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What is the Destiny of Patents of Brazilian Universities?

André Luiz de Souza Querido¹, Celso Luiz Salgueiro Lage², Alexandre Guimarães Vasconcellos³

Abstract

The power of patent is expressed when the innovative product or process goes to market, and the exclusive right that patent ensures generates the market power, and the holder possibility to obtain competitive advantage over competitors. Thus, it becomes compelling the discussions on the universities need for transformation of patent applications efforts into granted patents, which could be negotiated with a higher degree of juridical certainty and, consequently, higher value added. To establish an Index of Patents Granting, and understand the importance of Technological Innovation Nuclei for the increase of this index, it was developed a survey on the number of patents granted to Brazilian universities and evaluated the structure of Technological Innovation Nuclei of these universities. From the survey on the granting cases, it was verified that the universities presenting, among other characteristics, better structured Technological Innovation Nuclei stood out.

Keywords: University; innovation; patents; industrial property.

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Introduction

The advent of the Brazilian Technological Innovation Law, in 2004 December, failed to conclude discussions on the imminent need to increase the efficiency of patenting of inventions arising from academic environment. In this context, it becomes important the discussions about the university role in the formation of skilled labor, and in addition, the university role for the country industrial development, assuming a comprehension that the patent is essential for technology transfer to companies, originating then innovation.

Mechanisms to encourage industrial development in Brazil, as incentives and tax exemptions and financing from the National Bank of Economic and Social Development to innovative companies; the Technological Innovation Law; and the restructuring of the National Institute of Industrial Property were, all of them, created in parallel with the implementation of a policy for induction of cooperative projects between academic institutions and the Brazilian private sector. The Intellectual Property, as a mechanism for protection and stimulation of technology transfer from universities and research institutes to industry, is part of that context (Emerick, 2004).

In a scenery where technological innovation is embedded in the microeconomic context of company decision taking, and assuming that universities should actively participate in the country's industrial development through the training of human resources and the transfer of technology generated in their research laboratories, the evaluation of Brazilian universities efficiency for patenting becomes important.

The need to protect, by means of patent, the knowledge generated within the universities in Brazil has been much discussed, and the absence of this protection becomes difficult the knowledge transfer to companies that will invest in further development, so that finally, it becomes an innovation, a new commercial product or process that reaches the market (Stal and Fujino, 2002).

Assumpção (2000) conducted a survey of applications deposited in Brazil, from 1990 to 1999, on behalf of Brazilian universities, and concluded that there were few applications deposited, especially when weighed against the figures presented by universities in the United States. It further concluded that the average time recorded for the granting of patents in Brazil is a real obstacle, and accor-

ding the research findings, the granting of patents for the University of São Paulo and the State University of Campinas took on average seven years. Moreover, the data showed remarkable resurgence of interest in the patent system after 1997, and that the new Industrial Property Law 9279/96, extended the possibility of protection to technological fields with strong university research.

Póvoa (2004), in order to contribute for the understanding of universities involvement in patenting activities in Brazil, described and analyzed the data on patent deposits made by Brazilian universities in the National Institute of Industrial Property, between 1979 and 2004. The causes of the significant increase in the number of patent applications made by the universities after the year 1996 were also evaluated. The results indicated that the Brazilian universities operate in high-tech areas, contributing significantly to production of technological knowledge in the biotechnology and organic chemistry fields. It was also shown the domain of universities located in the state of São Paulo, which have made most patent applications during the period analyzed, with the universities located in the state of Minas Gerais in second place.

Gullo and Guerrante (2006) have surveyed the 50 largest patent depositors in Brazil, with Brazilian priority, in the period between 1999 and 2003, aiming to identify the main customers of the National Institute of Industrial Property, and evaluate the performance of companies, universities, and research institutions with respect to protection of their inventions through patents. Among the ten most significant depositors, seven companies (Petrobras, Arno, Multibras, Semeato, Vale do Rio Doce, Embraco and Dana), two universities (State University of Campinas and Federal University of Minas Gerais), and a fomentation agency (Foundation for Research Support of the State of São Paulo) were identified.

Amadei and Torkomian (2006) analyzed the patent deposits from the public universities located in the state of São Paulo at the National Institute of Industrial Property, in the 1995-2006 period, totalizing 672 records, considering the following universities: State University of Campinas, University of São Paulo, Paulista State University, Federal University of São Carlos, and Federal University of São Paulo. With the obtained results, an even though unstable breakthrough was verified, in the number of patent

applications coming from universities; and the advance of State University of Campinas in the number of patents deposited respecting to others, with about 60% of the total records. As a conclusion, it was stressed that the strengthening of internal policies of universities related to Industrial Property protection will cause a higher rate of academic inventions, assuring the invention rights, stimulating new research and, through effective mechanisms, the transfer of technology produced in the universities to the productive sector.

Nunes and Oliveira (2007) have surveyed the number of patent applications made by higher education institutions in Brazil, in the period between the years 2000 and 2004, trying to compare the result with that obtained in the work of the 1990s. As a conclusion, it was seen a significant increase of 120% in the number of patent applications made by higher education institutions, for the period discussed above, despite representing only 2.3% of patent deposits made by residents in Brazil.

However, as noted, all conducted works have surveyed only the number of patent applications, instead the granting cases. This work resulted from the observation that the literature supported by survey data on patent granting for Brazilian universities, with the respective follow-up of the general proceedings of the applications from these universities in the National Institute of Industrial Property, is scarce. This work, so, has not only surveyed the number of patent applications, but the number of patents granted as well.

It is noteworthy that these data on patent granting are very important, given that patent involves costs, and that the logic of evaluation of the university patents success should not be restricted to a quantitative analysis of number of patent applications. For such a purpose, it is also crucial to survey the number of granted patents, that is, it is necessary more investigation than that commonly developed. Thus, this study has a peculiar methodology, if compared to other similar works, as it does a survey on the current number of patents granted to Brazilian universities, in Brazil.

To establish an Index of Patents Granting, and understand the importance of Technological Innovation Nuclei to increase such index, it was developed a survey on the number of patents granted to Brazilian universities, and evaluated the real structure of the Technological Innovation

Nuclei of these universities; being such methodological procedure, largely different from that of the normally published works approaching this same subject.

As a matter of fact, the power of patent is expressed when the innovative product or process goes to market, and the exclusive right assured by the patent generates market power, and the holder possibility to obtain competitive advantage over competitors. Therefore, a more solid analysis on the patent success in universities should take into account, at least, the capacity of these institutions and their respective structures for support to innovation, currently categorized as Technological Innovation Nuclei, to transform the existing patents in patented inventions, which could be negotiated with a higher degree of legal certainty and, consequently, higher value added.

Clearly, it is not possible to survey the patents granting in Brazil, investigating the processing of applications presented up to the year of 1997, as at INPI there are areas in which the backlog of unexamined patents applications reverts to approximately 10 years. It should be understood that a patent granting survey works only with consolidated data, in other words, with granting cases per se.

From this fact, a possible conclusion is that all works on patents granting in Brazil, will necessarily be coupled to the National Institute of Industrial Property backlog, which justifies the survey coverage up to early 1980's, when the early Technological Innovation Nuclei are established in Brazil, and the year of 1997, the limit year for a survey of patents granting in Brazil.

It should be noted yet, that the difficulty to track not only the patent applications, but whether the patent was granted or not, or simply if it is still under examination, is probably one of the factors that justify the current study limitation to a number of patent applications, and within this context, this work uniqueness, timeliness and relevance.

Context

It is common sense that significant changes in the global economy have occurred, which affect both, the economics of developed countries and developing countries as well. Such alteration is expressed as extremely competitive global markets, new media's development, and especially new products and processes development from the so-called scientific-technological revolution.

The new role of information and knowledge in the economics context and within the production process has led to a repositioning in the current role of universities, which are not only responsible for labor training, but begun to provide critical knowledge for the development of some industries (Rapini, 2007).

Companies whose focus is turned to high tech products and processes (biotechnology, nanotechnology) are more susceptible to such market pressures. However, the industries of products considered traditional (such as textiles, cement, etc.) are strongly encouraged by the creation of technological innovations providing competitive advantage. As a result, traditional sectors incorporating cutting edge technologies, are also largely modified as well.

This adaptation, besides to become fundamental to the private sector, has begun to influence the role of universities. It is currently evident, that the role of the university, besides teaching, is extended to production and dissemination of basic and applied research results. Thanks to this additional function, universities are traditionally regarded as a source of innovation and technological change (Haase et. al., 2005).

Universities have as their primary function the promotion of high-level training, enabling students to act in different society segments. In this way, the new knowledge generation is essential for the training process, which must correspond to the highest levels of scientific and technological research, in order to enable the achievement of an excellence level.

Considering the scientific-technological investigation and innovation, the university has become a key element in the industrial development of modern states, even though some critics insist on maintaining a vision that privileges the dichotomization of university role and academic assignments, arguing that for the maintenance of intellectual independence, philosophical reflections, and teaching process, a detachment from the external world is required.

Also, the motivations of university researchers and teachers respecting to patenting, are quite different. The current set of values in academia tends to prioritize the effects of newspapers and scientific journals publications, instead of patent deposits and granting arising from the research. Such obstacle results from the lack of awareness about the possibilities of protection and exploitation of Intellectual Property, which is due to the relative success of scientific publications, regardless of the successful commercialization of research results. Such values of scientific community influence its inclination to patenting and licensing, acting as a barrier against the completion of these activities (Haase et. al., 2005).

The Brazilian universities, currently, have the possibility of licensing the inventions originated in academia, which allows the sharing of profits from these inventions between all researchers involved in the work. This fact alone, opens up great possibilities for the academy, enabling greater attractiveness for the academic career between high level scientists.

The research/technology transfer/ commercial application interconnection is a function that can be played by universities, provided they have the necessary infrastructure, represented by high-level researchers, duly equipped laboratories, libraries and high quality information systems, Technological Innovation Nuclei able to support the whole process of innovation within the institutional framework, including therein the activities of patenting and the negotiations for the technology transfer.

Thus, the performance of highly skilled and productive staff in an environment that stimulates research activities is a decisive factor for both, the generation of knowledge and its commercial evaluation and implementation providing economic values (Haase et. al., 2005).

Specifically respecting to Technological Innovation Nuclei, the ability to support the whole process of innovation within the institutional framework, including therein the activities of patenting and the negotiations for technology transfer involves several factors, such as adequate internal standardization, support from top management, financial resources and infrastructure. Thus, it is possible to deduce that the main obstacle to overcome is the recruitment of specialists with higher education, which have the appropriate profile for the proper performance of tasks related to Intellectual Property and technology transfer (Theotônio, 2004).

The infrastructure and human capital of the Brazilian university are responsible for the great potential for knowledge and technology generation; which is extended to almost all research areas, with great potential for patents obtainment. However, with the generation of new products and processes in their research labs, that is, with the expansion of its traditional functions, legislative changes concerning the treatment of patents issue become necessary, aiming increased legal protection of commercially exploitable research results, and their transfer to industries.

Ultimately, expanding the role of academia in this perspective can offer compelling benefits to education, as it promotes greater exchange between the research labs and the companies' centers of excellence in research bringing together students from the real challenges they will face in the labour market, where the academic theory will be more and more closer to the real needs that should be remedied by the new products and processes made available by companies to society.

Thus, the university-enterprise relationship, according to new policies of industrial development, naturally tends to enhance the university role in the country, embracing teaching, research, and support for industrial development; and it should not be interpreted as a loss of academic principles with the university finally bowing to market pressures.

When it comes to matters related to Industrial Property and patents owned by universities, conflicts arise involving issues of confidentiality and rights over research results publication. To enable an interaction between the private sector and academia occurring in a positive way, and to enable a successful transfer of technologies arising from academic research, it is necessary to formalize contracts, providing a higher degree of certainty for parties.

With the Law 10.973 entering in force on December 2nd, 2004, known as the Law on Technological Innovation, Brazil has acquired a new tool to foster innovation and scientific and technological research within the productive environment, aiming to build technological capacity and autonomy and the country industrial development. According to the Law on Technological Innovation, a Technological Innovation Nucleus within a university is a framework that aims to manage all the policy of scientific and technological innovation of the Institution.

The Law on Technological Innovation is fundamentally a public-private partnership Law aiming to improve the performance of the Innovation System. Before this Law, the neck of university-business partnership was essentially in the public sector. It was a matter of administrative Law, since public sector specific laws often made it difficult to interact with the private sector in collaborative projects aiming innovation.

The Technological Innovation Nucleus should be the structure that will help researchers to transform a product developed at the laboratory bench into a commercial success. The view that managing innovation policy within an institution transcends the mere patent deposit and follow-up should be reinforced.

The role of the Technological Innovation Nuclei does not end with patents, that is, such a process should converge for technology transfer, which can take two or three years; then, it is adequate a workforce in the Technological Innovation Nuclei that could follow-up the process from first to last, participating in the several stages. Such a team could then to monitor the invention, until it can be turned into a product or process with economic viability, with characteristics better than those of the commercially available concurrents.

It should be noted that some researchers do not have an accurate understanding of what, exactly, is the management of innovation policy by these nuclei. For some, a Technological Innovation Nucleus would act as a kind of referee for scientific publication, as they send their works to these nuclei, and do not follow-up the process anymore. This understanding associating a patent to a mere scientific paper denotes their ignorance about the system, as a patent generated within the university, but without any institutional concern with the licensing and technology transfer, and the respective royalties generation, will have little practical effect. This procedure

is actually a set of financial losses to the holder (patent owner), not generating power to exclude others. This power, ultimately, represents the market power, in other words, the power to promote scarcity, creating demand pressure, allowing the patent holder to obtain a higher profit margin when the patented product or process is marketed, besides to attract partners interested in the product allocation on the market.

Additionally, the Technological Innovation Nuclei should also transcend the researcher interests, as the researcher is only a part in the invention success. It should be noted that the invention will have as holder, the respective university in which it was developed. The Innovation Law clearly establishes this point, the invention holding.

Despite the efforts of public institutions, researchers and teachers to spread the culture of Intellectual Property in the academic environment, and the strengthening of the Technological Innovation Nuclei in the universities, the current picture is not the most encouraging one. The resurgent demand for Technological Innovation Nuclei finds its background on the fact that patent based appropriation of academic knowledge in Brazil, resulting in successful technology transfer to companies, has not met the expectations.

In this context, it is useful to obtain data to guide the public policy for consolidation of Intellectual Property and Technological Innovation Nuclei within the academic environment. More specifically, to obtain data to improve the understanding about the importance of Technological Innovation Nuclei structuring within Brazilian universities, for the composition of the Index of Patents Granting; justifying so the existence of such structures as a central instance of the innovation process within the university environment.

Method

During the month of August 2008, a survey on the number of patents registered in Brazil by Brazilian universities, between the dates of 01/01/1983 and 12/31/1997, was done. The website of the European Patent Office (EPO) was used, with the keywords "University" and "college" in the field "institution". The initial "BR" was used in the field "publication", in order to filter the patents of interest; excluding, for example, patents from Portugal. The years from 1984 up to 1999 were entered successively in the field "publication date", as the purpose was to obtain

patents deposited between the years of 1983 and 1997, since between the patent filing and the patent publication there is a secrecy period of 18 months.

The EPO website (espacenet) provided the publication number, publication date, and applicant university or college. The patents surveyed at espacenet were taken to the Industrial Property Magazine of the National Institute of Industrial Property, in order to search for the dispatch code of such patents; obtaining so a record of the patents processing within the studied period.

To facilitate data interpretation, we have created an Index of Patents Granting (IGPat). The data tabulation on the progress of all patent applications from Brazilian universities resulted in the construction of their respective IGPAT. This index was created in order to express the real success of the university, and it is based on the number of grantings, instead the number of patent applications. The number of patent applications, commonly used as a success indicator in patenting does not reflect the university efficiency.

The survey aimed to calculate the Index of Patents Granting of every Brazilian university, calculating initially a Partial Index of Patents Granting (PIGPAT), which reflects the relationship between the number of granted patents and the decided patent applications. This approach targets do not impair the performance evaluation of universities whose applications are still under examination. Thus, the Partial Index of Patents Granting will range from 0 to 1, as follows:

$$\text{PIGPAT} = \frac{\text{number of granted}}{\text{number of applications decided}}$$

To get the so-called Index of Patent Granting (IGPAT), it was taken into consideration the Partial Index of Patents Granting by the number of patents granted, with an understanding that the number of patents granted shall naturally be guided by its Index, as follows:

$$\text{IGPAT} = \text{PIGPAT} \times \text{number of granted patents}$$

The project “Fostering the establishment and consolidation of Technological Innovation Nuclei in Brazilian Universities” (Santos and Rossi, 2002) was jointly conducted by the National Institute of Industrial Property, the Technology Network of Rio de Janeiro and the Office of Technology Transfer and Interaction of the Federal University of Rio Grande do Sul, aiming to stimulate and disseminate the culture and practice of Intellectual Property and technology transfer within the Brazilian university context.

To evaluate the structure of Technological Innovation Nuclei in Brazilian universities in the 1980 and 1990 decades, data from the work developed by Santos and Rossi (2002), on the mapping of Technological Innovation Nuclei in Brazilian universities, were used.

To establish a measurement to assess the structure of the Technological Innovation Nuclei, 12 parameters related to infrastructure and management of the Technological Innovation Nuclei have been established. The score 1 (one) was attributed to parameters with information indicating the infrastructure of the Technological Innovation Nucleus, and in the absence of such information, it was assigned to these parameters the score 0 (zero).

The entering of any year until 1989 in the parameter (1), year of establishment, was considered as related to a pioneer center, with a score of 1, and thereafter a score of zero. If possessing more than three effective employees, parameter (4), a score of 1, and up to 3 permanent employees, score 0. For other parameters, a positive answer to the question resulted in a score of 1, if negative, the score was zero. The final sum of parameters values resulted in a structure profile for each Technological Innovation Nuclei. The parameters we have: (1) year of establishment, (2) domestic regulation on Intellectual Property, (3) availability of a standard to divide the results with researchers, (4) number of effective employees, (5) discipline of Intellectual Property, (6) adoption of means to divulge the Intellectual Property system, (7) patents registration hold institutionally, (8) interaction with the National Institute of Industrial Property, (9) promotion of patents protection, (10) operation of external specialized offices, (11) search for existing patents, and (12) divulgation of Technological Innovation Nuclei.

Discussion

The data on the progress of all patent applications from Brazilian universities led to construction of an index called the Index of Patents Granting (IGPat).

This work survey has generated data regarding patenting from higher education Institutions in Brazil, over the period between 1983 and 1997.

Rank	Institution	Patent applications	Granted	Not granted	Filed patent	Under review	IGPat
1	University of Campinas	108	70	11	12	15	53
2	University of São Paulo	90	61	16	7	6	44
3	Paulista State University	16	9	2	5	-	5
4	Federal University of Rio de Janeiro	6	4	-	2	-	2.6
5	Federal University of Pernambuco	2	2	-	-	-	2
6	Pontifical Catholic University of Rio de Janeiro	2	2	-	-	-	2
7	Pontifical Catholic University of Rio Grande do Sul	27	6	3	17	1	1.7
8	Federal University of Sergipe	26	6	4	16	-	1.3
9	Federal University of Sao Carlos	2	1	-	-	1	1
10	Federal University of São Paulo	2	1	-	1	-	1
11	State University of Maringá	10	3	2	5	-	0.9
12	Federal University of Minas Gerais	18	-	1	9	8	0
13	Federal University of Paraíba	10	-	1	9	-	0
14	Federal University of Juiz de Fora	3	-	1	2	-	0
15	Federal University of Santa Catarina	3	-	-	3	-	0
16	Federal University of Uberlândia	2	-	-	2	-	0
17	Federal University of Viçosa	2	-	-	1	1	0
18	Federal University of Rio Grande do Sul	2	-	-	2	-	0
19	Federal University of Ouro Preto	1	-	1	-	-	0
20	Federal University of Espírito Santo	1	-	-	1	-	0
21	Regional University of Blumenau	1	-	-	1	-	0
22	State University of Londrina	1	-	-	-	1	0
23	Federal University of Santa Maria	1	-	-	-	1	0
24	University of Brasília	1	-	-	1	-	0
25	University of Caxias do Sul	1	-	-	1	-	0
26	Federal University of Ceará	1	-	-	1	-	0
	Total	339	165	42	98	34	

Table I - Index of Patents Granting (IGPat)

Table 1 shows the data of total patent applications for Brazilian universities, the number of granted patents, the Index of Patents Granting and other data over the period from 1983 to 1997.

The data also show that, except for the Pontifical Catholic University of Rio de Janeiro and Pontifical Catholic University of Rio Grande do Sul, the best performances were obtained by public universities, both federal and state; which have proven leadership in the process of institutionalizing the management of Intellectual Property.

Among the Brazilian universities, Table 1 shows that the four institutions having the higher Index of Patents Granting were, respectively, State University of Campinas, University of São Paulo, Paulista State University, and Federal University of Rio de Janeiro, with a huge advantage for both, the State University of Campinas and the University of São

Paulo, which emphasizes the marked regional asymmetry. Table 1 shows that the State University of Campinas and the University of São Paulo, whose Technological Innovation Nuclei are pioneers in Brazil, being already well structured in the 1980 and 1990 decades, accounted for 58.40% of patent applications from universities received at the National Institute of Industrial Property in the period 1983 to 1997, and 79.39% of the total patents granted by all Brazilian universities, within the referred period.

Table 1 shows also that the State University of Campinas and the University of São Paulo have Index of Patents Granting (IGPat) of 53 and 44, respectively; while in third position, is the Paulista State University having an IGPat = 5; a situation that shows great regional concentration, as these universities are, all of them, located in the State of São Paulo, with a distance of 60 miles between each other.

Institution/Parameter	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Total
University of Campinas	1	1	1	1	0	1	1	1	1	1	1	1	11
University of São Paulo	1	1	1	1	1	1	1	1	1	0	0	1	10
Federal University of Rio Grande.do Sul	0	1	1	1	1	0	1	1	0	1	1	1	9
Federal University of Minas Gerais	0	1	1	0	0	1	1	1	1	1	1	1	9
Federal University of Pernambuco	0	1	1	1	0	1	1	1	1	0	1	1	9
State University of Maringá	0	1	1	1	1	1	0	1	1	0	1	1	9
Federal University of Sao Paulo	0	1	1	1	0	1	1	0	1	1	1	0	8
University of Brasilia	0	1	1	1	0	0	1	1	1	0	1	1	8
Federal University of Rio de Janeiro	0	0	1	0	0	1	1	1	1	1	1	1	8
Federal University of Santa Maria	0	1	1	0	0	1	1	1	1	0	1	1	8
Federal University of Viçosa	0	1	1	1	0	1	1	0	1	0	0	1	7
Federal University of Sergipe	1	0	0	1	0	0	1	1	1	1	1	0	7
Federal University of Ouro Preto	0	0	1	0	0	1	1	1	1	0	1	1	7
Pontifical Catholic University of Rio Grande do Sul	0	0	1	0	1	0	1	0	1	1	0	1	6
Paulista State University	0	0	1	1	0	1	1	0	0	1	0	0	5
Federal University of Ceará	0	0	0	0	1	0	0	1	0	0	1	1	4
Federal University of São Carlos	0	0	0	1	0	1	0	0	0	0	0	1	3

Table 2 - Structuring Profile of the Technological Innovation Nuclei. Parameter: yes = 1, no = 0. Source: Santos and Rossi, 2002.

Table 2 shows the structuring profile of the Technological Innovation Nuclei based in the 12 respectively investigated parameters.

A closer study of the trajectory of the better structured Technological Innovation Nuclei in the 1980s and 1990s, found that their performances were characterized by a series of circumstances, such as: availability of staff on an ongoing basis, support from university presidency and a research dean, and budgetary allocation within an ongoing strategic planning; which is defined as a pro-active relationship between the researchers and activities being developed in conjunction with the protection of Intellectual Property, as incubator and partnership developer.

It was noticed that the better structured Technological Innovation Nuclei had in the curriculum of the institution regular courses, a discipline dealing with the major features and benefits of Intellectual Property and technology transfer, to complement the current technological training, adapting it to the new reality in the national and international competitive scenery; they promoted the training of teachers responsible for the interaction with the external environment, especially with companies, in everything related to technology business techniques, giving emphasis to new projects and contracts preparation; they enabled teams and developed strategies to improve the mechanisms for identifying both, the external demands for technological solutions, and the researches of interest to several industries.

Additionally, they broadened the interactive channels with other higher education institutions having already the bodies responsible for activities related to Intellectual Property and technology transfer, with the purpose to understand the main problems faced, as well as the solutions for dealing with managerial issues linked to technological management of internally generated intellectual assets; they encouraged the practice of surveying the state of the art, through searches in databases containing patent documents, particularly in the disciplines of technological nature, as well as in the initial preparation of projects for courses termination.

Certainly, a Technological Innovation Nucleus with all of these features is a good example to be followed, since it has the differential elements that are present in Technological Innovation Nuclei of universities with higher Index of Patents Granting (IGPat).

However, it is noteworthy that even a well-structured Technological Innovation Nucleus, if within an academic infrastructure that does not take into account other important factors, for example, capacity for scientific publication, will have also difficulties to translate such a good structure of the Technological Innovation Nucleus into patents and licenses for the university. These factors altogether, will provide the tools to enable the institution to improve its IGPAT. They are items related to the university infrastructure, such as the presence of staff capable to generate attractive inventions, the maintenance of a significant number of publications, the availability of a cluster of nearby companies contributing for much of the development and licensing funding, and the support from the State Foundation for Research Support.

Specifically about clusters of nearby companies, and regional asymmetries, Albuquerque, et. al. (2009), taking as analysis unit the city, described the spatial distribution of scientific and technological activities in Brazil, from patent statistics (a proxy for technological capability), scientific articles (a proxy for scientific capability) and research (an indicator of human resources allocated into scientific activities), having as basic hypothesis the proposition that the relationship between scientific versus technological production should be mediated by economic analysis dimensions covering both, the variables directly related to the innovation system, and their spatial determinants as well.

Albuquerque, et. al. (2009), showed a clear interdependence between the city of São Paulo and other municipalities of São Paulo metropolitan region. They showed also that if São Paulo has high values for both variables - given its importance, and economic, urban and scientific relevance for the country - the hinterland cities have a lower articles/ patents rate.

Albuquerque, et. al. (2009) showed also a remarkable high participation of the municipalities of the macroaxis Campinas-São Carlos-Ribeirão Preto in the production of both, papers and patents.

Filho and Souza (2009) demonstrated that the states of Rio de Janeiro and São Paulo have contributed in conjunction, for more than 50% of the total national production of theses and dissertations about Intellectual Property, and that after the Law on Technological Innovation, the number of theses and dissertations developed in Brazil, about this same subject, increased by approximately 50%.

Filho and Souza (2009) have also showed that, proportionally, while in the period between 1997 and 2006, the total number of theses and dissertations has increased 2.7 times, the number of theses and dissertations about Intellectual Property in Brazil has increased 8.3 times, which gives an indicator of the increasing relevance of this subject in the Brazilian universities. They concluded that the training of qualified people, not only related to legal issues, but in areas related to technology and management, is a key to promote technological development in the country.

Still about the marked regional asymmetry observed in Brazil, which is naturally reflected in Brazilian universities IGPAT, and in an attempt to resolve such asymmetries, there is an imperious necessity for more discussion about Intellectual Property in the Brazilian universities, and improvements in the infrastructure of the Technological Innovation Nuclei.

Conclusion

From the survey of patents granting in the Brazilian universities, with respect to the Index of Patents Granting, it was observed that universities standing out in other parameters, are also holders of the better structured Technological Innovation Nuclei.

The Innovation Law took into account the trajectory of the most successful Technological Innovation Nuclei in the country, in other words, the purpose of this Law was to enable universities to structure Technological Innovation Nuclei with characteristics more and more closer to that of the Technological Innovation Nuclei that currently present the best performance on patenting and licensing. The Technological Innovation Nuclei have an important role in guiding the researchers; they are important to maintain a permanent and well trained staff, with the profile suitable for these centers, as scholars with discontinued actions do not meet these requirements.

The data showed that in universities without the management of a Technological Innovation Nucleus, a great number of requests is abandoned due to expiration of payments (annuities) terms, resulting in subsequent filing, which evidences the lack of structure for processes management.

In this context, the Brazilian Innovation Law, and its reference to Technological Innovation Nuclei in public universities, should prove its great value for the increase of the

Index of Patents Granting of these institutions, leading to the view that this Law is an important step towards the professionalization and structuring of Technological Innovation Nuclei in Brazil.

Putting into practice the Law of Innovation, that is, with the Technological Innovation Nuclei assuming the management of this process, the Index of Patents Granting (IGPAT) of the universities, possibly, will rise; since in the universities where research has been developed by means of a structured Technological Innovation Nucleus, the IGPAT showed significant increase. In this respect, it is worthy to highlight the need for Technological Innovation Nuclei being prepared to filter out the promising inventions, making their universities bear the costs related to these patents. This is of great importance to avoid that patents without any possibility to reach the market are deposited, increasing so substantially the costs, without achieve the expected return.

Thus, in order to accelerate the IGPAT increase, it is essential that Brazilian universities could count on the support of a well-structured Technological Innovation Nucleus, which is fully capable to effectively manage the university technological innovation policy.

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