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**Theme E
New Competition Policies and Intellectual Property Rights**

MANAGEMENT OF INTANGIBLE ASSETS AT BRAZILIAN UNIVERSITIES

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Abstract

The present work discusses the regulatory and organisational aspects of intellectual property rights at Brazilian public research institutes. It analyses the delayed and slowly arising interest for intellectual property at universities, and discusses the grace period in the Brazilian Industrial Property Law, the ownership of patents and the financial incentives granted to the researcher as well as the measures taken by the Ministries of Science and Technology and Education and Sport, towards valorisation of the results of academic research. Finally, it examines some obstacles to the establishment of Offices of Intellectual Property at Brazilian universities.

Key words: Patents, Intellectual Property Rights, Technology Transfer, Universities

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I. Competitiveness and the Brazilian Intellectual Property Legislation

The competitiveness and socio-economic development of countries, regions, sectors and enterprises are based on factors such as innovation, knowledge and learning. The fast internationalisation process of the economies amplify the importance of these factors, making them crucial elements for accumulating own technological capability. Special attention must be given to the use and diffusion of scientific and technological knowledge. The capacity of an economy to obtain competitive advantages from technical change and innovation depends on the dynamic efficiency with which companies and institutions diffuse, adapt and use information and knowledge².

¹This is an updated version of a paper presented at the international conference “Innovations and Intellectual Property: Economic & Managerial Perspectives” that was held at the Université Libre de Bruxelles in Brussels, on 22-23 November 2001. I would like to thank the Oswaldo Cruz Foundation (FIOCRUZ), the Brazilian Coordination for the Enhancement of Graduate Students (CAPES), and the German Academic Exchange Service (DAAD) for funding my research. I am greatly indebted to Professor Joseph Straus for very helpful academic support and generous hospitality at the Max Planck Institute for Foreign and International Patent, Copyright and Competition Law. Professor Paulo Figueiredo read and commented an early version of this manuscript. Professor Carlos Cosenza and Professor Orlando Cosenza undertook particularly valuable reviews. Christiane Pfliegshoerl helped me in proofreading the paper.

² See Soete, L. & B. Weel, *Innovation, Knowledge Creation and Technology Policy in Europe*, mimeo, Maastricht: Merit, 1999; Granstrand, O., *Economics and Management of Intellectual Property*, Edward Elgar Publishing Ltd., 1999.

The new technologies show more intensive as refers to learning and qualification of human resources than the former ones, emphasising the tacit and cumulative character of technology and its use as competitive instrument³.

With the possibilities provided by the information technologies, codified knowledge passed to circulate faster and is more intensely incorporated by the different sectors of society. To the extent, more knowledge is codified, the non codified knowledge does not loose importance. On the contrary, it becomes increasingly crucial⁴. Parallel to this phenomenon, knowledge is being created world-wide in an increasingly accelerated way, including the use and production of codified and tacit knowledge. The life cycle of products is shorter; the distance between the idea and the commercialisation of a new good is reduced⁵.

The perception of the very nature of the innovation process has changed⁶. The innovation capacity is less dependent on the ability to discover new technological principles, but concentrates on the systematic exploitation of the effects produced by new combinations of cumulated knowledge. The new model requires extensive access to the state of the art but, at the same time, it brings new problems related to the search of information, especially in view of the restrictions posed by legally protected knowledge.

Thus, the instruments for the protection of intellectual property rights present themselves in today's scenery as an expectation of security for the increasing investments in research and development. The valorisation of scientific and technological knowledge depends on the elected form of appropriation, on the nature of knowledge, on the socio-economic and regulatory environments and on the circumstances of competition that shape the use of this knowledge.

The modern national policies of innovation incorporate creation, diffusion and use of knowledge, graduation and training of professionals, the creation of networks, of systems of technological forecasting and management of intellectual property rights.

In Brazil, the accumulated technological capability is the result of a policy started during the 1950s, substituting imports and giving priority to the acquisition of relatively mature technologies and training of professionals in basic routines⁷. The economic context was of

³ See Possas, M.L., Nota Técnica de Síntese dos Fatores Sistêmicos da Competitividade da Indústria Brasileira, mimeo, Rio de Janeiro: IE/UFRJ, 1993.

⁴ See Bell, M. & K. Pavitt, National Capacities for Technological Accumulation: Evidence and Implications for Developing Countries, World Bank's Annual Conference on Development Economics, Washington, 1992.

⁵ See Cassiolato, J.E. & H.M.M. Lastres, Sistemas de Inovação: Políticas e Perspectivas, Parcerias Estratégicas, n. 8, 2000.

⁶ See Soete, L. & B. Weel (1999), *opere citato*, supra note 2.

⁷ It is important to point out that there are other key factors influencing technological capability building particularly at the firm level. For good discussions, see, for example: (i)

strong protection of the national industry, including governmental subsidies and subventions. Only weak efforts were made towards innovation and the capacity to create international networks was poor. In the decade of the eighties, the cycle of imports had come to its end.

As refers to the exhaustion of the Brazilian industrialisation pattern, “directed inwards”, it is possible to identify different components of systemic fragility remaining as a heritage: (i) low degree of contestableness of the markets used to protectionism; (ii) reduced technological capability and insufficient effort to achieve; and (iii) predatory use of human and natural resources leading to both, degradation of the environment and extreme dependence of the industry on the low cost of labour to be competitive, creating a perverse and unnecessary opposition of competitiveness and equity, in clear contrast with other New Industrialised Countries⁸.

Under the effect of the import substitution policy, the intensity and quality of the technological activities in Brazil were very different from that in the developed countries. There was a lot of copying, adaptation and improvement, which, although of high local relevance, remained far behind the frontiers of technology and was not always transformed into patents or other intangible assets. Technological learning is possible without patenting. It is worth mentioning that the use of patent indicators for measuring innovative activities is imperfect. This because (i) part of the knowledge, for not being codified, will not appear in the statistics; (ii) not every invention is patentable; (iii) the innovator entity may opt for means of appropriation other than patenting; (iv) for some sectors, patenting is more important than for others; (v) statistics do not indicate the economic value of the patents – radical innovations and incremental innovations have equivalent weight; (vi) the

Dahlman, C. & F.V. Fonseca, From Technological Dependence to Technological Development: The Case of the USIMINAS Steel Plant in Brazil, Working Paper, No. 21, IBD/ECLA Research Programme, 1978; (ii) Bell, M., Learning and The Accumulation of Industrial Technological Capacity in Developing Countries, in K. King & M. Fransman (Eds), Technological Capability In The Third World, London: Macmillan, 1984; (iii) Katz, J., Domestic Technology Generation in LDCs: A Review of Research Findings, in J. Katz (ed.), Technology Generation in Latin American Manufacturing Industries, New York: St. Martin's Press, 1987; (iv) Kim, L., Crisis Construction and Organisational Learning: Capability Building in Catching-up at Hyundai Motor, Paper presented at the Hitotsubashi-Organization Science Conference, Tokio, October 1995; (v) Kim, L., The Dynamics of Samsung's Technological Learning in Semiconductors, California Management Review, Vol. 39, No. 3, pp. 86-100, 1997; (vi) Kim, L., Imitation to Innovation: The Dynamics of Korea's Technological Learning, Boston, Mass: Harvard Business School Press, 1997; (vii) Lall, S., Learning to Industrialise: The Acquisition of Technological Capability by India, London: Macmillan, 1987; (viii) Dutrénit, G. B., Learning and Knowledge Management in the Firm. From Knowledge Accumulation to Strategic Capabilities, Cheltenham, UK and Northampton, MA, USA: Edward Elgar, 1998; and (ix) Hobday, M., Innovation in East Asia: The Challenge to Japan, Aldershot: Edward Elgar, 1995.

⁸ See Possas (1993), *opere citato, supra* note 3.

legislation presents sometimes substantial differences, making comparisons difficult. In the case of less developed countries such as Brazil, the problem is increased by the different stages of technological and economical development⁹.

The early 1990s was marked by reforms. Broad opening of the market and the end of the era of protectionism, nullification of tax exemptions and reductions provided under different special import regimes and progressive reform of the import taxation system with reduction of aliquots. However, there was a lack of clear strategies for increasing the technological content of products.

During the post-opening period, there was an attempt to attract foreign investment through concession of tax incentives – although not well succeeded – in order to obtain funds directed to innovative activities. The first years of the 1990s was marked by strong macroeconomic instability. The Brazilian enterprises opted for defensive measures involving reduction of production costs, automation of the industry, organisational innovations of the labour process, reduction of personnel and elimination of production lines. If, at one side, these actions avoided loss of the industrial capacity, at the other side, there was a lack of interest of the industrial sector in investing and forming national and international alliances fetching for innovations. On the contrary to what happens in many developed countries, the Brazilian companies absorb a small percentage of researchers, which have to find workplaces preferably in universities and research institutions¹⁰.

Well-established regulatory mechanisms in the field of intellectual property rights are a necessary condition for creating an environment favourable to private appropriation of the investment in research and development. Since the 1990s, the entire Brazilian legislative structure in the field of intellectual property rights is undergoing significant changes, indicated in Table 1.

The eminent point is the conclusion of the revision of the Industrial Property Code (Law No. 5.772 of December 21, 1971) which, after passionate debate and intense dispute between Brazil and the United States regarding the question of pharmaceutical patents,

⁹ See: (i) Pavitt, K., Uses and Abuses of Patent Statistics. In: Van Raan, A. F. J. (ed.) Handbook of Quantitative Studies of Science and Technology. Amsterdam: North Holland, 1988; (ii) Griliches, Z., Patent Statistics as Economic Indicators: A Survey, Journal of Economic Literature, v. 28, 1990; (iii) Patel, P. and K. Pavitt, Patterns of Technological Activity: their Measurement and Interpretation, in Stoneman, P. (ed.) Handbook of the Economics of Innovation and Technological Change. Oxford: Blackwell, 1995; (iv) Levin, R.; A. Klevorick; R. Nelson; and S. Winter, Appropriating the Returns from Industrial Research and Development, Brookings papers on economic activity. Washington, v. 3, pp. 783–820, 1987; and (v) Albuquerque, E.M., Domestic Patents and Developing Countries: Arguments for Their Study and Data from Brazil (1980-1995), Research Policy vol. 29, pp. 1047-1060, 2000.

¹⁰ See Cassiolato & Lastres, *opere citato*, supra note 5.

resulted in the new Law No. 9.279 of May 14, 1996¹¹. The new Law follows the precepts of the Trade-Related Aspects of Intellectual Property Rights Including Counterfeit Goods (TRIPS) and, on the contrary to the former Code, does not incorporate anymore the character of not-patentable of “substances, material, blends or food products, chemical-pharmaceutical products and medicines of any kind, as well as the respective processes for their obtainment or modification”¹².

Other highly relevant measures were the approval of the Law for the Protection of Cultivars, Copyright Law and Computer Software Law. The trade-related agreements resulting from the Uruguay Round Agreements Act (GATT) were incorporated to the Brazilian legislation through decree No. 1.355, of December 30, 1994. Among those agreements, the TRIPS Agreement deserves to be especially emphasised.

Still pending is the Draft law about the protection of intellectual property of the topography of integrated circuits (DL No. 1787/96). Besides, the Southern Common Market (Mercosul) - is negotiating agreements for the harmonisation of intellectual property protection.

Table 1

Brazilian Intellectual Property Legislation: Recent Changes

References	Dispositions
Interim Measures	
Interim measure No. 2,186-11, of August 23, 2001	Regulates § 1 and § 4 of article 225 of the Constitution, the articles 1 and 8, sub-paragraph “j”, 10, sub-paragraph “c”, 15 and 16, paragraphs 3 and 4 of the Convention on Biological Diversity, disposes about the access to genetic property, protection and access to traditional knowledge, the partition of benefits and the access to technology as well as technology transfer for its conservation and use, among other provisions.
Laws	
Law No. 10.196 of February 14, 2001.	Amends and adds dispositions to law No. 9.279 of May 14, 1996, which stipulates the rights and obligations regarding industrial property among other provisions.
Law No. 9.610 of February 19, 1998. Copyright Law.	Amends, updates and consolidates the legislation about copyright and gives other provisions. This law is partially ruled by the decree No. 2.894 of December 22, 1998. See decree of March 13, 2001.

¹¹ For a review of the events, see Tachinardi, M.H., A Guerra das Patentes: O Conflito Brasil x USA sobre Propriedade Intelectual, 1993.

¹² See article 9 of law No. 5.772, of December 21, 1971.

Law No. 9.609 of February 19, 1998. Law for Computer Programs.	Disposes about the protection of intellectual property of computer programs, and their commercialisation, among other provisions. Ruled by decree No. 2.556 of March 20, 1998.
Law No. 9.456 of April 25, 1997. Law for the Protection of Cultivars.	Implements the Law for the Protection of Cultivars, among other provisions. Ruled by decree No. 2.366 of November 6, 1997.
Law No. 9.279 of May 14, 1996. Industrial Property Law.	Regulates the rights and obligations regarding industrial property. Ruled by decrees No. 2.533 of April 16, 1998 and No. 3.201 of October 6, 1999. Amended by law No. 10.196 of February 14, 2001.
Decrees	
Decree of March 13, 2001.	Constitutes the Interministerial Committee for the Combat of Piracy, among other provisions.
Decree No. 3.201 of October 6, 1999.	Disposes about compulsory licensing by the authorities in cases of national emergency and public interest as established by article 71 of law No. 9.279 of May 14, 1996.
Decree No. 2.894 of December 22, 1998.	Rules the issue and supply of labels or identification marks of phonograms and audiovisual works foreseen in article 113 of law No. 9.610, of February 19, 1998, which amends, updates and consolidates the legislation about copyrights, among other provisions.
Decree No. 2.556 of April 20, 1998.	Rules the registration foreseen in article 3 of law No. 9.609 of February 19, 1998, disposing about the protection of computer programs and their commercialisation, among other provisions.
Decree No. 2.553 of April 16, 1998.	Rules the articles 75, 88, 89, 90, 91, 92 and 93 of law No. 9.279, of May 14, 1996, ruling the rights and obligations related to industrial property.
Decree nº 2.519, of March 16, 1998.	Turns public the Convention on Biological Diversity, signed in Rio de Janeiro, on June 5, 1992.
Decree nº 2.366, of November 5, 1997.	Rules law No. 9.456 of April 25, 1997 establishing the protection of cultivars, disposing about the National Service for the Protection of Cultivars, among other provisions.
Decree nº 1.355, of December 30, 1994.	Incorporates the results of GATT.
Legislative Decree No. 30, of December 15, 1994.	Approves the Final Document of GATT, the list of Brazilian concessions in the field of taxation (List III) and in the service sector and the text of the Plurilateral Agreement about Meat. See decree No. 1.355 of December 30, 1994.
Implementing Orders	

Interministerial implementing order No. 47, of August 3, 2000.	Creates the Executive Committee of Electronic Commerce in order to act as communication channel between the Government and the production, trade and service sectors related to electronic commerce.
Implementing order No. 88, Ministry of Science and Technology, of April 23, 1998.	Disposes about the financial gains deriving from the exploitation of the results of intellectual creation protected by intellectual property rights of public servants working at organisms or entities pertaining to the Ministry of Science and Technology.
Implementing order No. 322, of April 16, 1998. Ministry of Education and Sport.	Establishes as an incentive participation of public servants in the financial gains resulting from the exploitation of the results of intellectual creation protected by intellectual property rights.
Implementing order No. 32 of March 1998.	Delegates competence to the President of the National Institute of Industrial Property to authorise the function "Industrial Property Agent".
Resolutions	
Resolution CG No. 2, of April 15, 1998.	Delegates competence to FAPESP to perform activities of filing domain names.
Resolution CG No. 1, of April 5, 1998.	Disposes about the filing of domain names.
Source: Own elaboration.	

Another noteworthy fact is the approval of the law of arbitration¹³ establishing a court following easier settlement of eventual controversies resulting from contracts for the exploitation of technologies.

The new legislation is contributing to a more trustful atmosphere for investors and inventors. It provides the opportunity of appropriation within the national territory equivalent to that on international level and inhibits or delays the entrance of competitors who, availing themselves of strategies that imitate successful processes, are able to lower their risk. The chemical and pharmaceutical industries appear especially sensible to patenting – the absence of legal protection inhibits investments in development and trade. However, it has to be clear that, in spite of providing a greater barrier for mobility, the strategy to prolong the competitive advantage through intellectual property protection mechanisms may fail. Substituting technologies may appear through the disclosure of protected knowledge. The contents of patents are divulged and subject of being used for the improvement of other techniques. This is the proper basis of the patent system. Although an imperfect instrument, it represents the best solution for the trade-off between providing incentives to the investments and stimulating the process of making the benefits of the new technologies available to society.

¹³ Law No. 9.301, of September 1996, disposing about arbitration.

The imperfections of the system include the uncertainty about which of the possible parts of inventions to be protected will in fact be protected, the future legal costs and the relative easiness (depending on the industrial sector) of inventing around¹⁴.

The updating of the intellectual property legislation in the country shall help to find a balance between the interests of those who perform a creative activity and the interests of the society. The aim is to provide proper protection for the invention and creativity of the Brazilian researcher, eliminating the chance of appropriation (legally explicit or implicit due to legal omission) of alien knowledge without remuneration for the inventor¹⁵.

The transfer of research results financed with public funds for exploitation by the private enterprise becomes increasingly more important for the economical development of the nations because the insertion of a new product or process in the market is part of the technological innovation cycle¹⁶. For Beier (1982)¹⁷:

"Experience teaches that an effective transfer of technology from the research laboratory to industry can be obtained only by an active and well organised patent and licensing policy. Even though it would appear to be appropriate to make available R+D results financed by the government to everyone, by means of scientific publications, special information systems, technology clearing houses, etc., this approach has not been successful in practice. The transfer of government-financed R+D results to industry has functioned satisfactorily only when the government or the research centre has acquired a patent which can be exploited, as in industry, by licensing agreements."

It is very unlikely that a firm should invest in the production and commercialisation of a product without having the knowledge inserted in the product or process legally protected.

¹⁴ See Scherer, F.M., New perspectives on economic growth and technological innovation, British-North American Committee & Brookings Institution Press, Washington, D.C., 1999.

¹⁵ See Scholze, S.H.C. & C.I. Chamas, Regulación de la Protección y la Transferencia de Tecnología, Revista de Economía Y Empresa, Vol. XII, N. 34, 3er Cuatrimestre, 1998.

¹⁶ Straus (2000), citing a research carried out by Narin, Hamilton & Olivastro, comments that between 1993 and 1994, 73% of scientific articles referred to in American patents came from public institutions. Only 27% came from the industry. Another study mentioned by the author and carried out by McMillan, Narin & Deeds, showed that out of 2.334 patents granted in 1997 to 119 American biotechnology companies, 71,6 of not patentable front-page references were originated in public academic institutions (universities, research-hospitals and research institutions). 11,9% showed joint efforts between public and private institutions and only 16,5% of articles had entirely private origin. These data are indicators for the intensive use of public science in research and industrial development. See Straus, J., Expert Opinion on the Introduction of a Grace Period in the European Patent Law, Munich: European Patent Organisation, 2000.

¹⁷ See Beier, F.K., Governmental Promotion of Innovation and the Patent System. International Review of Industrial Property and Copyright Law, May, 1982.

For , "once knowledge is available at no single cost, no firm has an incentive to acquire knowledge at any cost"¹⁸. For a future return of investments in research and development, a firm desires – and needs – protection against initiatives of third parties who intend to exploit inventions without due consent of the owners.

II. The Interest in Intellectual Property Rights

The reflections and discussions about the new Brazilian intellectual property legislation contributed to mature the judgement of different sectors of society regarding this issue. Especially as for to the industrial property law, for about ten years the discussions focused the interests of the pharmaceutical industry and were led by a few sectors of government and the industrial sector. As result of their own lack of information, universities and research institutions only took part timidly. The disputes on ideological level prevailed to the prejudice of debates about the bases, concepts and theories of intellectual property and the effects of the new legislation upon academic institutions. Different factors were responsible for the development of a deeper interest in the topic and the elaboration of a minimum agenda for studies: (i) increasing interchange with foreign institutions, especially with partial and full doctorate programs and the possibility of technical visits to the exterior; (ii) deeper interest of researchers in science and technology policies and management; (iii) diffusion in Brazil of well-succeeded experiences of patent management (Massachussets Institute of Technology (MIT) e British Technology Group (BTG), for instance); (iv) maturing of the national research in some areas, notably in biotechnology; (v) co-operation of companies and institutions generators of knowledge in search of higher competition standards as a result of the economic opening that took place in the second half of the nineties; (vi) diffusion on the Internet, fostering the interchange of information on inter-institutional level; (vii) increased number of publications in international periodicals relating the problematic of the protection and exploitation of intellectual property in academic environments; (viii) search for alternative financial resources for research and teaching activities; (ix) awareness of the fact that part of the research results obtained with public funds has not been not used to benefit society. The increase in the number of Brazilian scientific articles on international level without corresponding increase in the number of patents, on the contrary to what happens in a number of countries such as South Korea; (x) besides the economic value involved, participate as inventor in a patent is increasingly becoming a matter of prestige among researchers¹⁹ and (xi) the public discussion about the renewal of the legislation, which motivated subsequent studies.

¹⁸ See Soete & Weel, *supra* note 2.

¹⁹ As Sherman explains:

"For many years public sector research was evaluated and measured by reputation (peer review), by quantity, and by quality of publication. In recent years, however, the way research is evaluated has changed. In particular, we have witnessed the introduction of patents as a method of evaluating the output of researchers and research institutes. (...) Patents are increasingly being used (...) in terms of the revenue which they produce, as markers and indicators of research performance."

Previously occasionally considered a threat for the national interests, patents and other intangibles passed to be subject of academic works, bringing to the scientific sphere an issue formerly lacking analysis in the country.

The debate about intellectual property in the academic sector cannot be dissociated from the debate about use of public funds for research, about the forms of appropriation of results and the relationship between science and technological development.

Nowadays, the Brazilian government recognises the gap between academic research output and technological innovation. It is noteworthy that, between 1981 and 1998, the Brazilian scientific production increased by 365%. In the beginning of the 1980s, Brazil graduated a little more than 1,000 doctors per year. Today, it is 6,000 doctors per year, a number comparable to that in countries like China, Italy, Switzerland and Canada, according to data issued by the Brazilian Ministry of Science and Technology. This fact is the result of opting for investments in scientific capability²⁰. There are, however, difficulties in making the connection between science, technological development and the market. Intellectual property is an inseparable part of this set, constituting essential knowledge to overcome this gap.

Legal instruments allowing more consistent and wider protection of research results provide the necessary basis for qualitative and quantitative technological changes. Although having a solid research structure in biotechnology with institutions all over the country, there are little results with global impact. One notes that the discussions of the human cancer genome group are bringing new elements into the Brazilian reality. Andrew Simpson, co-ordinator of the project, points out: “ science is a highly competitive activity”. José Fernando Perez, scientific director of FAPESP – agency for the support of research of the State of São Paulo and one of the financing agencies of the human cancer genome project -, emphasises his concern with patent and license. Projects submitted to FAPESP for obtaining funds for the sequencing of other genomes should express the need for future patenting.

Now, we face different challenges: amplification of the investment capacity in academic projects of high impact and national and international socio-economic interest; elaboration of mechanisms for the integration of other regions of the country in the innovation network; co-operation between academic institutions and the enterprise; preparation of academic institutions for the protection and exploitation of intellectual property; local venture capital and interest of the industry for generating innovation.

See Sherman, B., *Governing Science: Patents and Public Sector Research in the United Kingdom*. *International Review of Industrial Property and Copyright Law*, January 1995.

²⁰ For an analysis of some previous Brazilian scientific policies, see Guimarães; Araújo & Erber, *A Política Científica e Tecnológica*, Rio de Janeiro: Jorge Zahar, 1985.

From a quantitative standpoint, it is necessary to intensify the investment in research, especially in the training of specialised personnel and in the creation of links between research centres and the industry. On federal level, one notes an increase in the percentage of investments in research and development through the implementation of Sectorial Funds for the support of technological development, that will allow financing strategic projects and sectors²¹ in Brazil. The funds will come in part from royalties, in part from taxes charged from privatised companies and some special sectors. The first of these funds, destined to the oil and gas sector, began to operate in 2000 and already applied US\$ 77 millions to research in this area. The resources are independent from the federal budget.

According to the Ministry of Science and Technology, the Sectorial Funds are not only aimed to increment the funds destined to R & D but to mobilise intensely the chain of production, knowledge and technological innovation, creating goods and services for the wellbeing of the Brazilian population. The total budget of the Ministry of Science and Technology for 2001 amounts in US\$ 876 million. The Sectorial Funds are responsible for 30% of this value, 62% higher than the budget for 2000. From 2000 to 2003, expenses for science and technology in turn of US\$ 8,65 billion, half of which coming from the federal budget are foreseen. In the next five years, the Sectorial Funds should bring revenues of US\$ 3 billion. Today the country spends 1,4% of its gross domestic product in science and technology. The goal is to achieve 2% in 2005. In Brazil, 70% of resources for research come from the government and the rest from the private enterprise.

At level of local states, one expects major interest of the foundations for the support of science through programs aimed at the solution of regional problems.

According to data of the National Council for Scientific-Technological Development (CNPq) - Brazil's principal funding agency for scientific-technological research, linked to the Ministry of Science and Technology -, in the case of the Brazilian Genome Project, the creation of networks reaching all regions of the country is foreseen. Investments will amount to approximately US\$ 13 million, half of these funds coming from the Ministry of Science and Technology and the rest from state governments, universities and the private enterprise. Emphasis will be given to the solution of typically Brazilian problems with potential impact upon the whole production chain, especially in the fields of health and agriculture. Defeat the regional disparities is a fundamental element for the increase of Brazil's competitiveness.

III. Grace Period

²¹ Electricity; hydrography, limnology, hydrology and climatology; interaction university-enterprise to foster innovation; mineral sector, space sector and transports sector; implantation and recovery of the research infrastructure - facilities and equipment - at public institutions of university-level teaching; oil and natural gas; information science and automatisation; telecommunications. The creation of other funds is foreseen: health, agrobusiness, aeronautics and biotechnology.

The recent Brazilian legislation incorporates the concept of grace period.. It is established by the law²² that regulates the rights and obligations regarding industrial property:

"The disclosure of an invention or utility model occurring during the 12 (twelve) months preceding the filing date, or priority date, of the application shall not be considered to be comprised in the state of the art if made: I - by the inventor; II - by the Brazilian Patent and Trademark Office, through official publication of an application filed without consent of the inventor, based on information obtained from the inventor or as a result of his acts; or III - by third parties on the basis of information obtained directly or indirectly from the inventor or as result of his acts. Sole paragraph - The Brazilian Patent and Trademark Office may require from the inventor a statement relating to the disclosure, accompanied or not by proof, under the conditions established in the regulations."

In case of disclosures before the filing of the patent application, it still available to the Brazilian inventors to obtain the benefit. As of the disclosure date there are twelve months to file the patent application at the Brazilian Patent and Trademark Office. Such provision grants competitive advantage to Brazil face to some other countries that do not allow patenting after invention disclosure²³. This is the case of the most of European countries. Although Brazil admits the so-called grace period, the benefit to the inventor (specially the academic inventor) is geographically limited as many other countries have no such flexibility.

The preceding Brazilian legislation²⁴ was also attractive in the cases which was intended to demonstrate, to communicate to scientific entities or to display the inventions at official or official recognized events²⁵. In these cases it was always possible to file a "priority patent application". To file the application it was needed a descriptive report and eventually some drawings. In the case of inventions the applicant could postpone during one year the filing of the patent application before the governmental authority for industrial property.

To utility models, industrial models and industrial designs, six months were the time limit. Nevertheless the priority date was fixed as of the date of the filing of the priority application. The great advantage was the possibility of at first writing a simplified report. After six or twelve months according to the case and if no final patent application was provided the information fall into the public domain²⁶.

²²See article 12 of law No. 9.279, of May 14, 1996.

²³ For a comprehensive review on the state of the art of grace period, see Straus, J., Grace Period and the European and International Patent Law: Analysis of Key Legal and Socio-Economic Aspects, München: Beck, 2001.

²⁴ See Industrial Property Code, law No. 5.772, of December 21, 1971.

²⁵ Article 7, of law No. 5.772, of December 21, 1971.

²⁶Article 8, of law No. 5.772, of December 21, 1971.

It seems a measure of great relevance to the patenting of academic inventions the adoption of a grace period. It should be considered an essential element to the wording of patent laws taking into account the permanence of the first-to-file system²⁷. However it always wise to remind that it is better to respect the regular patent application filing dates instead of losing the opportunity of obtaining global patent protection²⁸.

IV. Ownership

Based on sub-paragraph XXIX of article 5 of the Constitution of 1988 of the Brazilian Federal Republic, article 6 of law No. 9.279/96 grants to the author of an invention or utility model the right to obtain a patent. Ownership of industrial creations made by employees, freelancers or trainees is regulated by the Industrial Property law (articles 88, 90, 91, 92 and 93). The law seeks to solve the conflict between the power of the employer and the legitimate interest of the employee.

Thus, in the light of Brazilian law, there are three types of inventions (and utility models as well):

Invention of a service. Developed by the employee, as foreseen in the working agreement or in case of being a natural consequence of the contract. Belongs exclusively to the employer. Save contractual conditions to the contrary, the salary and other obligations of the employer are the expected retributions. The employer may offer to the employed inventor participation in the revenues obtained with the commercial exploitation of the patent. This benefit may derive from negotiations between the interested parties or from the regulations of the employing organisation. The participation, however, will not be integrated to the earnings of the employee.

Mixed invention. In case of personal effort of the employee to develop the invention associated to the use of resources and/or facilities of the employer, there will be co-ownership of the patent. Equal parts will pertain to employer and employee save contractual agreements to the contrary. The exclusivity of exploitation of the invention is granted to the employer. In case of absence of an agreement between the parties, the patent has to be exploited economically within one year after having been granted. In case of lack of exploitation by the employer, the employee may detain the exclusive patent rights save "lack of exploitation due to superior force".

²⁷In Germany, the Ministry of Education and Science defends the future adoption of a grace period in the German patent law in order to value the academic inventions.

²⁸ See the Cohen-Boyer invention case. After inventing the gene splicing DNA cloning technique they published a paper which invalidated the patenting in many countries. It is estimated that they could be US\$ 20,000,000 richer if this mistake was avoided. See also Straus, J., Current Issues in Patenting Research Results Close to Industrial Application, In Max-Planck-Gesellschaft, European Research Structures - Changes and Challenges: The Role and Function of Intellectual Property Rights, Ringberg Castle, Tegernsee, 1994.

Free invention. In case the invention was developed independently from the working agreement and no resources or facilities of the employer have been used, the employee is exclusive donor of his invention.

It has to be pointed out that the above-mentioned are generalised situations and grey zones may appear. A service agreement, for example, may foresee the development of free inventions, allowing the employer to appropriate them. Thus, specific cases deserve a detailed characterisation of the development of the industrial creation and an analysis of the contractual conditions and other documents, of the norms and regulations of the employing entity and still, occasionally, hearing of testimonies²⁹.

Universities and research institutions are employers; researchers and professors under contract are employees. The type of each invention developed within the academic environment has to be established case to case. In most of cases, we are speaking about invention in service; in some cases, there may exist significant effort of the inventor, who in this case will participate in the exploitation of the patent. For the case of invention in service, universities and research institutions are responsible for patent prosecution; the inventor is entitled to part of the revenues, as we will see ahead. In situations of co-property, an agreement between the parties will be necessary. The same applies to contracted research and companies involved. In view of all this, it is prudent and necessary to previously regulate the relationship between the parties.

V. Financial Incentives for the Researcher

According to article 93 of law No. 9.279, to inventors, employees of the public service, of foundations, federal-, state- or municipal entities, falls remuneration equal to the part of the advantages raised by the application or patent, as an incentive. The entity itself is in charge of elaborating its own regulations as refers to the form and conditions of such. The articles 88, 89, 90, 91, 92 and 93 of Industrial Property Law are ruled by decree No. 2.553, of April 16, 1998. Table 2 shows the principal measures established in the articles 3, 4 and 5.

These general measures follow examples adopted in other countries and institutions such as not incorporate the incentive to the earnings and preview the ownership in the working agreement. Many universities and public research institutes, however, still ignore the existence of this decree and have not adapted their statutes to the new requirements.

Table 2

Decree No. 2.553: Relevant Measures

²⁹ See Carvalho, N.T.P., Os Inventos de Empregados na Nova Lei de Patentes, Revista da ABPI, n° 23, julho/agosto, 1996.

The employee of the public service who develops an invention, improvement or utility model and industrial design is entitled to a bonus.
The bonus will be calculated according to the value of advantages obtained by the entity with the exploitation of industrial property rights.
The public entities shall amend their internal statutes in order to define the conditions for payment of this bonus.
The bonus can not exceed one third of the value of the economic advantages obtained by the entity through the exploitation of industrial property rights.
The bonus will not be incorporated to the salary of the professionals.
The ownership of the intellectual creations as well as the participation of the creators shall be defined in the working agreements.
Source: Own elaboration.

VI. The Regulation of Intellectual Property at the Ministry of Science and Technology and the Ministry of Education and Sport

At the time the decree n° 2.553 was signed, the Ministry of Science and Technology (MCT) elaborated the implementing order MCT n° 88, of April 23, 1998, and the Ministry of Education and Sport (MEC), the implementing order n° 322, of April 16, 1998. Both of them discipline in a similar way the repartition of the revenues resulting from the exploitation of intellectual property developed at organs of the MCT and MEC. This measure does not only affect universities and research units of the Ministry but also the beneficiaries of financial support and grants from organs and entities linked to these Ministries (see Table 3). Such as decree No. 2.553, the implementing orders are extremely significant for being novel instruments at the national panorama, intended to benefit institutions and researchers. For a better efficiency, however, these dispositions should be accompanied by a parallel and complementary mechanism: The implementation of a national program for structuring intellectual property in the academic environment.

The implementing orders demand that the financial revenues should be shared and that the contracts include confidentiality clauses and define the ownership. Basic condition for this is the existence of an informed environment, prepared for implementing these measures. On the contrary, however, many institutions ignore the existence of these implementing orders and affirm not to dispose of technical knowledge to deal with this matter, nor of personnel qualified to do so. A survey carried out by Chamas (2001) with the directors of the 20 principal Brazilian universities showed that only 45% took knowledge of the implementing order MEC No. 322. 30% of universities established policies for the protection and commercialisation of intellectual property.

Table 3

Implementing Orders MCT no. 88 and MEC no. 322: Relevant Measures

The revenues resulting from the exploitation of intellectual property rights will be shared as an incentive in equal parts among:
(i) the organ of the MCT/MEC owner of the intellectual property rights, responsible for the activities, from which the intellectual creation resulted;
(ii) the unit of the organ of MCT/MEC where the activities which resulted in the intellectual property rights were carried out; and
(iii) the professional of the organ of the MCT/MEC, author of the intellectual creation.
Having more than one organ, unit or professional, equal shares will be given to all, save other previous adjustments.
The participation to be paid to the professional during the whole term of the protection is understood as incentive and will not incorporate to his earnings.
The incentive will be paid with the same periodicity the profits are received by the MCT/MEC.
The expenses resulting from the protection of the intellectual creation as well as administrative and judicial expenses will be deduced from the total profit to be shared.
Confidentiality clauses, ownership and the financial participation of the creators shall be established in contracts.
Financial support and grants given by organs and entities of MCT/MEC are subject to the same measures as refers to beneficiaries, otherwise the benefit shall be cancelled.
Source: Own elaboration.

Some institutions, especially in the south and south-east of the country, employ efforts to establish intellectual property offices. However, in the absence of a governmental policy towards democratisation of information, training of personnel and investments in this new line of activity, the original intent of the legislator may not be achieved and the regional inequities will come up in one more field of knowledge. The greater part of universities has no instruments for the detection of intellectual creations susceptible to legal protection (invention disclosure reports, for example). Besides, article 9 of the implementing orders No. 88 and No. 322 establishes that “financial support and grants given by organs of the MCT/MEC are conditioned to the observance if this orders by the benefited physical and juridical persons, otherwise they shall be cancelled. How will this be controlled? No cancellation of a contract due to non-observance of this article is known at the governmental sphere. The policy of giving one third of the revenues as an incentive is questionable. A floating percentage corresponding to the amount of advantages might be more attractive. The percentage destined to the inventors could decrease to the degree the profits increase.

VI. University Patenting

Table 4 shows the profile of patents granted to Brazilian residents by the National Institute of Intellectual Property (INPI) and the United States Patent and Trademark Office (USPTO), in the period 1980-1995. The annual medium participation of individual inventors, Brazilian residents, in the number of patents granted by the INPI is of 35,55%, a

rate higher than that presented by the developed countries. In the number of patents granted by the USPTO to Brazilian individual inventors, we achieve a little more than 39,1%.

The higher number of individual inventors may be explained in three ways: (i) according to the theory established by Penrose³⁰, less developed countries present a higher number of patents granted to individual inventors; (ii) the existence of individual patenting of inventions financed with public resources and (iii) a reasonable number of patents of autonomous enterprises (Albuquerque, 2000)³¹.

Table 4

Patents granted by INPI and USPTO to Brazilian Residents(1980-1995)

Ownership	INPI	USPTO
Individual inventors	2954	186
Companies with local capital	3244	178
Companies with foreign capital	1139	29
Governmental firms	688	81
Universities and Research Institutions	239	1
Governmental Agencies	22	-
Other	23	-

Source: Albuquerque, 2000.

In fact, a great number of inventions made in Brazilian universities was patented directly by the researchers without the university involvement would have taken knowledge or demonstrated interest in participating in the process. Some researchers elected the university as co-owner. Without questioning the technological and economical value of these inventions, it can be stated that these patents were not filed in the United States or in Europe due to a lack of capital and little orientation regarding the necessary paperwork. A number of applications filed in Brazil by university researchers and professors were not granted, not always because they were not patentable but because deadlines and

³⁰See Penrose, E.T., *The Economics of the International Patent System*, Baltimore, MD, John Hopkins University Press, 1951.

³¹ For a review employee inventions issues, see also: (i) Neumeyer, F., *Employees' Rights in Their Inventions, A Comparison of National Laws*. *International Labour Review*, v. LXXXIII, n. 1, January, 1961; (ii) Baker, M.B. & Brunel, A.J., *Restructuring the Judicial Evaluation of Employed Inventors' Rights*. *35 St. Louis U.L.J.*, 399, 1991.; (iii) Ubertazzi, L.C., *Die Zuordnung von Arbeitnehmererfindungen im italienischen Recht, Gewerblicher Rechtsschutz und Urheberrecht, Internationaler Teil*, München, 1979.; and (iv) Wotherspoon, K.R., *Employee Inventions Revisited*, *22 Industrial L.J.*, 119, 1993.

requirements established by the INPI had not been observed. Another item shown in Table 4 is the low participation of universities and research institutions: 2,9% from the total of patents granted by INPI and 0,2% in the case of USPTO. A search in the patent bank of USPTO resulted in one single university patent in the period: US US5021397: Synthesis of ceramic superconductor CPO from xenotime, filed by Pirelli S.A., University de São Carlos e University of São Paulo³². The same invention was patented in Europe and in Japan: (i) EP464965B1: Synthesis of superconductors from xenotime³³ (Switzerland, Germany, Spain, France, United Kingdom, Greece, Italy, Liechtenstein, Holland e Sweden) and (ii) JP2074525A2: Synthesis of Superconductive Material³⁴. The priority patent is BR8707200A: Síntese de Supercondutores a Partir da Xenotima³⁵. This is probably the first Brazilian invention made in a university with patents granted abroad. No records of an earlier patent with participation of a Brazilian university were found in the United States, Europe or Japan. According to information of one of the inventors, researcher at the University of São Carlos, none of the patents of the same family was exploited commercially. From 1990 to 1999, 355 patent applications coming from Brazilian universities were filed at the National Institute of Intellectual Property. From the 355 patent applications, 338 (95,2%) came from universities; 4,8% came from isolated university-level teaching institutions (see Table 5). 90% of the applications refer to inventions and 10% to utility models. 84,8% have a single owner, 15,2% share the ownership with other institutions or companies. Among the applications with more than one owner, 74% are in cooperation with public institutions. Only 14 applications (26%) refer to projects in collaboration with companies. This percentage indicates once more the lack of efforts from the private enterprise towards cooperative innovation activities. During the 1990-1995 period, we observe a decline in the number of applications. 1996 and 1997 the number of applications increased with the implementation of the new Industrial Property Law, amplifying the areas liable to patent protection (pharmaceutical, biotechnology and foods).

Table 5

Patent Applications Filed by Universities at the INPI(1990-1999)

Year	Number of Applications
1990	35
1991	32
1992	23
1993	31
1994	21
1995	19

³²Filed on December 23, 1988 and granted on June 4, 1991.

³³Filed on December 23, 1998 and granted on February 28, 1996.

³⁴Filed on December 23, 1998 and granted on March 14, 1990.

³⁵Filed on December 23, 1998 and granted on July 30, 1996.

1996	26
1997	63
1998	49
1999	51
Source: Assumpção (2000) ³⁶	

67,6% of applications came from 3 universities: the State University of Campinas – UNICAMP (35,2%), São Paulo University – USP (21,4%) and Federal University of Minas Gerais – UFMG (11,0%) (Table 6). These 3 universities count on offices for the protection of intellectual property, assisting them in the regular filing and the necessary follow-up of patent applications, thus avoiding losses resulting from administrative failures.

Table 6

Patent Applications: UNICAMP, USP, and UFMG(1990-1999)

Institution	Invention		Utility Model		Total	
	Number	%	Number	%	Number	%
UNICAMP	119	38,8	6	12,5	125	35,2
USP	68	22,1	8	16,7	76	21,4
UFMG	23	7,5	16	33,3	39	11,0
Other	97	31,6	18	37,5	115	32,4
Total	307	100	48	100	355	100
Source: Adapted from Assumpção (2000)						

VII. The Organisation of Offices of Intellectual Property at Brazilian Universities

At 20 of the principal Brazilian universities, 45% were found to have Offices for Intellectual Property (OIPs). The remaining 55% intend to establish OIPs (Chamas, 2001).

Three main obstacles for the set-up of services for the protection and economic exploitation of intellectual property rights were detected: lack of financial resources, cited by 53% of universities, lack of qualified personnel, in 60%, and lack of technical knowledge, in 86,7% of universities. The problems become even worse, when expenses such as those involved in contracting lawyers-offices and payment of the fees for patent filing and maintenance, especially in foreign countries, have to be faced. Some of the institutions also mentioned internal problems, in special related to their juridical departments, which do not show great interested in this issue. There were also problems with the National Institute of Industrial Property, especially as regards to the time lag between filing and the concession of the

³⁶ See

Assumpção, E., O Sistema de Patentes e as Universidades Brasileiras nos Anos 90, Rio de Janeiro: INPI, 2000.

patent. In the interviews, we also evaluated the lack of expertise in the commercialisation of technologies. The lack of intimacy of the academic environment with the business world leads to some problems: (i) slowness in the process of searching for partners and licensees; (ii) difficulties in negotiating royalties, up-front payments and milestones; (iii) waste of opportunities due to wrong evaluation of the potential of technologies, missing to file patents in foreign countries, restricting them to the internal market; (iv) difficulty to negotiate technologies on international level and (v) prolonged maintenance of many patents without perspective for exploitation.

The effort of Brazilian universities to organise themselves towards protection and exploitation their creations is evident. Although the debate and interest for intellectual property surged slowly, the legal barriers are being removed gradually and an atmosphere receptive for this new activity is being created. The academic scenery shows a local increase in the number of OIPs, strongly linked to the regions South and Southeast. At all interviewed institutions, the OIPs are organised in the traditional form, linked to some organ of the presidency or rectorate, or even to the central authority. They assimilate strongly a tradition of institutional administration, given that their professionals are basically staff-members, only occasionally counting on the participation of grant-holders or consultants. The OIPs, however, need to develop their own capacity and ability to deal with the business environment. In the near future, this will be one of the biggest challenges for their success. The greatest challenge of all is to develop and internalise an intellectual property culture – agile, dynamic, efficient and with a clear goal – within a culture of public administration, used to other priorities and with a different timing in its decision-making. In Brazil, the financial results of the OIPs are still not expressive and will have to be evaluated within a greater space of time. Rare are technology firms forming them around the universities, employed in exploiting their intellectual property. On the other hand, no Brazilian university has offered programs to establish and participate as share holders in corporations (no even by way of university foundations).

VIII. Brazil Proposes Law for Technological Innovation

During the I National Conference on Science, Technology and Innovation held in Brasilia from September 18 to 21, 2001, the Brazilian Minister of Science and Technology presented a draft law, establishing measures aimed to encourage research and technological innovation.

The new initiative aims to garnish the federal scientific and technological institutions, presently suffering from restrictions hampering them to hire researchers with more flexibility. The possibility of competitive examinations for public servants is not being eliminated as an option but more agile mechanisms for time-limited contracts and immediate filling of vacant jobs are being established.

A two-year's special permission, with the possibility of renewal for more two years, is planned for researchers pertaining to scientific institutions, to allow them to cooperate with

technology based companies. The measure is aimed at the production of goods directly originated in the researcher's invent. During the time of his absence, the researcher's seniority, wages and fringe benefits will be granted as if he were serving at his institution of origin. The researcher will also be allowed a leave of absence for participating in the constitution of a technology-based company.

Each institution should maintain a technological innovation centre of it's own or in co-operation with third parties, in order to guarantee the management of it's innovation and technology transfer policy as well as the promotion, protection and economic exploitation of it's intellectual property.

Encouragement of the independent inventor also makes part of the new policy. His invention and patent request can be evaluated by the technological innovation centre and make part of the portfolio of institutional projects destined to future industrialisation.

Strategic alliances between scientific and technological institutions, companies supported by governmental programs and technology-based companies shall be supported with the aim to create innovating products and processes. Governmental resources, financial, human and of basic structure, shall be allocated for research activities of pre-competitive nature. Creation and management of technology companies shall be prioritised. The Union may hire companies for developing research and development activities with high technological risk.

IX. Final Considerations

The new intellectual property legislation requires not only a national program allowing capacity building in the field of intellectual property, but also intensified efforts towards technological development and policies in support of scientific-technological and industrial integration. Changes in the regulations will be necessary to stimulate the adoption of new mechanisms for the commercial exploitation of research results obtained with public funds, including hazardous contracts, constitution of companies by university researchers, joint ventures and foreign investment.

The debate around use of public resources for research, obviously not only of interest for the public sector but also for the industry and the service sector, is taking place late in Brazil. This is for sure a consequence of the development pattern adopted by the country in the course of the last five decades. However, the question must be examined at this very moment, when the Brazilian industry needs to make use of research and technology to conquer and maintain positions at highly competitive markets. It is necessary to create an favourable atmosphere for innovation, so that companies invest more in research and development and universities and research institutions contribute to this process through the training of personnel and research of interest for the society.