



RESEARCH

## Intellectual Property: Element of Economic Development

Propriedade Intelectual: Elemento de Desenvolvimento Econômico

Propiedad intelectual: Elemento de Desarrollo Económico

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### ABSTRACT

The study's purpose has been to consider the importance of academic research to promote technological development. It is based on Brazilian and international literature and data collected from international Universities, in order to compare them and understand how research and development are important to implement technological progress. It is to be considered that the academy plays an important role in this procedure if it has the necessary autonomy and freedom to implement research. In this sense, data were collected in intellectual property offices, it is worth mentioning the *Instituto Nacional da Propriedade Industrial (INPI)* [National Institute of Industrial Property] and United States Patent and Trademark Office (USPTO), European Patent Office (EPO) and the China National Intellectual Property Administration (CNIPA) Trademark Office.

**Keywords:** University, Research, Development, Technology.

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## RESUMO

O presente artigo aborda a importância da pesquisa acadêmica no processo de desenvolvimento da tecnologia. Com base em doutrina nacional e estrangeira, além de dados coletados em universidades internacionais, foi possível elaborar um quadro de como se procede a pesquisa, que acaba por fomentar o avanço tecnológico. Neste diapasão, deve-se ter em mente que a Academia tem um papel vital e esta por seu turno depende da necessária autonomia e liberdades de empreender para viabilizar a construção do conhecimento. Nesse sentido foram coletados dados em escritórios de propriedade intelectual, valendo destacar o Instituto Nacional da Propriedade Industrial (INPI/BR) e o Escritório de Patentes dos Estados Unidos da América (USPTO), do Escritório Europeu de Patentes (EPO) e do Escritório de Patentes da China (SIPO).

**Palavras-chave:** Universidade, Pesquisa, Desenvolvimento, Tecnologia.

## RESUMEN

El propósito del estudio ha sido considerar la importancia de la investigación académica para promover el desarrollo tecnológico. Basado en la doctrina nacional y extranjera, además de los datos recopilados en universidades internacionales, fue posible elaborar una imagen de cómo procede la investigación, lo que termina promoviendo el avance tecnológico. En este contexto, debe tenerse en cuenta que la Academia tiene un papel vital y esto a su vez depende de la autonomía y las libertades necesarias para permitir la construcción del conocimiento. En este sentido, los datos se recopilaron en las oficinas de propiedad intelectual, incluido el *Instituto Nacional da Propriedade Industrial (INPI)* [Instituto Nacional de Propiedad Industrial] y la Oficina de Patentes de los Estados Unidos, la Oficina Europea de Patentes y la Oficina de Patentes de China.

**Palabras clave:** Universidad, Investigación, Desarrollo, Tecnología.

## INTRODUCTION

Intellectual property can play an important role in fostering economic development. For this purpose, information element should be sought in its institutes and not a mere system of standards that aims at the establishment of an exclusivity regime, constituting a mere notary segment, that aims to grant real rights to the users of the system. The scope of this branch of law is not restricted to its administrative aspects, but constitutes an element of analysis and study for the elaboration of public policies, by other state and private actors, who can understand the quality of the available information and thus use them as innovative factor in the production process and service delivery.

The present work intends to analyze the available information of the intellectual property system, limiting to this aspect its approach, to avoid the examination of the administrative procedure related to the granting of rights, which is a linked administrative activity, therefore, limited, with regards to in its discretion, to the legal dictates in force. Thus, the objective of this approach is to discuss which data can be extracted from that related administrative activity and which can, in a more discretionary space, implement economic development policies. This understanding seems to have a special dimension, given the known shortcomings

in Brazil regarding national patent application filings. On the other hand, the understanding of this lack, whose origins and causes are complex and derive from the precariousness of policies that favor innovation in the education environment, imposes the adoption of other conducts, provided they are implemented concurrently with the promotion of Research and Development (R&D) within universities, whether public or private. It is one of the elements that make up higher education, namely: teaching, extension and research.

Thus, the analysis of the potential of technological information and how it is obtained is the object of reflection. The question is, how can this move from being a mere statistical data, which is constant in global publications, to become a generating element of innovation policy, not to resurrecting models derived from the era of the Industrial Revolution or immediately after World War II. We seek to understand the ability to understand this information, within the framework of the so-called Knowledge Revolution, which promotes economic development on the one hand and minimizes environmental impacts, to guarantee the quality of life of human beings, because of the perverse effects of ecosystem degradation, already well known.

For this purpose, it starts from fundamental concepts of Intellectual Property Law, within the scope of patents, as well as an approach of statistical data released, starting with those provided by the *Instituto Nacional da Propriedade Industrial (INPI)* [National Institute of Industrial Property] and then those disclosed by the United States Patent and Trademark Office (USPTO), the European Patent Office (EPO) and the State Intellectual Property Office of China (SIPO).

The choice of these foreign offices was due to the importance they play in the international scenario and the number of patent filings and the main question of the present study, due to the usefulness that can be extracted from this data to implement measures capable of boosting the Brazilian development. Thus, the question is whether the global patent system is a monopoly element or contains information that can foster sustainable growth, provided it is properly interpreted and used.

### 1 – Preliminary Approach

The intellectual property system, resulting from patent protection, is a tool for fostering economic development, provided that the interested party has the proper interest in interpreting and understanding its operation. This is an indispensable requirement in so far as it presupposes a privilege assumption, but it opens up possibilities, provided it is properly manipulated. Exactly, this is the focus that will be given in this presentation.

Understanding intellectual property institutes requires an approach to the two main international conventions that concern the subject. This is an indispensable examination

for understanding the possibilities offered by the system, for those who have an understanding of its operation and go for an examination devoid of established prejudices. Conventions to be addressed will be the Paris Union Convention for the Protection of Industrial Property (CUP) in 1883, and the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS) in 1994.

The starting point to focus on is the change in behavioral patterns stems from new standards of intellectual property protection. Where once there was greater freedom, today there is a greater constraint, with the perception of the expressive value of intangibles of this nature. Beyond this point, there is a perfect understanding of the need to hold technological knowledge to obtain a significant advantage in international trade.

## 2. Technology

All of these concepts go through the examination of the importance of technology as an element of fostering economic development. It constitutes an inclusion factor, but it depends on an understanding of its functioning to make it possible to take advantage of the opportunities generated. Olivier Blanchard<sup>1</sup> observes that the state of technology is determined by the products that can be extracted from the economy, including the organization of business companies as regards their suitability to the legal system of a particular state. This understanding depends on an analysis of the imperfections or failures of the capital market, which eventually provides a competitive advantage for those large actors in obtaining R&D<sup>2</sup> project financing.

Technology should be understood as a comprehension process. When faced with a new modality, having this knowledge means recognizing the capacity of its implementation, in the best possible way, optimizing costs, in search of a better financial result. This knowledge is very present in China, as noted by Tomasz Dyczkowski<sup>3</sup>:

This fascination in technology and conviction that technology is a panacea for any problem seems to stem from the fact that the Chinese society made a jump over the technological revolution. When in Europe products employing certain technologies were first adjusted then improved and finally – when obsolete – replaced by next models, in China the most recent technology may be the first in use, and the technological advance is therefore more visible. The other factor that contributes to the described situation is a global transfer of

production to China. If the vast majority of electronic devices is produced in China, then such offer must be dominant in this business culture. In European business style, where key resource is information and resource in scarce is time, young entrepreneurs offer either information services (T.O.B. or Unity iNews) or pay attention to organising free time (Cultural Olympics, Cultural Interacting Fun).

Technology plays a role in opening new frontiers, challenges that are overcome in the relentless pursuit of solving the difficulties posed, including the pursuit of control of an increasingly valued asset of archived data. The dispute over 5G technology in data transmission involves the perception that the storage of personal data ensures control of increasingly important strategic information in a range of activities of economic value. The strategic nature of this issue is verified by the development policy implemented by South Korea, with private investments, until 2023, of the US \$ 20 billion<sup>4</sup>.

The understanding of the 5G technology tools were the object of analysis by Cicinatti University professors<sup>5</sup>:

The society of 2020 will be a connected society. The IoT together with intelligent and integrated sensor systems and in-home sensor networks will change the way people lead their lives. “Smart living” people will require constant and ubiquitous mobile connectivity to the network to upload their activity data and IoT control commands, thus generating a “massive reporting” uplink data flow. Massive machine to machine communication and critical machine to machine communication will play pivotal roles in service delivery and industry operations.

Vehicular Ad-hoc Networks (VANETs) are constantly advancing. By 2020, VANETs integrated with cellular networks will be in operation as VANET cloud, leading to a smarter and safer transportation system.

When the number of devices connected to the Internet passes tens or hundreds of billions in the coming decade, the offloading of networked data on unlicensed bands will play a critical role in network load balancing, providing guaranteed bit rate services and a reduction in signalling control. Hence, it is important that 5G will provide seamless compatibility with dense heterogeneous networks to satisfy the high demand of real-time traffic, so that end users will experience smooth connectivity to the network.

<sup>1</sup> Blanchard, Olivier. *Macroeconomia*, pág. 197

<sup>2</sup> Kupfer, David. *Economia Industrial*, pág. 140

<sup>3</sup> Dyczkowski, Tomasz. *Discovering the entrepreneurial potential in differences between Europe and China*, pg. 38

<sup>4</sup> <https://www.lifewire.com/5g-south-korea-4583813>, acesso em 14.06.2019

<sup>5</sup> Mitrar Rupendra. *5G mobile technology: A survey*, pg. 133

As can be seen, the challenge of new technology is not a futuristic vision, but rather the direct consequence of technological evolution, where automation becomes present, as well as the use of the so-called Artificial Intelligence, creates new challenges to the law, all this under the 4<sup>th</sup> industrial revolution. Controlling this technological information will be a key part in international negotiations regarding foreign trade, as evidenced by several recently published journalistic articles.

In this field, knowledge has to be held, through the technological process it assumes capital importance, when verified the economic development of societies. The economic evolution of nations has already had an important milestone in the industrial revolution, where the accelerated process of industrialization was carried out, and today this phase has been supplanted by the knowledge revolution.

Intellectual property, through its protective elements, constitutes one of its diffusion elements. The addition and accumulation of this knowledge serve as the driving force for its constant improvement<sup>6</sup>. In this tuning fork, it must be noted that technology, nowadays, constitutes an important good, an object of commercialization, and this value is added by sophistication, far surpassing that of commodities, and considering the absence of environmental impacts.

Denis Borges Barbosa, describing the increments used by technology, reports that Japan, in its economic development process, made use of technology, copying available products, to improve them and thus develop them, as a basis for the creation and sustaining their economic development. The level of intellectual property protection, when technology transfer, has an impact on the field of direct investments in this segment. As a result, weakness in this sector is concentrated in countries that take them through licensing through their importation. In turn, those with technological knowledge are more likely to license them in those countries with the highest standards of intellectual property protection<sup>7</sup>. For its part, the patent system can be seen as an efficient system for the promotion of technology, if there is any scientific and technological development<sup>8</sup>, and it cannot pass in albis that Brazil already has expertise in several of these, such as in the exploration of oil in depths and Research Institutes such as Farmanguinhos, Butantã among others. This understanding is defended by Robert Sherwood, who states that the increased investments in technology is based on the improvement and enhancement of intellectual property protection systems<sup>9</sup>.

On the other hand, these rights must be subordinated to the public interest, and it is true that in the case of patents, one of the most traditional forms of restriction of these rights is compulsory licensing, an institute found in the vast majority of patent laws, as an element to curb the abuse of economic power, resulting from the position of privilege and monopoly deriving from the protection afforded by the Law. The TRIPS enshrines the possibility of compulsory licensing, as, incidentally, an analogous precept is contained in Law No. 9279/96. Based on the recognition by the United Nations that access to medicines is an inherent right of human beings, as well as the difficulties experienced by several African countries in acquiring these products, a dispute has been settled between consumers and pharmaceutical companies<sup>10</sup>. In the face of this conflict, added to the terrorist attacks of September 11<sup>th</sup>, 2001 and the subsequent spread of the Antrax, the Doha Round, promoted by the World Trade Organization, took place. The difficulties arising from the compulsory licensing and the inability of the local industry to manufacture certain products were observed, opening up the possibility that they may be imported, and this prerogative is granted to the countries with the least economic development. To this end, the TRIPS Board shall be notified<sup>11</sup>.

Technology must be viewed in many ways and the participation of universities and research centers in its promotion is not negligible. This, however, is not enough if there is no efficient system of its protection. In this sense, it must be taken into account that the field of technology protection, through the patent system, obeys the principle of territoriality.

Territoriality means recognizing that patent protection is restricted to the country in which it is granted. Under the principle of absolute novelty, anything that has been disclosed on the date before the filing of a patent application constitutes an obstacle to the grant of protection. For its part, the concept of absolute novelty finds no limits to the territory in which patent protection is sought. This has several exceptions, the best known being the principle of unionist priority, which gives an application filed in a member country of the Paris Union Convention a period of 12 months to deposit it in any Member State, with the date of the first filing for novelty purposes<sup>12</sup>.

Thus, there is no need to speak of an international patent, and the lack of protection in the Brazilian territory entails

<sup>6</sup> Anderson, Robert. Intellectual Property, Technology Diffusion and Growth, p. 71

<sup>7</sup> Correa, Carlos M. Intellectual Property Rights, the WTO and Developing Countries, p. 30

<sup>8</sup> Correa, Carlos M. op. cit, p. 39

<sup>9</sup> Guisse, Monica Steffen. Propriedade Intelectual no Mundo Contemporâneo: Fomento ao Desenvolvimento, p. 4

<sup>10</sup> Sichel, Ricardo Luiz. Das Gemeinschaftspatentübereinkommen und TRIPS, p. 99

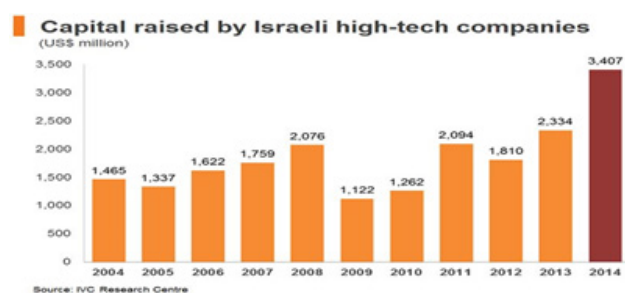
<sup>11</sup> Amaral Jr., Alberto. Licença Compulsória e Acesso a Medicamentos nos Países em Desenvolvimento, p. 8

<sup>12</sup> Sichel, Debora Lacs. Direito Patentário no Brasil: Do Estado Nacional para o Mundo Globalizado, p. 115

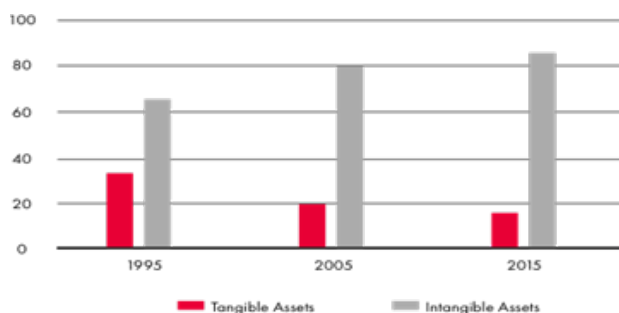


the domain of its object, which opens up a great possibility as the number of patent applications filed with the *Instituto Nacional da Propriedade Industrial (INPI)* [National Institute of Industrial Property] is much lower compared to the statistics released by the world's top patent offices.

International experience has shown the importance of technological information as a driving force of development. In Israel, following the conclusion of a technical cooperation agreement with China (Hong Kong), a significant development of high-tech business companies can be observed, as shown in the chart below<sup>13</sup>. According to the same report, Israeli and global funds in 2014 invested the equivalent of US\$ 2.2 billion in high technology in Israel. All of these projects are based on the implementation of Research and Development (R&D) Centers.



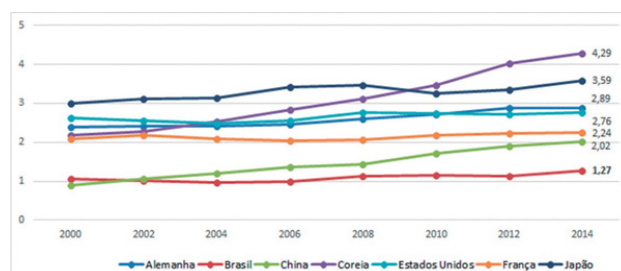
Similarly Australia recognizes the importance of the patent, especially in health, in setting the necessary environment for development in a constant stream of innovation<sup>14</sup>. The point to be noted focuses on a global movement of process optimization, establishing investment sources, such as Canada's sovereign patent<sup>15</sup> fund, where the evolution of intangible versus tangible values is evident, as shown in the table below.



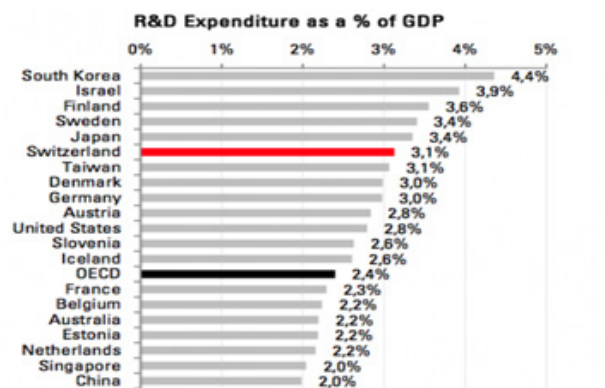
Thus, Canada established some of the following objectives, including the protection of national companies, in the face of aggressive litigation by holders of patent law, the perception of the importance of marketing intellectual

property intangibles, because of their added value. Based on models from France, South Korea, and Japan, Canada seeks to establish the ambiance for the development of the innovation sector, both in the private sector and in R&D development in universities.

Brazil has a very up-to-date legislation regarding best Research and Development (R&D) practices. However, as shown in the table below, investment, calculated as a proportion of Gross Domestic Product (GDP) is still low, especially compared to other nations<sup>16</sup>.



From the table above, it can be seen that China, previously inferior to Brazil, in 2002 surpassed the country in terms of investments in R&D. This, when observed in the order below, eventually shows that Brazil does not emerge among the nations that invest the most in innovation<sup>17</sup>:



This last picture, on the other hand, shows that, outside the discourse, there are no practical measures to implement technological innovation policies, which justifies the low quantity of national patent filings. In 2016, Brazil allocated approximately 1.21% of GDP to R&D.<sup>18</sup>

What can be seen from the examples above is the role played by the Academy and how it should have the support of the private sector, given the valuation of intangible assets

<sup>13</sup> <http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Technology-Financing-in-Israel-The-Hong-Kong-Partnership/rp/en/1/1X000000/1X0A34L3.htm>, accessed on Oct. 11<sup>th</sup>, 2018  
<sup>14</sup> <https://www.alrc.gov.au/publications/18-patents-and-biotechnology-industry/importance-patents-industry>, accessed on Oct. 14<sup>th</sup>, 2018  
<sup>15</sup> Sovereign patente Fund in Canada - <https://www.cigionline.org/articles/worthwhile-intervention-potential-role-sovereign-patent-fund-canada>, accessed on Oct. 14<sup>th</sup>, 2018  
<sup>16</sup> Arbix, Glauco. Políticas de inovação em nova chave, p. 55  
<sup>17</sup> <https://www.swissnexbrazil.org/noticias/principios-da-inovacao-suica/#sthash.1j1wg44j.dpbs>, accessed on Sept. 14<sup>th</sup>, 2018  
<sup>18</sup> 2016 global R&D Funding Forecast, pag. 5

in the face of their added value, generally the necessary driving force for development. economic. This awareness is evident when looking at the top 10 universities in the R&D ranking<sup>19</sup>:

Position	University	Country
1.	Stanford University	USA
2.	Massachusetts Institute of Technology	USA
3.	Harvard University	USA
4.	University of Pennsylvania	USA
5.	KU Leuven	Belgium
6.	KAIST	South Korea
7.	University of Washington	USA
8.	University of Michigan System	USA
9.	University of Texas System	USA
10.	Vanderbilt University	USA

What can be observed is the massive participation of USA universities in this first group. Expanding the picture to the first twenty institutions continues to be a prominent position for the USA, with the participation of one more university from South Korea, one from Britain and one from Switzerland. In general, there is no participation of a Brazilian university.

The next table presents the number of patent applications and publications from the main Brazilian universities<sup>20</sup>:

Table 3  
Publication *versus* Patent Filing Rate

	Publications* (1998-2002)	Patent Filing (1998-2002)	Publication/Patent Filing Rate
USP	1,6517	51	323.86
Unicamp	6778	168	40.35
Unesp	4335	20	216.75
Unifesp	2536	6	422.67
UFScar	1869	9	207.67

\* Publications indexed in the SCIE database - 1998-2002 (FAPESP, 2005)

The above table shows the disproportionate number between publications and the number of deposits made, which shows the first sign of misunderstanding or lack of knowledge of the true extent of intellectual property.

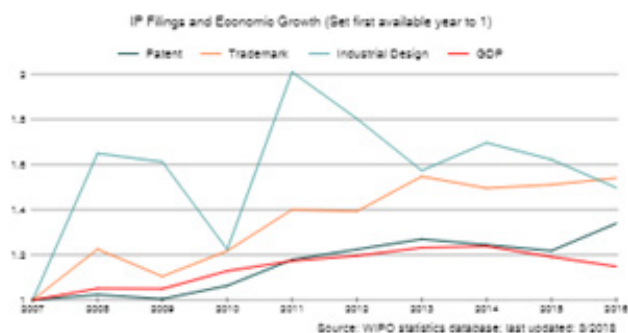
It is clear from the data extracted from the statistical data provided by the World Intellectual Property Organization that in Brazil about 30,000 patent applications are filed, while in other countries this amount is much higher. The surplus, those procedures that are not presented in Brazil, either through the Unionist priority route or through the Patent Cooperation Treaty (PCT) is in the public domain and can be freely used without the need to pay any amount to its holder abroad. This is, of course, an action that should derive

from state policy, based on prospects for the information available in global intellectual property tools.

The public domain is configured when protection from abroad is not required, by applying the principle of priority of the Paris Union Convention or by designation under the Patent Cooperation Treaty (PCT). Exceeding these deadlines, these inventions can be used and developed in Brazil without paying any amount in royalties. It is, therefore, an excellent mechanism for improving technical development, which should go hand in hand with research investments.

Even when looking at the commercial aspect, that is, involving brands and industrial designs, the following tables deserve to be highlighted, comparing Brazil and Poland<sup>21</sup>:

#### Brazil



#### Poland



The growth factor of trademark and industrial design deposits, as seen in the graphs above, points to a clear growth of these in Poland which has been leveraging as a European center of commerce, especially considering the so-called "Silk Road" project. In the Polish city of Lodz, it handled 10 trains in 2012, and in 2018 it increased to 500, due to the development of its logistics, aiming at optimizing transport<sup>22</sup>.

What can be seen from the above data is emblematic

<sup>19</sup> Ewalt, David. Reuters top 100: the world's most innovative universities – 2017, <https://www.reuters.com/article/us-amers-reuters-ranking-innovative-univ/reuters-top-100-the-worlds-most-innovative-universities-2017-idUSKCN1C209R>, acesso em 14/09/2018

<sup>20</sup> Amadei, José Roberto Plácido. As patentes nas universidades: análise dos depósitos das universidades públicas paulistas (1995-2006), disponível em <https://www.scimagojr.com/journalsearch.php?q=5000154508&tip=sid&clean=0>

<sup>21</sup> [http://www.wipo.int/ipstats/en/statistics/country\\_profile/](http://www.wipo.int/ipstats/en/statistics/country_profile/)

<sup>22</sup> <https://polandinenglish.info/38677429/chinapoland-freight-trains-boost-economic-development-in-lodz>, acesso em 13/09/2018

of the recent development process. Poland and Brazil went through historical moments in the late twentieth century, with the prevalence of closed political systems and centralized economy. Both underwent political transformations, culminating in the opening of their economic systems. Thus, there is no way to foresee an improvement in the short term, as policies in this field present their results in the medium and long term.

## CONCLUSIONS

The present analysis highlights some points, which can be summarized in three fields, the first referring to the importance of technological innovation, the second relating to policies to foster the sector and the third regarding the role of academia. In this sense, it is important to note, in a preliminary way, that implementing economic development policies depends, for their sustainability, on a field favorable to technological development. In this sense, it seems inadmissible to create institutes that aim to promote this new level, but are unable to fulfill this task in the face of structural situations or unpredictability of the regulatory framework, and lack of predictability of the rapid action of the judiciary.

On the other hand, R&D is the result of investments. These, in turn, depend on a favorable environment, which favors entrepreneurship, which encourages free enterprise in search of bold solutions to problems posed. This environment should be limited by market laws and free from state or corporate interference that seeks to establish artificial pricing mechanisms to the detriment of the investor's fair remuneration. The new product, nonexistent in the state of the art becomes incomparable concerning existing ones, as it provides previously nonexistent utilities. Thus, any search for similarity with respect to previous products, from any perspective, becomes fallacious, given the comparison of heterogeneous objects, with different effects, part of different assumptions, which prevents an analysis based on objective criteria. An innovative procedure, even in the area of disease treatment, constitutes a new level of human, social and economic evolution and is therefore incomparable with the previous one. Understanding differently is to fail to comprehend the innovative character of technology.

It should be noted that the speed of technological evolution has been decisive in making strategic decisions. For this purpose, the role of academic research centers and the growing investments made by European countries and the United States of America in the search to meet the constant needs of further scientific data analysis remains evident. The stagnation of research in Brazil will lead to increasing losses, in addition to placing the country at the sidelines of the entire technological process.

What happens in this way is that the innovative process becomes continuous. It is everlasting and devoid of a final moment. The achievement of a new technological level, with all the richness, that it provides, is the basis for its continua-

tion, in search of an even bolder level, since accommodation is unthinkable. Those who stop will soon be doomed to be outdated, losing the status of innovators to obsolete ones. Thus, R&D policies form the basis of a country's economic development consistently.

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