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University Licensing: Strategies and Implications

Should Universities grant exclusive licenses? Should they favor SMEs instead of big companies when licensing?

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Abstract: *In this research we look at the Bayh-Dole Act enacted in 1980 in the United States of America which gave permission to Universities to claim the ownership of patented inventions developed with public funding. In particular, we analyze one specific condition established by this law which is that the Universities should favor SMEs over big companies when licensing their inventions. This research also aims at examining good practices in terms of licensing University inventions, such as choosing the right method of payment and assessing the pros and cons of exclusive and non-exclusive licenses from the University point of view.*

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§1. Introduction

Technology Transfer (Tech transfer) includes a wide range of activities which are strongly linked with Intellectual Property. These activities aim at promoting innovation and the dissemination of technology through different forms, such as patents, licensing, or simply by making available the results of a technical investigation to the public.

Several treaties, agreements and laws have highlighted the importance of Technology Transfer as a tool to promote the development of countries. One of the most important agreements is the Trade-Related Aspects of Intellectual Property Rights, also known as TRIPS, which is an international agreement signed by all the members of the World Trade Organization.

This agreement establishes the following objective in article 7, namely; "*The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations*".

This pact also expressly mentions Tech Transfer as an important tool to promote development in article 66.2, which states that "*Developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base*".

With these provisions, the TRIPS agreement establishes the importance of fixing a balance between the protection of intellectual property rights and the transfer of technology to the society, considering that innovations are a tool to improve the economy of countries by creating jobs and developing key sectors of the economy.

Contracting members have to make efforts to achieve this balance by creating national laws that encourage the transfer of technology to the society without undermining intellectual property rights.

Throughout this paper, we will focus on a specific Tech Transfer Law called the Bayh-Dole Act, enacted in 1980 in the United States of America which allowed Universities to retain the ownership of public-funded patents. More specifically, we will analyze if some requirements that impose this law can be applied in other countries, such as the preference that Universities should to give to SMEs as licensees of public-funded inventions.

Another aspect that is worth mentioning is, that for the very first time, the law allowed Universities to grant exclusive licenses regarding public-funded inventions. Before this legislation, the inventions were owned by the United States government which only granted non-exclusive licenses to the firms. This was very unattractive to firms that wanted the exclusivity of the invention.

For the purposes of this research, it is critically important to study the definition of SMEs according to degree of development of the countries and if they have the absorptive capacity to assimilate the technology and develop the invention that is going to be licensed.

§2. Bayh-Dole Act: Before and After

The Bayh-Dole Act of 1980 is an Act within the United States of America which gives permission to institutions to claim inventions that are made with public funding. The Bayh-Dole Act is quite simply about who should own and manage academic inventions and who should share in the fruits of their success. Before the Bay-Dole Act the government had special licensing policies for research that was federally funded and only granted non-exclusive licenses for the patents it owned.

The Bayh-Dole Act came into effect on July 1, 1981 and was intended to reconnect academic research and innovation to the mainstream economy after some controversial cases in the 1960s in which the government asserted ownership of patents based on research it had funded. From this point on the government created a uniform federal patent policy for universities and small businesses that gave them the right to own any patent that resulted from grants or contracts funded by the government.

It should be noted that the government retained a non-exclusive royalty-free license to any of these patents and reserved the right to compel licensing or to utilize the invention itself in cases where contractors' licensing policies failed to promote utilization or when it is needed for public health or safety. The act had regulations that required universities to share any licensing royalties with inventors and also required the universities and other research performers to give small businesses a preference when it came to awarding licenses. The Act also limited the duration of exclusive licenses that universities could negotiate with large businesses. In 1983 the president sent an Executive Memorandum to agencies instructing them to allow large businesses as well as universities and small businesses to get the title on government funded patents. This Order came into effect in 1987. The time limits on the length of exclusive licenses from university to large businesses was removed in 1984 by amending the Bayh-Dole Act[1].

Effects of the Bayh-Dole Act

The Bayh Dole Act had effects on different fronts, namely:

- During the late 1990's and early 21st century, many commentators and policy makers saw the Bayh-Dole Act as an important factor for the result of growth in U.S. universities' innovative and economic contributions. But there is little evidence of substantial shifts since Bayh-Dole in the content of academic research[2].

- Following the passage of the Bayh-Dole Act, the number of research related patents granted to U.S. research universities increased exponentially. Figure 1 shows that there was an increase in the rate of patenting with a turning point in 1980[3].

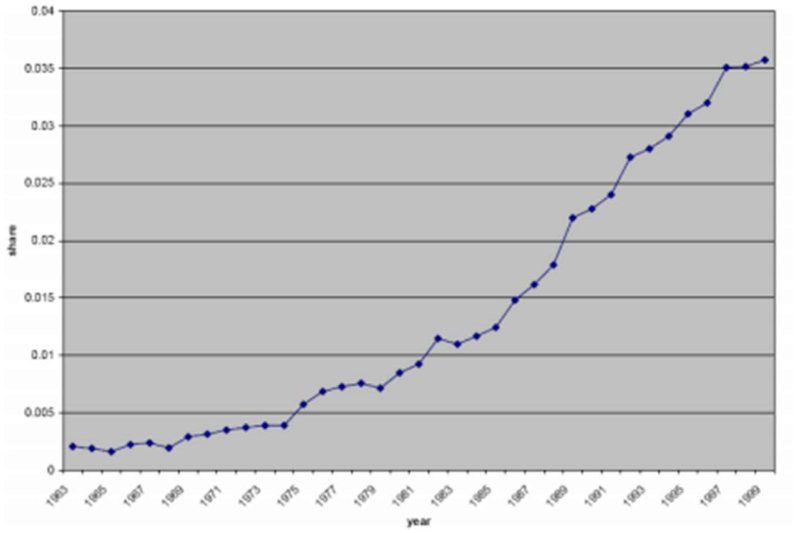
[1] D. MOWERY, R. NELSON, B. SAMPAT, A. ZIEDONIS, Ivory Tower and Industrial Innovation – University Industry Technology Transfer Before and after the Bayh-Dole Act, Stanford University Press, Stanford California, 2004, 85 ff.

[2] D. MOWERY, R. NELSON, B. SAMPAT, A. ZIEDONIS, Ivory Tower and Industrial Innovation – University Industry Technology Transfer Before and after the Bayh-Dole Act, 2004, supra at note 1, at 94 ff.

[3] D. MOWERY, B. SAMPAT, The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: A Model for Other OECD Governments? In The Journal of Technology Transfer 30 (1-2) 2004, 115 ff.

FIGURE 1

Number of patents granted in U.S.A.



- The Bayh-Dole Act also had an effect on the way universities handled their inventions. Prior to this Act, only a few universities in the US had a special office regarding the licensing of technology. After the Bayh-Dole Act this number increased and today all major research institutions have a special Office for Technology Licensing. Also the level of basic technology transfer activity - invention disclosures, patent applications, patent issuances, licensing—has increased[4].

- Another effect that is worth mentioning is that it came to light that universities with less experience in patenting and licensing tend to receive patents that are less heavily cited. Many of these universities started patenting inventions after the Bayh-Dole Act went into force and they started to patent faculty inventions without doing a proper market search for licenses of these inventions. This resulted in patenting of inventions that had little chance of being licensed. Because the universities started to get confronted with rising cost and little revenue from licenses, they became more selective in their patenting activities.

Issues and Concerns

The Bayh-Dole Act mostly mentioned as a landmark Act that had a large positive impact on U.S. research and on the U.S. economy. However, there are some issues that have been discussed such as the creation of conflict of interest between industry and research universities because the Bayh-Dole Act gives universities the right to grant exclusive licenses for their patented inventions or sell the title to the patent to private industry. Another issue that has been raised is that many researchers have consulted or worked before with the private sector and have ties with

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[4] D. MOWERY, B. SAMPAT, The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: A Model for Other OECD Governments?, 2004, supra at note 3, at 121.

certain companies and that they may favor certain companies when licensing out patents. This would not promote fair competition. While there are concerns associated with the Bayh-Dole Act, there has been insufficient proof of these issues creating actual negative effects. In general the benefits created by the Bayh-Dole Act greatly outweigh any possible negative consequences[5].

§3. License Agreements

A licensing agreement is a partnership between an intellectual property rights owner (licensor) and another who is authorized to use such rights (licensee) in exchange for an agreed payment (fee or royalty)[6] for a limited period of time.

This "permission" granted by the licensor of a patent consists of an exemption to the right to exclude others from the use of the patented technology that is born with the registration of the invention before the local Patent Office.

The terms of a license agreement should be clear and precise in regards to the "objective of the license", which means that they must define the scope of the invention, the duration of the agreement, its exclusivity or non-exclusivity, the geographic scope, the royalties and the way that these payments are going to be made, and any other limitation that the licensor or licensee might want to include, such as a limitation in the field of use of the invention.

It is important to note that sometimes licenses do not only involve patented inventions but also other Intellectual Property Rights such as Know-How or Trade Secrets, which are required to exploit the invention. The inclusion of this knowledge would have an impact on the capacity of the licensee to exploit the invention[7] and on the complexity of the invention. Usually, large firms frequently have more tools to develop inventions, but if the invention has a high degree of complexity, consultations with the faculty member may be required.

Generally speaking, including Know-How and/or Trade Secrets in a license agreement could be seen as a thread to the licensor activities because it would enhance the position of the competitor/licensee in the market. However, in case of University licensing it is possible to assert that this is not a problem since they are not usually engaged in commercial activities (apart from licensing, of course).

Role of Universities

Universities can receive a high income due to licensing activities if these agreements are managed wisely and include the correspondent safeguards regarding the royalties and the objective of the license agreement.

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[5] R. RHINES, Consequences of the Bayh-Dole Act, 12th, 2005.
6 http://www.wipo.int/sme/en/ip_business/licensing/licensing.htm
[7] D. TEECE, Managing Intellectual Capital, Oxford University Press Inc., New York, 2002, 135.

Likewise, if Universities work hard to develop and commercialize new technologies they can be a key element to improve the situation of a country, by creating jobs, extending the industry, and creating basic and applied knowledge which can be used to develop new products.

Nevertheless, when analyzing the licensing activity of Universities, it is important to keep in mind their traditional role in society, which is to spread knowledge among the educational community and to encourage basic research as opposed to applied research that obviously has more commercial value.

Licensing and patenting activities can be seen as activities that contravene this traditional role of Universities as guardians of knowledge, because they retard the disclosure of the research's results to the public and grant a commercial monopoly over these results to certain firms[8].

This social role can be complemented with the licensing activities of the Universities, if they assume the commitment to reinvest in Research & Development (R&D) most of the revenues received from licenses agreements. We specify "most of the revenues" because clearly the University has to assign a percentage of the revenues to the faculty member, who invented the technology for reasons of equity and to promote the invention activities among their employees.

This approach, which is used by many Universities around the world, would eliminate some of the adverse effects derived from an aggressive licensing strategy conducted by Universities, but still leaves some negative impacts as the delay on the disclosure of inventions and the eventual monopolies that would grant over innovations to big firms, this issue will be discussed in paragraph 5.

After the Bayh Dole Act and similar law modifications around the world, many Universities created Technology Transfer Offices (TTO), which are in charge of the transference of the IPR generated inside the University.

One of the most common activities of the TTO is facilitating license agreements to commercialize the patents invented by the faculty members. In some cases, the activity of the TTO must be complemented with other institutions such as Incubators in order to help future licensees to successfully commercialize the inventions[9].

Economic considerations

As explained above, when drafting a license agreement TTO should pay special attention to the terms of the license agreement because unclear clauses can lead to litigation between the parties of the license agreement.

[8] G. LIBECAP, Advances in the Study of Entrepreneurship, Innovation and Economic Growth, Volume 16, University Entrepreneurship and Technology Transfer: Process, Design, and Intellectual Property, Elsevier Ltd., Oxford, 2005, 198 ff.

[9] R. TAPLIN, A. NOWAK, Intellectual property, innovation and management in emerging economies, Routledge, New York, 2010, 67 ff.

One of the most important terms in the license is the "price" or "value" of the agreement It is important to highlight that the value of the license agreement would not be equal to every potential licensee because in the end it would be defined by the "willingness to pay" each of them. This willingness to pay would depend heavily on the specific conditions of the agreement such as exclusiveness, duration, scope of the rights, among others.

The price of the license can be set as a "lump–sum payment" or "fixed fee" in case the University and the licensee are confident that the invention already has a certain level of commercial success, thus it is not necessary to invest further resources to develop the technology because the product has a commercial value that can be easily identified by the consumers.

On the other hand, if the parties know that the technology is in an embryonic stage, such as a prototype, it would be preferable to establish "royalty payments", which are frequently lower than a fixed fee but are permanent over the duration of the license agreement. This is often the case of University inventions, which are in early stages, thus a strong flow of resources needs to be invested by the licensee in order to commercialize the technology[10].

According to which type of option the University and the licensee choose, we will encounter different externalities:

(a) "Fixed entry fee" or "single fee"
Positive externalities

University	Licensee	Society
Receives a "big payment" to recover from the investments of R&D and patenting activities	Only pays at the beginning of the relationship, thus after this payment, all the revenues are property of the firm	The firm usually will try to introduce the product to the market very quickly in order to recover from the first payment, thus the society will have access to the product

It could not be positive for the University to grant licenses over the formula of one "single fee" because this generally excludes the possibility of working in collaboration with the firm in the development of the invention.

(b) "Royalty payments"
Positive externalities

University	License	Society
Long-term relationship	Support from the	Establish a link between the

[10] R. JENSEN, M. THURSBY, Proofs and Prototypes for Sale: The Licensing of University Inventions in AER 2001, 241.

with the firm Regular income due to the license agreement Possibility to work closely with the licensee to develop the invention	University, and more specific, from the inventor, to develop the invention No need of making a big investment at the beginning of the transaction Share of associated risks with the University as the Royalties are based in a future cash flow Opportunity to assess accurately the real value of the invention at an early stage of its developing	University and the firms which can be positive to the development of new products and services Training of new scientists focused on the industry

The **risks** for the University of choosing the system of "royalty payments" is that the licensee becomes insolvent over the term of the license, thus the firm cannot pay the royalties established in the contract.

Another situation that could happen is that the licensee intentionally does not exploit the technology in the market in order to block the use in of the invention.[11] In that case, it would be advisable to include an obligation in the license that allows the termination of the contract in case the licensee willfully does not exploit the technology. Another option is to include a clause in which the licensee obligates himself to put the invention into practice.

Finally, it could be possible that during this long-term relationship between the University and the firm, the latter begins to pressure the University to focus their research efforts to the firm's interest.

The first and second risks describes above can be overcome by establishing clauses in the license that allow the termination of the contract if any of these situations occurs. In regards to the "pressure" to the University, we believe that the institution should have mechanism to prevent this type of situations in their policies.

In spite of these risks, we believe that the royalty option is more feasible for University inventions and also, generates more benefits for all the stakeholders involved. However, this does not exclude an intermediate solution such as combining a "lump sum" payment in the beginning of the license relationship to recoup the investments made by the University and then,

[11] F. MUNARI, R. ORIANI, M. GRANIERI, The Economic Valuation of Patents, Edward Elgar Publishing Limited, Northampton, USA, 2011, 233 ff.

a lower royalty fee which in turn, could serve as an incentive to both the University and the firm to keep collaborating and working in the invention.

§4. Exclusive v. Non-exclusive Licenses

During the licensing negotiation, one of the most important issues is to decide whether the license to be granted would be exclusive or non-exclusive. The Bayh-Dole Act does not place any restriction in terms of this issue, leaving this decision entirely to Universities that are the ones that have to balance private and public (mission oriented) interests[12].

Exclusive licenses are basically a compromise that the technology will be used only by the licensee, thus in the end it is a promise that the licensee will not have competitors in that technology (or field of use of the same)[13]. In the most extreme case of exclusive licenses (and the ones that we will focus on) not even the licensor is able to use the technology.

In case of non-exclusive licenses, the licensor is able to grant licenses for the same technology and field of use to several licensees, consequently the invention can be used by all of them without restrictions.

Each option has its advantages and drawbacks from the University's point of view, considering that this type of institutions have their role in the transfer of technology to the society.

In most cases, the inventions produced by Universities are in a very embryonic stage (just a prototype), thereby the licensee is required to make substantial investments in order to have the invention ready for the market[14]. If the Universities are not willing to give exclusive licenses it is highly unlikely that prospective licensees would be willing to sign the agreement because they would not be able to secure further investments in the technology.

In economic terms, exclusive licenses usually have a "higher royalty rates because the licensor is foregoing revenue from other licensees and accepting more risk by placing the technology in hands of only one party"[15]. For that reason, is extremely important that Universities have a well-established TTO capable of identifying possible licensees and their capacities to develop the invention.

Furthermore, it is worth mentioning that once the technology is licensed, there is a strong probability that the University and the inventors would continue to use the licensed invention in order to conduct further research activities. This is allowed in some countries under the

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[12] J. H. ROOKSBY, The Branding of the American Mind: How Universities Capture, Manage, and Monetize Intellectual Property and Why It Matters (Critical University Studies), John Hopkins University Press, Baltimore, 2016, 175 ff.

[13] WORLD INTELLECTUAL PROPERTY ORGANIZATION, WIPO Intellectual Property Handbook, 2004, 189.

[14] R. JENSEN, M. THURSBY, Proofs and Prototypes for Sale: The Licensing of University Inventions, supra at note 9, at 241.

[15] B. FRIEDLANDER, L. EVANS, The law and business of licensing: Licensing in the 21st Century. Licensing Executive Society, 2001, 975.

"Research Exemption" [16] or "Experimental Use Exemption". All these exceptions have to comply with one requirement: that the research has to be done without commercial purposes.

This condition although it seems easy to comply, it is not the case of University research because sometimes when these institutions are exploiting the patent for research purposes, they could discover new information related with the invention, but non-obvious, and they would try to file another patent application for that result.

If we assume that one of the main purposes of Universities is conducting researches and licensing these results in exchange of a payment, this "exploitation" of the licensed invention for research purposes could go beyond the scope of the experimental use/research exemptions.

This is similar to what happened in a case in United States called Madey v. Duke University[17]:

Madey was a professor and a researcher in Duke University, who had patented two inventions regarding lasers equipment. This researcher worked for 10 years in Duke University, but then he had differences with the University and he resigned. After his resignation, Duke University continued to use his laser lab equipment, which resulted in a lawsuit filed by Madey for patent infringement.

During the case, Duke University claimed that its use of the patents falls under the experimental use exemption and other non-commercial uses. In the end, the result was favorable to Madey, since the Federal Circuit decided that the interpretation of the experimental use exception covering "*research, academic or experimental purposes*" made without commercial purposes was too broad.

The Court then stated that the experimental use defense was to be interpreted very narrowly, considering only the legitimate business of the entity and not the commercial willingness of the activity. In this particular case, the Court determine that the use of the patents does not amount to "*use for amusement, to satisfy idle curiosity, or for strictly philosophical enquiries*", therefore, the Court dismissed the Duke's defense of the experimental use exemption[18].

This decision although does not concern a license agreement, highlights the important mission of University or researching, which can in some cases be viewed as an infringement if does not comply with the requirements set out by the law. In the case mentioned above, the decision was unfavorable to the University because the experimental use defense in the United States is very narrow and it is only related to small "innocent" uses.

[16] We should not confuse the "Experimental use/Research Exemption" with the so-called "Bolar exemption" (In the United States called "Research Exemption"). The Bolar exemption constitutes a concession granted in some countries to generic manufacturers which want to start with the drug test to obtain the marketing approval before the expiration of the patent term.

[17] 307 F3d 1351 (Fed. Circ. 2002).

[18] R. GOMULKIEWICZ, D. CONWAY-JONES, X. NGUYEN, Licensing Intellectual Property - Law and Application, Aspen Publishers, USA, 2008, 478 ff.

In case of an exclusive license, the licensor (University) would not have the right to use the patent, thus it would be a "third party" just as Duke University, which would not be able to conduct research activities with the licensed technology.

This is contrary to the core activities of Universities which are basically researching and educating young generation. For that reason, it is crucial for Universities that are considering to grant an exclusive license, to negotiate the inclusion of a "Research Clause".

Both parties should define the extent of this clause in regards to the commercial or non-commercial purposes of the research during the negotiation of the license agreement. In any case, if the clause is set in terms of not allowing any research activities with direct (or indirect) commercial purposes, this clause would not be appropriate for University researching activities because although the mission of Universities is in essence not commercial, it is obvious that researching activities can lead in some cases to lucrative results not only in terms of licensing but also in terms of reputation and prestige among the students and the academic community.

Several Universities around the world have adopted the policy of granting exclusive licenses with these research clauses. An example is Harvard University, which in its website has the following clause[19]:

> **2. License.**
>
> **2.1. License Grant.** Subject to the terms and conditions set forth in this Agreement, Harvard hereby grants to License (i) an exclusive, [worldwide,] royalty-bearing license under Harvard´s interest in the Patent Rights and (ii) a non-exclusive license to use the Harvard Technology Transfer Materials, solely to develop, make, have made, offer for sale, sell, have sold, import, export, distribute, rent or lease Licensed Products [in the Territory], solely for use within the Field; provided, however, that:
>
> **2.1.1.** Harvard retains the right for itself, and for other non-for-profit research organizations, to practice the Patents Rights and to use the Harvard Technology Transfer Materials within the scope of the license granted above, solely for research, educational and scholarly purposes; and…

This model clause could be applied in other Universities in cases of exclusive licenses in order to allow Universities to conduct research activities with the licensed products. It is important to note that it does not mention the phrase "commercial purposes" but only that the research has to be carried out "solely for research, educational and scholarly purposes".

Notwithstanding the above, it is worth mentioning that the granting of exclusive licenses with "research clauses" could not be a good solution in every case because the nature of the invention might require a non-exclusive license.

[19] http://otd.harvard.edu/industry-investors/sample-agreements/licensing/

Accordingly, if the invention is well developed and generic (can be used in many fields), it could be advisable to choose another license system, such as a non-exclusive license or an exclusive license but limited to a specific field.

Although it is true that if a University chooses this system the revenues derived from the license agreement could be lower, in the long run this could have a positive effect on social welfare because there is no monopoly over the invention, which definitely increases competition in the market.

Also, if the University can achieve several non-exclusive licenses, the royalties can be higher than in an exclusive license. However, if the University only chooses to grant non-exclusive licenses, likely this institution would be the responsible of patent enforcement, a function that is essentially different to the university's mission and that could be extremely exhausting, costly and complicated.

Therefore, when assessing the possibility of an exclusive license, the University and the TTO should analyze very carefully the stage of development of the invention and also, if it is worth to give the monopoly of the invention to only one licensee, instead of giving the right to use the technology to several licensees which would divide the risk and increase the likelihood of effective commercialization in the market.

Finally, in the event that the University decides to grant an exclusive license, it is essential that the University reserves the right to conduct further research with the technology to promote the educational and research purpose of the institution.

§5. Should Universities favor SMEs when licensing?

When the government provides universities with public funds to invest in inventions, the government expects that these investments flow back to the community. One of the ways to benefit the community is if the universities license their new technology to small companies within the community.

University licensing to the private sector

Universities are seen as important role players in development of science and technology. The knowledge and technology that universities produce have huge economic and social benefit. Universities provide the industry with new technology and this is the reason for universities to develop a good intellectual property (IP) policy.

Many of the inventions produced by the universities are patentable, yet there are many that are no more than proofs of concept or laboratory-scale prototypes, which require further research and development prior to their possible commercialization[20]. By granting public universities the rights to their own IP derived from publicly-financed research, and allowing them to commercialize their results, governments around the world are trying to accelerate the

[20] WIPO, Creating a Virtuous Circle: Developing IP and Innovation Policy and Strategies in Public R&D Institutions and Universities to Facilitate the Transfer of Technology, presentation in Morocco, 2016, 5 ff.

transformation of inventions into industrial processes and products, and to strengthen collaborative ties amongst universities and industries.

If companies want to remain competitive, they will have to work on improving the technologies the use in their production system. Also, it is important to note that firms cannot always rely in their laboratories to improve the technologies, or maybe they don't even own their own laboratory, thus they have to work together with universities that have these facilities to improve the inventions. On the other hand public funded institutes, such as universities, are looking for alternative resources due to shrinking federal budgets, but also because some governments created special legislation which is favorable to licensing and incentivizes universities to look for commercial outlets for their innovations[21].

SME's v large companies

The concept of SMEs (Small to Medium-Size enterprises) it is not well defined because it depends heavily on the specific context of the country or region. Therefore, it is possible to find several definitions of SMEs.

The following table gives different SME definitions used by multilateral institutes [22].

Institution	Maximum # of Employees	Max. Revenues or Turnover ($)	Maximum Assets ($)
World Bank	300	15,000,000	15,000,000
MIF – IADB	100	3,000,000	(none)
African Development Bank	50	(none)	(none)
Asian Development Bank	No official definition. Uses only definitions of individual national governments.		
UNDP	200	(none)	(none)

As seen in the chart, the World Bank states that SMEs can be defined as enterprises that employ less than 300 people and have a maximum turnover or revenue of 15,000,000, while the African Development Bank which includes several Least Developed Countries has a modest definition of SMEs, considering that they are composed of firms that employ less than 50 people, without limiting their revenues.

For that reason, it is highly important to consider the economic context of the country in which the SME operates. It would not be the same the Gross National Income from a Least Developed Country than a fully Developed Country as United States of America.

[21] B. FRIEDLANDER, L. EVANS, The law and business of licensing: Licensing in the 21st Century, supra at note 14, at 963.

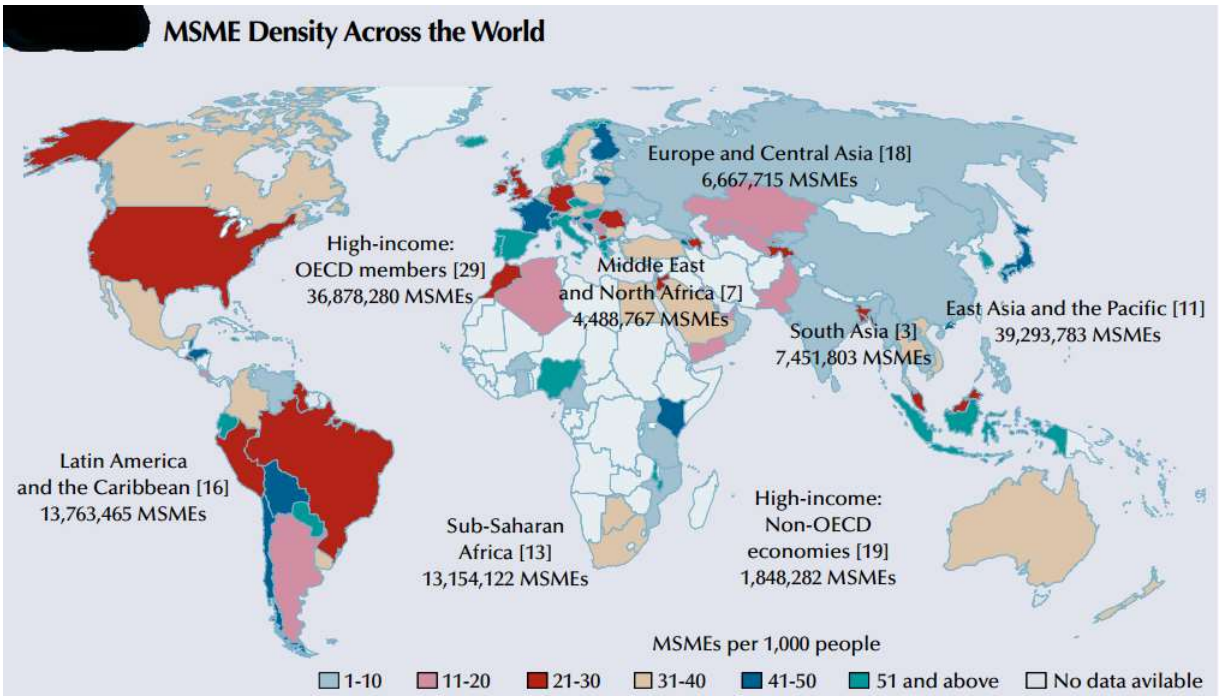
[22] T. GIBSON, H. VAN DER VAART, Defining SMEs: A Less Imperfect Way of Defining Small and Medium Enterprises in Developing Countries, in Brookings Global Economy and Development 2008.

Besides of the revenues, there are other criterions to define SMEs, as mentioned in the Report issued by the Caribbean World Bank, which have three keywords - small, single and local:

- Small - SMEs are small in nature - either in terms of number of employees – up to 10 persons for 'small', up to 200 persons for 'medium'.
- Single - Most SMEs have a single owner who could also be the sole employee. The 'single' also refers to single products produced or service provided.
- Local - SMEs are essentially local in nature - their market is usually localized to the area where they are located (same city, district or state); or may be 'local' in the sense that they operate from a place of residence.

The figure below provides a visual summary of MSME (Micro, Small and Medium Enterprises density in 116 developed and developing countries in major economic zones across the globe[23].

FIGURE 3



Source: International Finance Corporation, Micro, Small, and Medium Enterprises Around the World, 2010.

According to the IFC (International Financial Corporation) report, on average, there are 31 MSMEs per 1,000 people, across the economies covered. On a regional basis, Latin America has the second highest level of MSME density in the world.

This information is vital for Universities because if they want to license their technology to SMEs they will have to make sure that these enterprises have the resources to spend on development of the technology, unless the invention is mature and it is ready to be commercialized by the firm.

[23] Micro, Small and Medium Enterprise Development in the Caribbean: towards a new frontier, Caribbean Development Bank, 2016.

From experience big companies have a bigger budget to invest in the development of technology and this may result in the universities not wanting to license their technology to SMEs, especially if we are talking about an SME of a developing country.

As mentioned in paragraph two, public universities are, according to the Bayh-Dole Act, given incentives to favor small companies over big companies when choosing a licensee for their technology. The government prefers this, because they want the majority of the publicly funded technology to flow directly back to the community.

Absorptive capacity of companies

From the perspective of Wesley M. Cohen and Daniel A. Levinthal in their article "Absorptive Capacity: A New Perspective on Learning and Innovation", this skill refers to "*a company's ability to recognize the value of new, external information, and to assimilate and apply this information to commercial ends*"[24]. This ability is extremely important for innovation as it encompasses all the prior related knowledge of the firm which is used to develop a certain technology or to optimize a process conducted by the company.

As mentioned by the authors, this knowledge includes a shared technical language and several skills, which were acquired by the members of the firm over the time, either by formal training or by accumulated work experience.

Also, absorptive capacity can be produced by the firm's own activity, such as R&D, which helps companies to internalize new innovative information, and manufacturing of new products, which gives the company the chance to get involved in the process of creating new products their commercialization. Another way of acquiring new knowledge is by assimilating the accumulated knowledge of the firm's members, or by training them abroad.

Complementary to the fact that companies themselves can invest in the development of their absorptive capacity, governments can also support companies, in particular SME's, but also help the universities to increase their level of absorptive capacity. Government policies that stimulate research investments in scientific areas are crucial for the creation of opportunities for SME's and universities to start a collaboration that can possibly result in a licensing agreement. To give an example: to implement this strategy governments in some countries started with public promotion programs that support the above mentioned collaboration between SME's and Universities. These programs should result in less barriers between these two parties. We see now there are different strategies to influence a SME's absorptive capacity. On one hand the company can invest in itself to increase their absorptive capacity level and on the other hand the right government policies can also have a positive effect on increasing this level.

Although large companies are more frequently in touch with Universities than SME's and they more frequently have different kinds of agreements with these universities, it is still not easy to conclude that SME's per se have less absorptive capacity than large companies for example when the SME is categorized only based on their human resources, their number of employees. Because in some cases, namely where it regards scientific technology, a small or start-up company may have a higher probability of benefiting from academic research.

[24] W. COHEN, D. LEVINTHAL, Absorptive Capacity: A New Perspective on Learning and Innovation in ASQ, Vol. 35, No. 1 1990, 128.

This shows that there are different factors to take into consideration when trying to measure a company's absorptive capacity[25].

It is obvious that SME's are of high importance to the development of the economy but in some cases, SMEs do not have the possibility to increase their prior knowledge or they don't have the capital to invest in research and development or education for their employees.

By the contrary, big companies usually have more resources to invest in development of new technology from universities.

The question arises whether universities should license to big companies and get a certain level of certainty that their new technology will be developed further or should they chose to license their new technology to SME's, because SME's are the greater public and the public funded technology will flow more directly back to the public. What would be ideal for society as a whole? Are SME's ready and do they have the absorptive capacity to commercialize the new technologies?

As we have said throughout this paper, one part of this answer would depend on the stage of development of the invention because if the invention is too embryonic, there is the possibility that the SME would not be able to invest a huge amount of money in order to place the invention in the market. However, looking at the other extreme, if the SME receives the invention fully developed by the University, the firm would not have the opportunity to develop and assimilate the knowledge related to the invention into its structure.

One key element of the absorptive capacity is that this "skill" has to be developed and assimilated (absorbed) into the organization that receives the technology. If the firm does not have the opportunity to manufacture the products or to make experiments and be in contact with the faculty inventor, they will not grow in terms of acquired knowledge which could be used to improve the invention.

This process of acquiring knowledge through experimenting has been called as "learning to learn" and it is a crucial element in the development of firms and its members. Certainly, in case of SMEs, this process has to be supported by the University by establishing a network that include incubators, joint ventures, introducing venture capitalists, and much more.

This strategy has been used by some developing countries as Thailand, which acknowledged the necessity of supporting companies in their lack of capacity of exploiting the inventions that they received from the University. In this country, Chulalongkorn University developed a strategy of helping Medium Enterprises (not SMEs because they were too small to invest in R&D) to develop their own products through meetings with professors and by teaching marketing strategies to commercialize the inventions[26].

[25] D.DELL'ANNO, M DEL GIUDICE, Journal of Innovation and Entrepreneurship, 2015.
[26] R. TAPLIN, A. NOWAK, Intellectual property, innovation and management in emerging economies, Routledge, New York, 2010, 67 ff.

This approach benefited a lot the local community because it acknowledged the necessity of creating a prior knowledge that would be the base to build the knowledge and skills required to develop successfully the University inventions in that country. Indeed, Thailand's experience is an example for developing countries whose SMEs and MEs have not developed the right amount of absorptive capacity to develop their own products place them into the market.

Furthermore, as we have pointed out, this method has positive impacts not only on the development of the licensed technology but also on the growth of the SMEs themselves because they learn commercialization strategies and manufacturing processes which can help them to start their own R&D. In this sense, it is important to remark that the absorptive capacity is a cumulative process, hence, if the University license its technology to an SME and this firm develop the invention correctly, it will be more prepared for future licenses at least in the same field as it has already acquired knowledge through the first operation.

Moreover, there is a geographic advantage that should not be overlooked when negotiating licenses with local SMEs, that is the physical proximity that these entities have with the University. This closeness could make the relationship between the TTO officer and the owner of the SME more fluid, since they share a same language, customs and if the country is relatively small, they knew each other before dealing with the license agreements. This could be a huge advantage for the development and the implementation of the invention as it facilitates the communication between the parties and helps both parties to identify key sector of the local economy where inventions or technology is required.

Conversely, giving an exclusive license to a SME could be a huge risk because as a small company, it has less staff, less accumulated knowledge and a higher risk of becoming insolvent.

Nevertheless, at the same time this could be great opportunity to improve the situation of a certain local community by creating jobs, enhancing the manufacturing industry and strengthening key sectors of the economy.

Likewise, the granting of an exclusive license to a big company usually secures high revenues to the University, that although it is not recognized within the TTO offices, it is an important goal for them, especially in developing countries where there are not enough resources to fund the University's patenting activities.

Besides of that, to some extent it can be a sort of "guarantee" that the invention is going to be developed and made available to the public (which indeed is important for the University's mission) because the company has the resources to do so. However, as we have said there is no obligation to use and to make available the technology to the public, thus it is important to include clauses that require that the licensee make its "best effort to commercialize" the technology within the life of the license agreement because it may happen that the firm only signs the license in order to block the entry of this new technology to the market either because it has a competitive product in it or it simply does not want to make that technology available to consumers.

Which is the best solution for the University? It will depend on the degree of development of the invention and on the size and absorptive capacity of the SME. As we explained, it is not the same an SME in the United States to one in Haiti because, with a few exceptions, SMEs in the United

States are bigger and have more access to specific-related knowledge and trained professionals within the firm.

We notice that this question is not only about intellectual property, but also about politics and economics. The answer to this question is crucial to developing countries because it has an impact on the way Universities manage their patents and licenses. If they choose to benefit SMEs by applying an appropriate strategy (for example the one that Chulalongkorn University is using), the economy of a country would be boosted considerably.

On the contrary, if Universities do not provide support networks for SMEs as licensees of their inventions, there will be no transfer of technology and knowledge from the University to the SME, which would result in inventions that do not reach their full potential or simply fail.

In light of the above mentioned situation, we recommend that if a developing country wishes to improve its economy, it can start by amending the law to give preference to SMEs when licensing University owned inventions. This is a good way to begin, as long as there is a network and a culture that promotes the transfer of technology and the creation of absorptive capacity within the SMEs.

§6. Conclusion

The Bayh-Dole Act has changed the way in which Universities handle their licenses, allowing them to retain the ownership of public funded inventions and grant exclusive license to firms, a possibility that before 1980 was impossible and that was delaying the process of innovation within the Universities.

We believe that these modifications have had a positive impact on the licensing practices of the Universities from the United States, where the licenses increased considerably after the issuance of the law.

In particular, we analyzed the option of Universities to grant exclusive licenses and how this can influence the result of the development of the invention. In general, it is positive for Universities to grant exclusive license because they secure a higher royalty rate and there is more collaboration between the inventor and the licensee. This cooperation helps that the invention reaches its full potential.

Moreover, the Bayh-Dole Act requires Universities to give preference to SMEs when licensing their inventions. After our research, we are now in the position to conclude that this condition benefits the progress of developing countries, as it creates jobs and boost the local economy.

However, it is extremely important to consider very carefully the situation of the country and the size of the SME because if the firms are too small, likely they would not be able to develop the Universities' technologies which are usually in a very embryonic stage.

For this reason, prior to the modification of Tech Transfer laws in developing countries, the government should design a support network for SMEs in order to help them to increase their knowledge and their absorptive capacity which could be used to assimilate and develop the technology before placing it on the market.

Another important factor not to overlook is are the political situation in a country. The political and economic situation of a country, especially developing countries, will be of influence on the way a university is going to manage their new inventions.

No matter what the University's choice is, it is advised that the inventor gets involved in the further development of the invention and its implementation because he is the person that has the best knowledge about the invention and its possible functions or applications. This involvement would act as a "bridge" between the University's knowledge and the SME, which in turn would help the latter to acquire the sufficient knowledge to make the invention a successful product in the market.

Bibliography

Articles

1. D. MOWERY, B. SAMPAT, The Bayh-Dole Act of 1980 and University-Industry Technology Transfer: A Model for Other OECD Governments? In The Journal of Technology Transfer 30 (1-2) 2004, 115 ff.
2. R. RHINES, Consequences of the Bayh-Dole Act, 12th, 2005.
3. R. JENSEN, M. THURSBY, Proofs and Prototypes for Sale: The Licensing of University Inventions in AER 2001, 241.
4. W. COHEN, D. LEVINTHAL, Absorptive Capacity: A New Perspective on Learning and Innovation in ASQ, Vol. 35, No. 1 1990, 128 ff.
5. T. GIBSON, H. VAN DER VAART, Defining SMEs: A Less Imperfect Way of Defining Small and Medium Enterprises in Developing Countries, in Brookings Global Economy and Development 2008.
6. S. ÖCALAN ÖZEL, J. PÉNIN, Exclusive or Open? An Economic Analysis of University Intellectual Property Patenting and Licensing Strategies in Journal of Innovation Economics & Management 2016/3 (nº21), 151.
7. D.DELL'ANNO, M DEL GIUDICE, Journal of Innovation and Entrepreneurship, 2015.

Books

1. D. MOWERY, R. NELSON, B. SAMPAT, A. ZIEDONIS, Ivory Tower and Industrial Innovation – University Industry Technology Transfer Before and after the Bayh-Dole Act, Stanford University Press, Stanford California, 2004, 85 ff.
2. D. TEECE, Managing Intellectual Capital, Oxford University Press Inc., New York, 2002, 135.
3. G. LIBECAP, Advances in the Study of Entrepreneurship, Innovation and Economic Growth, Volume 16, University Entrepreneurship and Technology Transfer: Process, Design, and Intellectual Property, Elsevier Ltd., Oxford, 2005, 198 ff.
4. R. TAPLIN, A. NOWAK, Intellectual property, innovation and management in emerging economies, Routledge, New York, 2010, 67 ff.
5. F. MUNARI, R. ORIANI, M. GRANIERI, The Economic Valuation of Patents, Edward Elgar Publishing Limited, Northampton, USA, 2011, 233 ff.
6. J. H. ROOKSBY, The Branding of the American Mind: How Universities Capture, Manage, and Monetize Intellectual Property and Why It Matters (Critical University Studies), John Hopkins University Press, Baltimore, 2016, 175 ff.
7. WORLD INTELLECTUAL PROPERTY ORGANIZATION, WIPO Intellectual Property Handbook, 2004, 189.
8. B. FRIEDLANDER, L. EVANS, The law and business of licensing: Licensing in the 21st Century. Licensing Executive Society, 2001, 975 ff.

9. R. GOMULKIEWICZ, D. CONWAY-JONES, X. NGUYEN, Licensing Intellectual Property - Law and Application, Aspen Publishers, USA, 2008, 478 ff.
10. A. LINK, D. SIEGEL, M. WRIGHT, The Chicago Handbook of University Technology Transfer and Academic Entrepreneurship, The University of Chicago Press, Chicago, 2015.

Related jurisprudence

1. 307 F3d 1351 (Fed. Circ. 2002).

Websites

1. http://otd.harvard.edu/industry-investors/sample-agreements/licensing/
2. http://www.gdrc.org/sustbiz/what-are-smes.html
3. http://www.wipo.int/sme/en/ip_business/licensing/licensing.htm