the reduction of the participation of Brazilian innovative firms in total investment in innovative activities, internal activities of R&D, external acquisition of R&D and acquisition of other external knowledge more than 31%; 48%; 31% and 26%, respectively. However, the budget designated for total investment in innovative activities, internal activities of R&D, external acquisition of R&D and acquisition of other external knowledge based on the net revenue increased in this period. In others words, only some Brazilian innovative firms realize the investment in innovative activities, because this activities is associated with risk and requires the high investment in R&D constantly. Finally, each R&D project demands high financial support for long term, because it involves high quantity of human capital with high qualification and the constitution of research labs.

Table 3 Participation in percentage of Brazilian innovative firms that invest in innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge and the participation in percentage of net revenue designated for innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge from 2003 to 2005.

Year	Total Investment of Innovative Activities ¹³		Internal Activities of R&D		External Acquisition of R&D		Acquisition of other External Knowledge	
	Rate of firms	Rate of net revenue	Rate of firms	Rate of net revenue	Rate of firms	Rate of net revenue	Rate of firms	Rate of net revenue
2003	24.45	2.46	5.86	0.53	1.43	0.07	2.44	0.08
2005	21.91	2.77	5.54	0.57	1.35	0.08	2.53	0.13

Source: PINTEC/IBGE

¹³ The total investment on innovative activities includes internal activities of research and development, external acquisition of research and development, external acquisition of research and development, acquisition of other external knowledge, training, acquisition of machinery and equipment, introduction of technological innovation in the market, industrial project and other technical preparation.

Brazilian innovative small firms present limitation to invest in R&D, because they present the restriction of the investment in R&D for long term. The table 4 reflects the situation of table 3. Number of Brazilian innovative small firms exposed by risk in decreased in innovative activities, internal activities of R&D, external acquisition of R&D and acquisition of other external knowledge, but the average of financial support per Brazilian innovative small firms grow up in the period from 2003 to 2005. The budget designated for acquisition of other External Knowledge increased twelve times in the period 2003 and 2005. It can be a tendency the relative importance of transfer of technology among innovative agents to promote innovative activities for these firms. In the same thing, it can affirm the budget designated for External Acquisition of R&D.

Table 4 Participation in percentage of Brazilian small firms that invest in innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge and the participation in percentage of net revenue designated for innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge from 2003 to 2005.

Year	Total Investment of Innovative Activities		Internal Activities of R&D		External Acquisition of R&D		Acquisition of other External Knowledge	
	Rate of firms	Rate of value	Rate of firms	Rate of value	Rate of firms	Rate of value	Rate of firms	Rate of value
2003	26.35	2.53	6.74	0.27	1.26	0.02	2.56	0.05
2005	18.13	5.36	3.53	0.41	0.86	0.04	1.89	0.60

Source: PINTEC/IBGE

The table 5 shows the participation of Brazilian medium firms in investment in innovative activities. It observes the percentage of medium firms that invest in innovative activities and the net revenue designated the innovative activities increased from 2003 to 2005. However the same tendency is not observed in Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge. There was the decrease of the participation of medium firms between 1.43% in 2003 and 1.14% in 2005 and the value of investment related the net revenue decreased from 0.53% to 0.32% in terms of external acquisition.

In this case, the collaboration between other innovative external agents decreased. In this case, the average of budget per Brazilian innovative medium firms designated for External Acquisition of Research and Development and Acquisition of other External Knowledge decreased from 2003 and 2005, because number of Brazilian innovative medium firms dedicated in investment of innovative activities, Internal Activities of R&D and Acquisition of other External Knowledge augmented and it rose down the budget designated these activities. However Brazilian innovative medium firms do not consider the external acquisition of R&D important to constitute their technological competences.

Table 5 Participation in percentage of Brazilian medium firms that invest in innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge and the participation in percentage of net revenue designated for innovative activities, Internal Activities of Research and Development, External Acquisition of Research and Development and Acquisition of other External Knowledge from 2003 to 2005.

Year	Total Investment of Innovative Activities		Internal Activities of R&D		External Acquisition of R&D		Acquisition of other External Knowledge	
	Rate of firms	Rate of value	Rate of firms	Rate of value	Rate of firms	Rate of value	Rate of firms	Rate of value
2003	24.45	2.46	5.86	0.53	1,43	0,07	2,44	0,08
2005	26.75	2.85	6.39	0.32	1,14	0,03	2,88	0,06

Source: PINTEC/IBGE

The low investment in innovative activities by Brazilian innovative firms is related the macroeconomic regime, because the rate of interesting in Brazil is very high. This fact does not induce the high investment in R&D by Brazilian firms. Other problem is related to the funding of R&D in Brazilian innovative firms, because the assessment of credits in Brazil is limited mainly for Brazilian SME and the their guarantee is not relevant for funding agencies.

The organization of information Brazilian innovative SME is informal. As a consequence the management of investment in R&D of innovative activities is difficult and increases the cost of transaction, because the organization of portfolio is fundamental to negotiate the technology or to incorporate it in the productive process

of Brazilian innovative SME. In this case, the third section will treat the profile of the use of industrial property by Brazilian innovative SME in terms of protection and use of licensing, and know how to promote innovative activities.

Profile of use of Industrial Property in Brazilian SME

The use of industrial property by Small and Medium Enterprises (SME) is related the specified activities by SME, structure of markets, strategies of innovative firms, range of technology demanded by industrial and service sector and size of firms (Salles Filho et al, 2005).

In the second half of the 1990's, it changed the regulation concerning intellectual property in Brazil. The main motivation of change has been related to the insertion of Brazil as member of World Trade Organization (WTO). Besides, the second part of the 1990's was changed in institutional aspect:

- a) insertion of Trade-Related Aspects of Intellectual Property Rights (TRIPS)¹⁴ in 1994 by Brazilian Decree 1355/1994;
- b) promulgation of new law industrial property in 1996¹⁵;
- c) promulgation of the Innovation Law in 2004. This law promotes the transfer of technology from university to firms¹⁶ and permits the diffusion of knowledge;
- d) flexibility of the analysis of the international transfer of technology in Brazil.

However, the institutional change of industrial property in Brazil has not promoted the substantial role in innovative activities and the impact of the filling patent as methods of protection by Brazilian innovative firms has not been significant, but the trademark application and registration have been significant in the 2000's.

Following table 6, the use of industrial property by SME in Brazil is different. The rate of Brazilian innovative firms use patent as a protection decreased more 45% between 1998-2000 and 2003-2005. The same tendency can be observed in Brazilian innovative small firms, but the decrease of the same period was 25%. The protection of technology by patent moved up between 7.64% to 8.28% of Brazilian innovative medium firms.

In terms of protection by trademark, the participation of Brazilian innovative firms rose the use of this protection from 21.76% in 2001-2003 to 23.52% 2003-2005. This result converges the protection by trademark by Brazilian innovative medium firms, but the rate of growth was more 86% in the same period. This tendency demonstrates the tendency for differentiation of product, because the procedures and the cost of protection by trademark are easier than the procedures of patents by Brazilian innovative firms and SME.

Table 6 Rate in percentage of use of Methods of protection by Total, Small and Medium of Brazilian innovative firms of Extractive and Transformation Industry from 1998 to 2005.

Period	Total of Implemented Innovation		Small Firms		Medium firms	
	Patents	Trademarks	Patents	Trademarks	Patents	Trademarks
2001-2003	12.34	21.76	5.33	22.92	7.64	12.03
2003-2005	6.69	23.52	3.96	20.80	8.28	22.46

Source: PINTEC/IBGE

In relation of patents, the table 7 presents the participation of Brazilian innovative firms in patent filling and patent granted. In patent filling, the rate of Brazilian innovative firms that present patent filling and patent granted decreased from 8.05% in 1998-2000 to 6.12% in 2003-2005. In this case, this is reflected that the investment in R&D by Brazilian innovative firms has little result the patent filling.

Nevertheless the trajectory of patent granted by Brazilian innovative firms was different in the same period. It observes the reduction in 41% of Brazilian innovative firms from 1998-2000 to 2001-2003, but in the period of 2001-2003 and 2003-2005, the growth was 128% and the net growth from 1998-2000 and 2003-2005 was 34%. The increase of patent granted for Brazilian innovative firms is not necessary to relate the innovative activities in Brazil, because the main source of innovative activities is acquisition of machinery and equipment.

¹⁴ The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) is Annex 1c of the Marrakesh Agreement Establishing the World Trade Organization on April 15th, 1994.

¹⁵ The new regulatory framework in terms of intellectual property included the new law of Author's Right (Law 9610/1998); new law of Software (Law 9609/1998); new law of New Varieties of Plants (Law 9456/1997) and Law of Topography of Integrated Circuit (Law 11484/2007).

¹⁶ The Innovation Law in Brazil presents other mechanisms such as researcher in university and institute of research can work in Brazilian firms to develop any technology.

The relative participation of Brazilian innovative small firms in patent filling slowed down between 4.65% in 1998-2000 and 4.06% in 2003-2005, and the reduction of the participation of Brazilian innovative small was dramatically in the second period more 30%. In terms of patent granted, the tendency is shape of “U”. Firstly, it observes the decrease between 4.55% in 1998-2000 and 3.30% in 2001-2003, after this, there was a growth for 8.29% in 2003-2005.

The rate of Brazilian innovative medium firms presents the same tendency of Brazilian innovative small firms in patent granted. However the patent granted decreased from 10.73% in 1998-2000 to 4.75% in 2001-2003 and it increased from 4.75% in 2001-2003 to 12.25% in 2003-2005.

Table 7 Rate of patent filling and patent granted by Total, Small and Medium of Brazilian innovative firms in Extractive and Transformation Industry from 1998 to 2005.

Period	Total		Small Firms		Medium firms	
	Patent Filling	Patent Granted	Patent Filling	Patent Granted	Patent Filling	Patent Granted
1998-2000	8.05	8.50	4.65	4.55	10.78	10.73
2001-2003	6.14	4.99	4.06	3.30	6.45	4.75
2003-2005	6.12	11.41	2.96	8.29	7.74	12.25

Source: PINTEC/IBGE

In terms of licensing, patents and know how, it observes that this procedure is not relevant for Brazilian innovative firms. The table 8 shows the low relevant of this instrument to promote the innovative activities by Brazilian innovative firms and Brazilian innovative SME. Brazilian innovative SME presented the low relevancy more than 93% and the high relevancy of licensing, patents and know how as source of used information by Brazilian innovative small and medium decreased.

This table demonstrates that the market of technology in Brazil is not important. Nevertheless the Brazilian government has developed the legal instrument such as Innovation Law in 2004 and Law of Fiscal Incentives for Innovative Activities in 2006 (Law 11196/2006 and altered by Law 11487/2007), but these instruments are recently, and the effects of these laws by Brazilian innovative firms are not incorporated by data from Brazilian Innovation Survey.

Table 8 Grade of importance of licensing, patents and know how as source of used information by Total, Small and Medium of Brazilian innovative firms in Extractive and Transformation Industry from 1998 to 2003.

Period	Total of Brazilian innovative firms			Small Firms			Medium firms		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
1998-2000	2.68	3.79	93.53	1.47	3.26	95.27	2.90	3.28	93.82
2001-2003	1.90	0.97	97.12	1.07	0.56	98.37	1.98	1.85	96.17

Source: PINTEC/IBGE

The perception of the acquisition of licensing patents and know-how to promote the technological innovation by Brazilian firms is not relevant in the innovative activities. Besides the lack of organization the institutional aspect after 1990's is limited the effective use of this important instrument for firms located in developing countries. National agents present a great level of technological development, but the integration of agents of Brazilian Innovation System is immature, but a part of relationship among Brazilian innovative agents results the technological innovation by firms. Nevertheless some interaction of Brazilian innovative firms occurs with foreign agents, because some agents present relationship between headquarters in other countries and subsidiaries installed in Brazil. Other relationship concerning transfer of technology is related to licensing of industrial property, franchising, technical assistance services and technology licensing (Teruya, 2008).

The flexibility of the analysis¹⁷ of international licensing of industrial property and transfer of technology by National Institute of Industrial Property (INPI)¹⁸ started in 1990 do not reflect the increase of Brazilian innovative firms to acquire the technology.

¹⁷ The analysis of contracts of licensing industrial property, licensing of technology has been the attribution of INPI since 1971. From 1971 to 1990 this procedure was related to the policy of industrialization of imported substitution.

In this way, the table 9 demonstrates that the acquisition of technology by Brazilian innovative firms and Brazilian innovative SME is majority among national agents. The relative rate of Brazilian innovative firms and Brazilian innovative SME decreased between 1998-2000 and 2001-2003. However it verifies the increase from the period of 2001-2003 to the period of 2003-2005.

By the way, the introduction of new instruments such as Law of Innovation and the new Industrial Policy called Policy of Productive Development can increase the relationship among Brazilian agents of innovation and the innovative activities by Brazilian innovation firms.

While the foreign origin of licensing patents and know how, it observes the decrease by Brazilian innovative firms and Brazilian small innovative firms in the period of analysis. However, Brazilian innovative medium firms, it observes a dramatically decrease between 2.33% in 1998-2000 and 0.59% in 2001-2003 and the growth from 0.59 in 2001-2003 to 1.41% in 2003-2005.

Table 9 The rate of origin of licensing, patents and know how as source of used information by Total, Small and Medium of Brazilian innovative firms in Extractive and Transformation Industry from 1998 to 2005.

Period	Total of Brazilian innovative firms		Small Firms		Medium firms	
	Brazilian agents	Foreign agents	Brazilian agents	Foreign agents	Brazilian agents	Foreign agents
1998-2000	6.76	2.44	6.34	0.65	5.90	2.33
2001-2003	2.24	1.23	1.36	0.45	3.53	0.59
2003-2005	5.76	1.16	4.68	0.35	7.41	1.41

Source: PINTEC/IBGE

This profile of use the industrial property by Brazilian innovative firms and Brazilian innovative SME demonstrates that the low importance of industrial property as a source of innovative activities. The main use of industrial property is based on trademark as distinctive function of produced goods. Meanwhile, the use of licensing as a mechanism to promote the catching up is very restricted by Brazilian innovative firms.

Conclusion

The technological innovation is diffusing rapidly because the competitiveness of goods and services is intensive knowledge factor. As a consequence the investment in R&D is fundamental, as well as the acquisition of technology to constitute the technological competencies in the firms. So, industrial and technological policies towards the competitiveness of firms need to be implemented in order to compete in the local and global markets. The financial support is decisive for SME to invest in R&D and innovative activities as well as planning guide program to support the development of SME.

Brazilian SME presents a few generations of knowledge and technological acquisition, according the present article. Furthermore, the industrial property as source of innovative activities is very restricted in Brazilian SME. However, the use of trademark by Brazilian innovative SME can be resulted by the search of their competitiveness in local and global markets. So, Brazilian innovative SME are far from the competitiveness based on the differentiation of products, although governmental policies attempt toward competitive Brazilian SME.

It is result of the immature innovation system and the lack of integrated public policies to provide industrial development at the earlier of the 1990's. Besides, the lack of coordinated institutional policies contributed the increase of technological gap between Brazilian firms and the foreign ones by the openness foreign trade. The sudden Brazilian openness market and the implementation of new industrial property in Brazil restricted the technological and catching up development.

The Brazilian SME participates the industrial chain in various sectors. By the way, SME can be incorporated into intensive-based activities under subcontracting practices or under licensing of industrial property. As well as it is necessary to coordinate of mechanism of industrial property and the technological innovation among Brazilian firms in order to protect the initial innovative of SME and to promote interaction inter-firms in the generation and acquisition of knowledge.

¹⁸ The international contracts of licensing industrial property, licensing of technology and franchising needs to register at INPI, because this procedures can permit the payment abroad of the acquisition of technology, the fiscal deduction and the respect of the industrial property right by other parties.

References

- COUTINHO, L. A (1997). A especialização regressiva: um balanço do desempenho industrial pós-estabilização. In VELLOSO, J.P.R. (ORG) (1997). *Brasil: desafios de um país em transformação*. IX Fórum Nacional. Rio de Janeiro: José Olympio. Nacional. Rio de Janeiro: José Olympio.
- PAVITT, K. (1984). Sectoral patterns of technical change: towards a taxonomy and a theory. *Research Policy*, v. 13, n. 6, pp. 343-373.
- RAMELLO, G M. (2005) Intellectual property and the markets of ideas, *Review of Network Economics*, Vol.4, Issue 2, pp. 68-87.
- SALLES FILHO, S.; CARVALHO, S.; FERREIRA, C.; PEDRO, E.; FUCK, M. (2005). Sistema de propriedade intelectual e as pequenas e médias empresas no Brasil, Study prepared for WIPO, Geneve.
- TEECE, D. (1986). Profiting from Technological Innovation, *Research Policy*, vol. 15, Issue 6, pp. 285-305
- TERUYA, D. Y. (2004). Globalização tecnológica e o sistema de inovação argentino e brasileiro do setor de equipamentos de telecomunicações, PhD Thesis, São Paulo, Brazil.
- ____ (2008). *Transfer of technology and licensing of property rights in Brazil from 1990 to 2005: the characteristics of the process of transfer of technology and their challenges for innovative activities in Brazilian firms*, 12th International Joseph Alois Schumpeter Society Conference, Rio de Janeiro.
- YOU, J.I (1995). Small firms in economic theory, *Cambridge Journal of Economics*, vol. 19, pp. 441-462