RESEARCH AND INNOVATION IN BIOTECHNOLOGY: an analysis of the patents granted by Brazilian Universities in the last decade.[1]

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INTRODUCTION

The competitive environment created with the globalization of the economies has been strongly driving the search for innovations, as much in the field of productive technologies, as in models of business management. The information and communication technologies (ICTs), as much as modern biotechnology, are technologies based on science, on basic research transformed into scientific and technological knowledge.

Evaluating around 2,000 significant technological innovations, Pavitt[2] (1990) proposes a taxonomy of "sectoral innovation patterns" and establishes three enterprise groups with patterns of distinct technological paths: (i) companies dominated by suppliers; (ii) production-intensive companies or economies of scale; and (iii) science-based companies, whose sources of technological innovation are R&D activities. A study conducted by Rapini[3] states that sectors such as genetic engineering, organic and inorganic chemistry, food technology, biotechnology, laser technology and microelectronics (telecommunications, electronic components, data processing), mainly characterized for being science-based, are more prone to the University-Enterprise interaction.

These authors acknowledge the importance of the mechanisms of protection of intellectual property (IP), with emphasis on patent mechanism, to secure the investments made in the innovative process, mainly in R&D.

The globalization of the economy forced the countries to adjust in order to gain competitiveness and market by promoting technological innovation in a context where both the

1 The opinions expressed in this article are the sole responsibility of the author.
2 Pavitt, K. Sectorial patterns of technical changes: Towards a taxonomy and a theory. In: The Economics of Innovation. England: Edward Elgar Publ. Ltda, 1990.
3 Rapini, M.S. Interação Universidade-Empresa no Brasil: Evidências do Diretório dos Grupos de Pesquisa do CNPq. Estud. econ., São Paulo, v. 37, n. 1, p. 211-233, janeiro-março 2007.

adoption of strategies for conquering foreign markets by domestic companies, and the attraction of foreign capital by Governments, turn to be the key elements in the economic development policies.

In response to these institutional changes that occur in many countries, Brazil implemented Law N° 10973/04, the Innovation Law[4], to facilitate the interaction between universities and private companies and to stimulate the generation of technological innovations.

Innovation Policy in Brazil

The Innovation Law implemented as from 2005 plays a relevant role in the promotion of innovation and scientific and technological research. It aims to stimulate the interaction between the private sector and the research and education institutions to strengthen the competitiveness of the national productive sector. In this regard, it provides for innovation incentives and scientific and technological research, and has as objectives: (i) to stimulate the building of strategic partnerships and cooperation between universities, public research institutions and private companies that address research and development activities that aim the generation of innovations; (ii) to encourage the transfer to the private sector of technologies produced in public research institutions; (iii) to stimulate the generation of innovations directly in domestic enterprises; (iv) to foster a culture of innovation by means of a differential approach to the issue of intellectual property in the context of the Institutions of Science and Technology with the implementation of the *Núcleos de Inovação Tecnológica (NITs)* (Centers for Technological Innovation).

The new global economic and scientific context and its consequent regulatory framework, national and international, have been stimulating stronger competitiveness among countries; consequently, they exert pressure to transform research into innovation whose internationally indicator used are patent filings.

The present study aims to assess the innovative activity or technological innovation by examining the number of patent applications filed in the area of biotechnology by Brazilian applicants in Brazil. In addition, it aims to identify those patent applicants' profile, particularly Brazilian universities that filed patent applications and partnerships with private companies in order to understand the relationship between government, universities and private enterprises.

[4] Brazil. Law 10.973, 2004. *Lei de Inovação* (Innovation Law).

METHODOLOGY

To conduct the survey of patent filings we decided to use the Espacenet patent database, and three international patent classifications of the Biotechnology area were used:

- C12N - Microorganisms or enzymes; their composition;
- C07K14 - Peptides having more than 20 amino acids; Gastrins; Somatostatins; Melanotropins;
- C07H21/04 - Compounds containing two or more mononucleotidic measures, having separate phosphate or polyphosphate groups linked by radical saccharides of nucleoside groups.

The Espacenet database provides information about patent applications of more than 80 countries and is characterized as a fairly complete and updated database with more search options available, in addition to have free access and a friendly interface. The search strategy used, i.e. the search fields selected were:

a) Priority Number: BR (Brazil) and the year of publication - from 2000 to 2010;
b) IPC (International Patent Classification): C12N, C07K14 and C07H21/04.

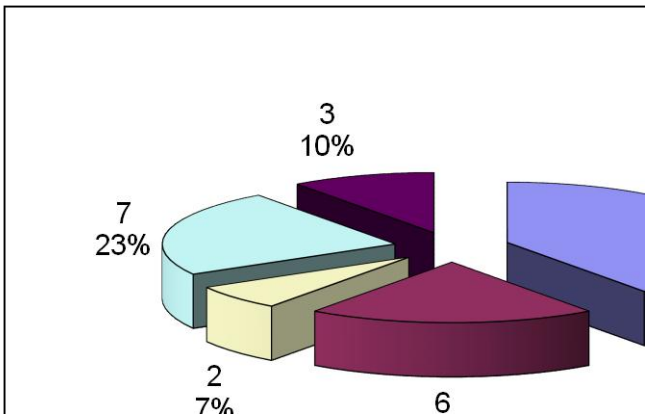
Once all the summaries of the files were selected in the defined classifications and printed, they were ordered by year. From this material, we drew up a summary table for each year, containing the patent applicant, the abstract of the patent application and the patent applicants' profile.

PRELIMINARY FINDINGS

Postgraduate Programmes in Biotechnology

There are 30 postgraduate programmes in Biotechnology in Brazil. The highest-rated programmes received a score of 5 and totalize 30% of the existing programmes. They are evenly distributed between public and private institutions. With regard to the regional distribution of the programmes, Chart 1 shows that 40% are in the Southeast.

Chart 1 – Distribution of Programmes across the Regions of Brazil



Southeastern Region – SE / Southern Region – S / Central-West Region – CO / Northeastern Region – NE / Northern Region - N

With the completion of the survey on patent filings, we aim to develop a geo-referenced map, indicating the regionalization of post-graduate programs *vis-à-vis* the patent filings in Brazil.

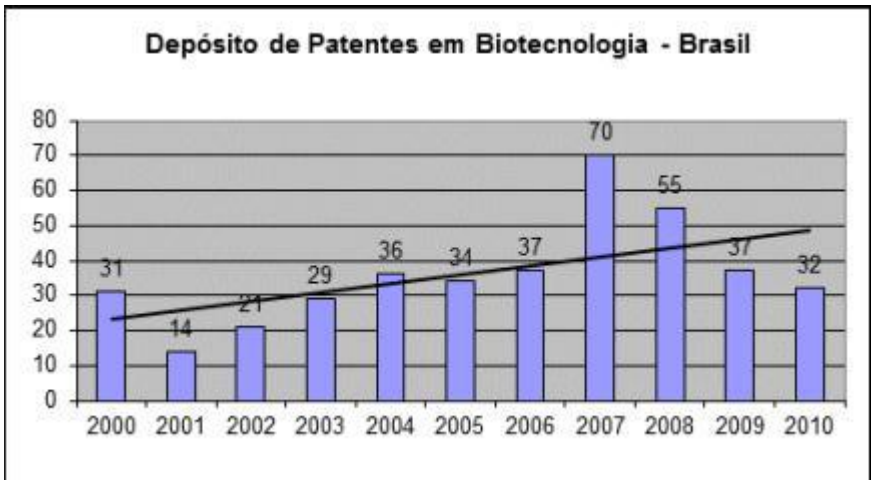
Patent Filings / Technological Innovation

The transformation of research into innovation in Brazil has not yet reached a degree of maturity that would place it in a better position with regard to technological innovation. We are well positioned in relation to scientific production, but poorly positioned in relation to innovation. For the Brazilian Minister of Science, Technology and Innovation, what is currently lacking is a bridge to connect the universities to the companies, since *"we occupy relevant places in the world scientific production (...). Of all published scientific articles 2.5% are produced by Brazilians*"(*Agência Gestão C,T&I*, 2012).

The assessment of the preliminary findings of the survey points to a total of 396 patent filings conducted over the past 10 years. Chart 2 shows the number of patent filings per year. Note a growth trend line caused mainly by the large number of filings in the years 2007 and 2008, from the Innovation Law.

Chart 2 – Number of Annual Patent Filings – from 2000 to 2010

Patent Filings in Biotechnology – Brazil



Patent Applicants' Profile

In order to facilitate the comprehension of the various types of patent applicants and their respective profiles, we decided to classify them into five categories:

a) *Universities;*

b) *Individuals;*

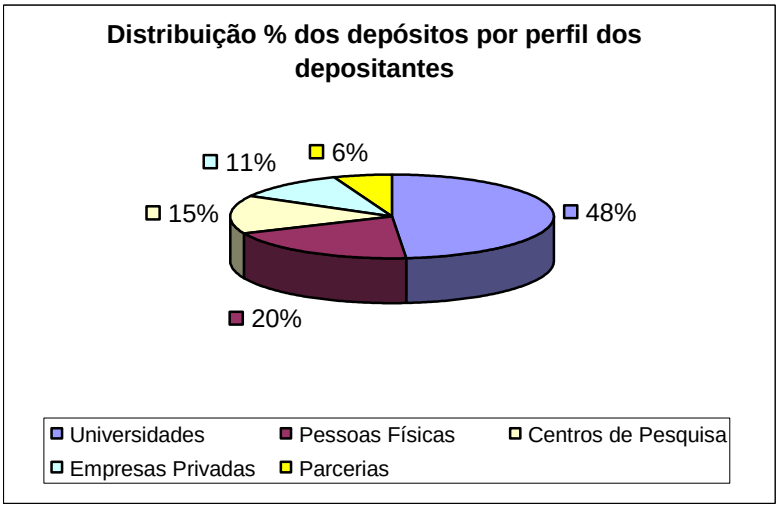
c) *Research centers;*

d) *Private companies;*

e) *Partnerships.*

The largest patent applicant in Biotechnology are the universities, with 193 files in 10 years, followed by individuals with 78 files, research centers with 59, private companies with 44 and partnerships with 23, according to Chart 3.

Chart 3: Filing distribution by applicants' profile



On the other hand, it can be observed in the table below that the partnerships between universities and private companies are still not significant. In the last 10 years, of the total of 23 partnerships made between public institutions and private companies in patent filings, 13 were with Brazilian universities, and 12 were made since the entry into force of the Innovation Law in 2005.

Table: Partnerships in patent filings from 2000 to 2010

	Parcerias
2000	VALEE S.A./Embrapa
2001	
2002	
2003	Biogenetics/Fapemig
2004	Hormogen/Cnen; Biolab Sanus/ Fapesp; Biosintética Ltda/Fapesp; União Química/Unifesp
2005	Biolab Sanus/Butatntan; Poli Engenharia/UnB
2006	Cristália/Fapesp
2007	2 entre Farmarcor Biotec/USP; Bioenzima/Federal de Caxias do Sul;Lab. Bio Vegetal/USP
2008	Ouro Fino/UnB; Biotecnologia S.A./Senai; Blausigel/Unicamp; Coalhos Bio Paran/UnB; Imunoscan em. Molecular/Fed. Uberlandia
2009	Medic Formula/UFSC; Unicórnio Reprod. Animal/UnB; Hospital Alemão/Butantan
2010	Alvos Consult. Prod. Biotec./Fiocruz; Invent.Biotecnologia/USP

CONCLUSION

The handling of the compiled information will enable the development of an insertion mapping of the IP topic in postgraduate courses in Biotechnology.

Later it will be possible to make a comparative analysis with data from other countries. But it is worth noting that the filings in the United States and China, for example, have already reached the amazing figure of thousands of annual patent filings.

It will also be possible to conduct an analysis of the content of the patents filed in Biotechnology aiming the identification of the technological fields that are being investigated by Brazilian inventors. Beforehand, we can identify genetic engineering as the field that assembles the majority of patent filings.

Other relevant information is that since 2005 the number of patent applications filed by universities has been growing. This growth can be explained by the implementation of the Innovation Law and also by the Brazillian IP Office (INPI) performance in the process of the managers' training of the *Núcleos de Inovação Tecnológica - NITs* (Centers for Technological Innovation) established by this law.

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